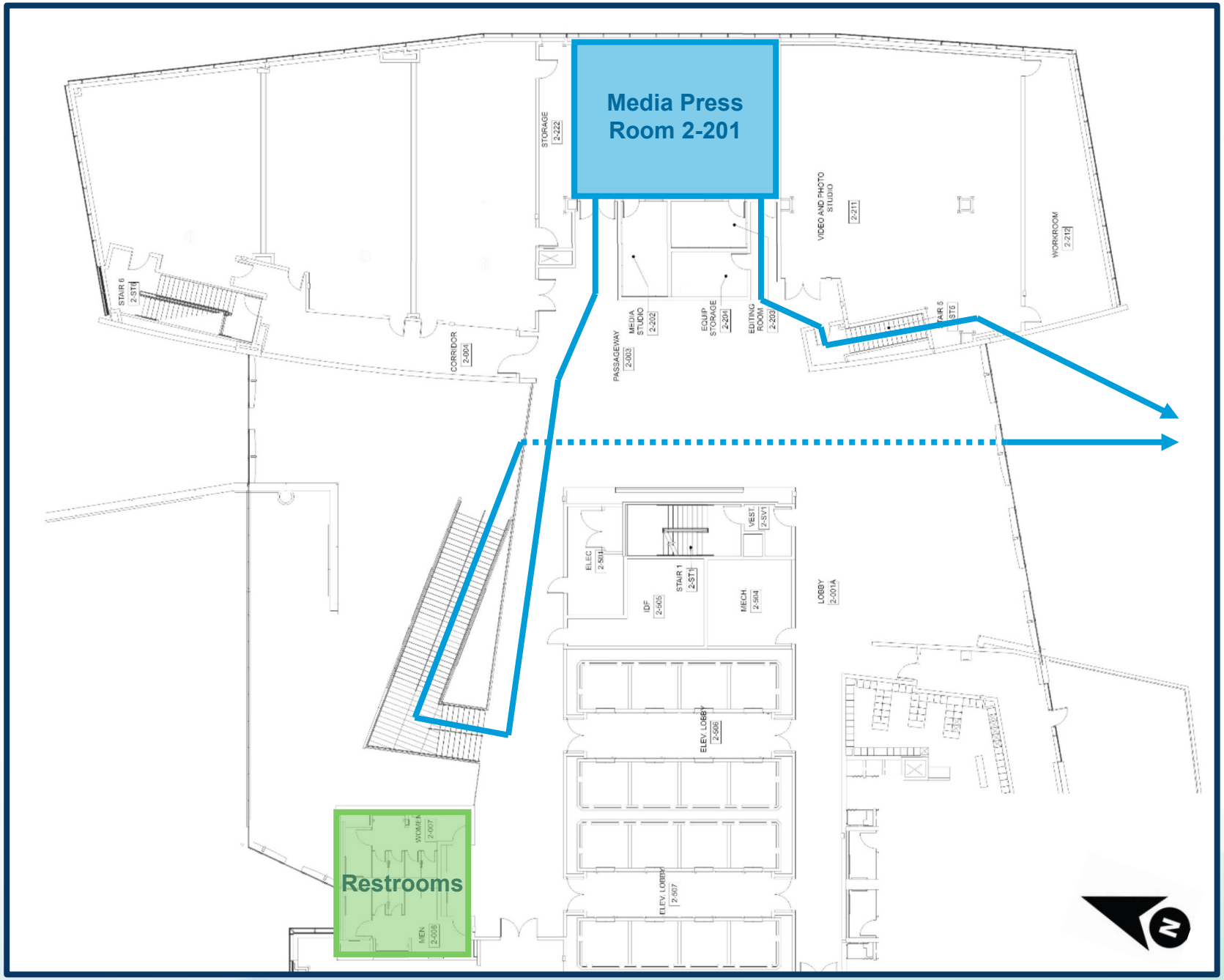
| DOCKETED | |
|---|---|
| **Docket Number:** | 24-BSTD-01 |
| **Project Title:** | 2025 Energy Code Rulemaking |
| **TN #:** | 255815 |
| **Document Title:** | April 18, 2024, Presentation Slides from Lead Commissioner Hearing on 2025 Building Energy Efficiency Standards |
| **Description:** | Presentation slides from the April 18, 2024, Lead Commissioner Hearing on the proposed changes to the 2025 Building Energy Efficiency Standards. All materials related to this hearing, including a recording of this hearing will be posted on the event website at https://www.energy.ca.gov/event/meeting/2024-04/day-3-lead-commissioner-hearings-2025-building-energy-efficiency-standards. |
| **Filer:** | Javier Perez |
| **Organization:** | California Energy Commission |
| **Submitter Role:** | Commission Staff |
| **Submission Date:** | 4/19/2024 2:28:28 PM |
| **Docketed Date:** | 4/19/2024 |

# Good morning and thank you for joining us.

The hearing will begin shortly.

# 2025 Building Energy Efficiency Standards – Lead Commissioner Hearing

April 18, 2024




**P Street Emergency Gathering Point**

# Housekeeping Rules

## Public Comments

### In Person

- Raise hand

### Microphone will be provided

- State your name and affiliation
- Maximum 2 minutes per speaker, 1 speaker per affiliation

### Zoom App/Online

- Click “raise hand”

### Telephone

- Press *9 to raise hand
- Press *6 to Mute/Unmute

### When called upon

- CEC will open your line
- Unmute on your end
- Spell name and state affiliation, if any
- Maximum 2 minutes or less per speaker, 1 speaker affiliation

# Todays Agenda

| | Topics | Presenter |
|---|---|---|
| | General Structure of Hearing | Payam Bozorgchami |
| | Opening Remarks | Commissioner McAllister |
| | Rulemaking Introduction | Javier Perez |
| | Single-Family Residential Buildings Mandatory Measures | Stephen Becker |
| | Single-Family Residential Buildings Prescriptive Measures | Danny Tam |
| | **Break** | |
| | Single-Family Residential Buildings Additions and Alterations | Bach Tsan |
| | **Lunch** | |

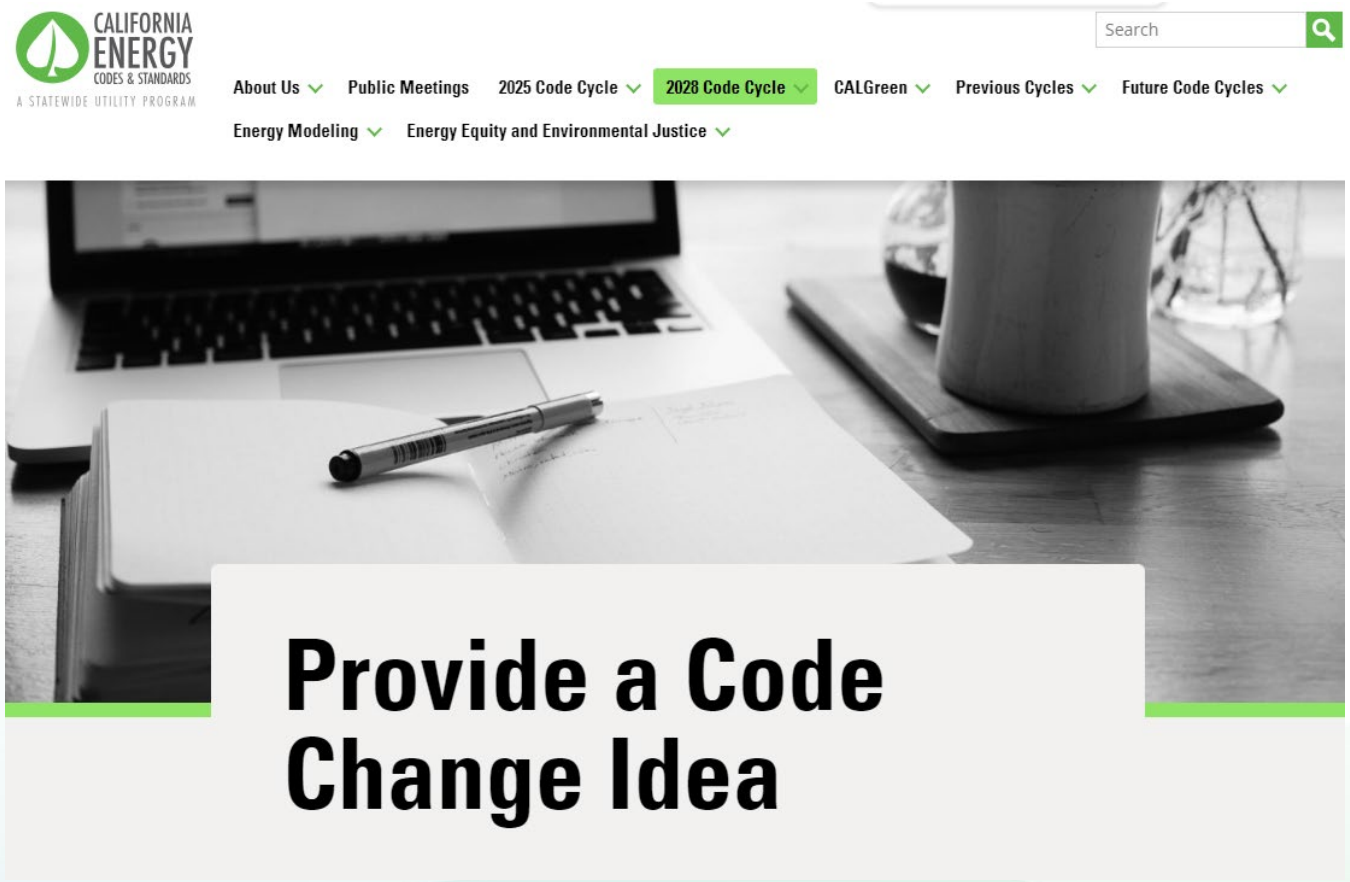
# Todays Agenda (continued)

| | Topics | Presenter |
|---|---|---|
| | Multifamily Buildings, Mandatory Measures | Anushka Raut |
| | Multifamily Buildings, Prescriptive Measures | Javier Perez |
| | **Break** | |
| | Multifamily Buildings, Additions and Alterations | Javier Perez |
| | Closing Remarks | Commissioner McAllister |
| | **End** | Payam Bozorgchami |

# 2028 Measure Proposal Ideas

## CASE Team 2028 Measure Intake Webpage Now Available

- Measures not included in 2025 cycle
- New ideas, technologies, etc.
- Intake portal now open
- Visit: https://title24stakeholders.com/provide-a-code-change-idea/



# Thank you for participating in today's hearing!

## Comments on Lead Commissioner Hearings

- **Due Date: May 13, 2024, by 5:00 PM**
- **Comments to be submitted to: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=24-BSTD-01**
- **Public Assistance with Participation**

  Public Advisor - Mona Badie
  publicadvisor@energy.ca.gov

  916-957-7910

  https://www.energy.ca.gov/about/divisions-and-offices/office-public-advisor

# 2025 Building Energy Efficiency Standards Rulemaking - Lead Commissioner Hearings

Energy Code Authority, Drivers and Themes, Metrics, and Timeline

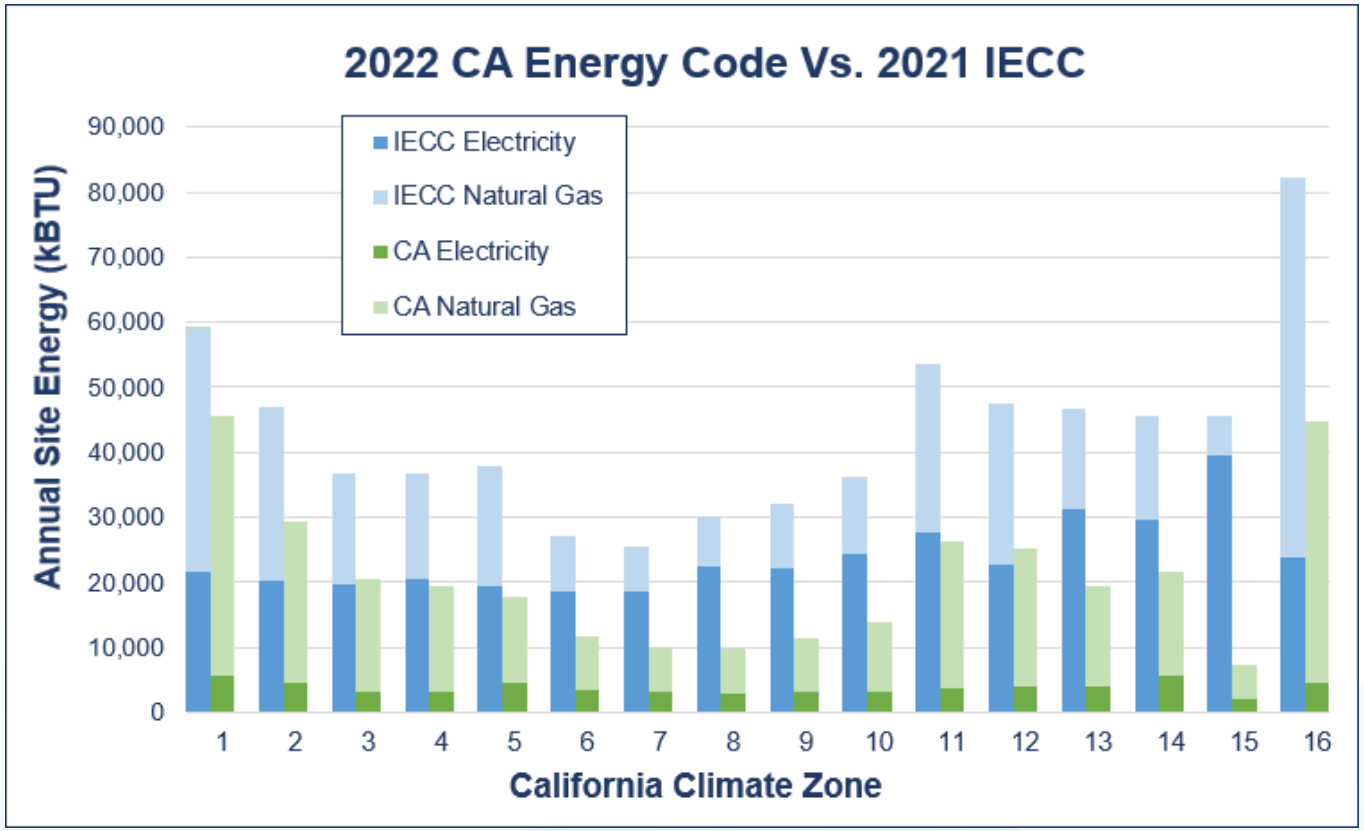
Javier Perez, Project Manager, 2025 Standards

April 18, 2024

# California Energy Commission's Authority and Process

## California's Warren Alquist Act Signed into law in 1974

- Reduction of wasteful, uneconomic, inefficient, or unnecessary consumption of energy as it relates to buildings
- Residential Chart Details:
  - Blue bars: Site energy of a single-family building built to 2021 International Energy Conservation Code (IECC)
  - Green bars: Site energy of a single-family building built to 2022 California Energy Code
- For more on how the 2022 Energy Code compares to federal standards, see our 2022 Impact Analysis at: https://www.energy.ca.gov/publications/2023/impact-analysis-2022-update-california-energy-code



# 2025 Energy Code Drivers and Themes

## State Goals

- Increase building energy efficiency cost-effectively
- Contribute to the state's GHG reduction goals

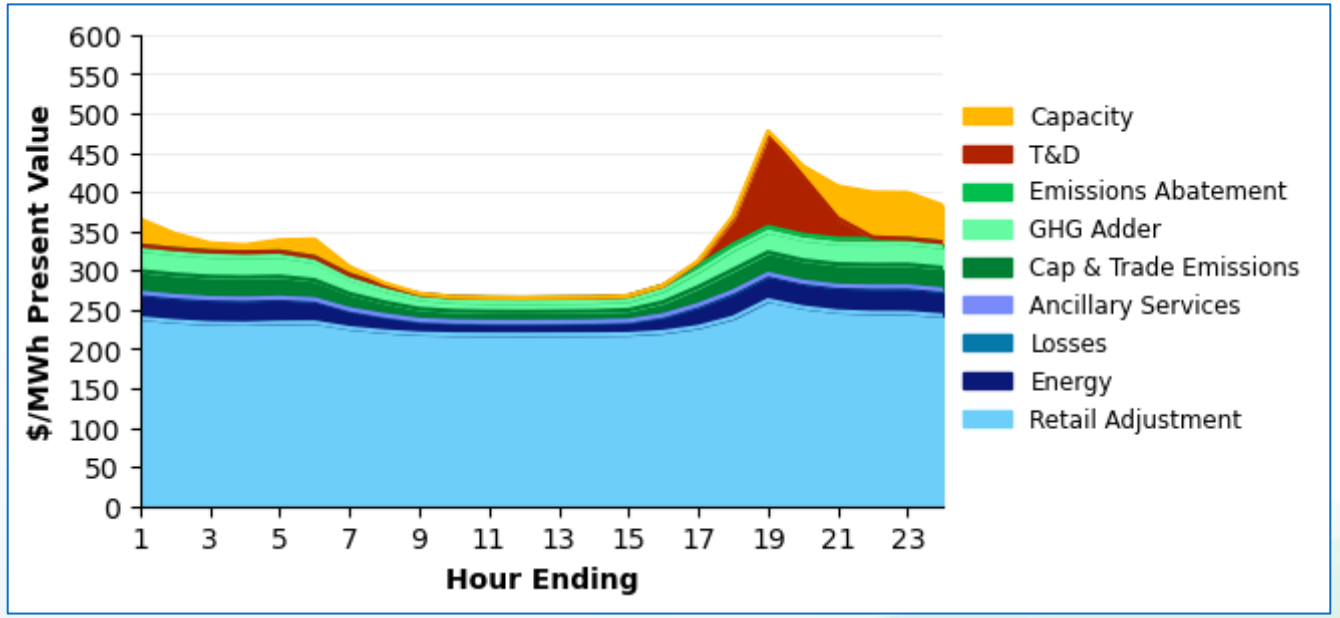
## 2025 Energy Code Strategies

- Heat pump baselines
- Promote demand flexibility, Solar PV generation and energy storage
- Covered process loads
- Equity & affordable new housing program integration
- Additions, alterations, and smaller homes (e.g., ADUs)
- Interagency coordination

# Long-Term System Cost

Long-term System Cost (LSC) Hourly factors are used to convert predicted site energy use to long-term dollar costs to CA's energy system.

Since the *time* that energy is used is as important as the *amount* of energy used, these factors are generated on an hourly basis for a representative year and created for each of CA's diverse climate zones.



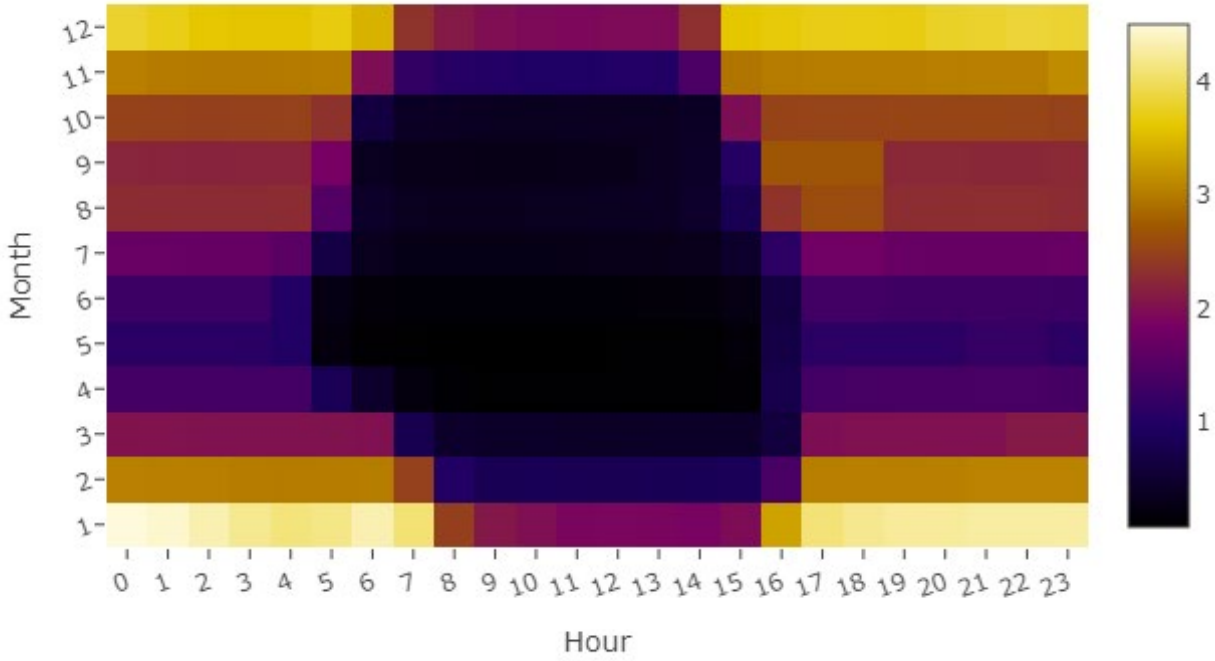

Sample LSC shape by component, average day, levelized 30-year residential, climate zone 12

# Source Energy Metric

Long run marginal source energy is defined as the source energy of fossil fuels following the long-term effects of any associated changes in resource procurement.

Source Energy focuses specifically on the amount of fossil fuels that are combusted in association with demand-side energy consumption and assists in aligning our standards with the CA's environmental goals.

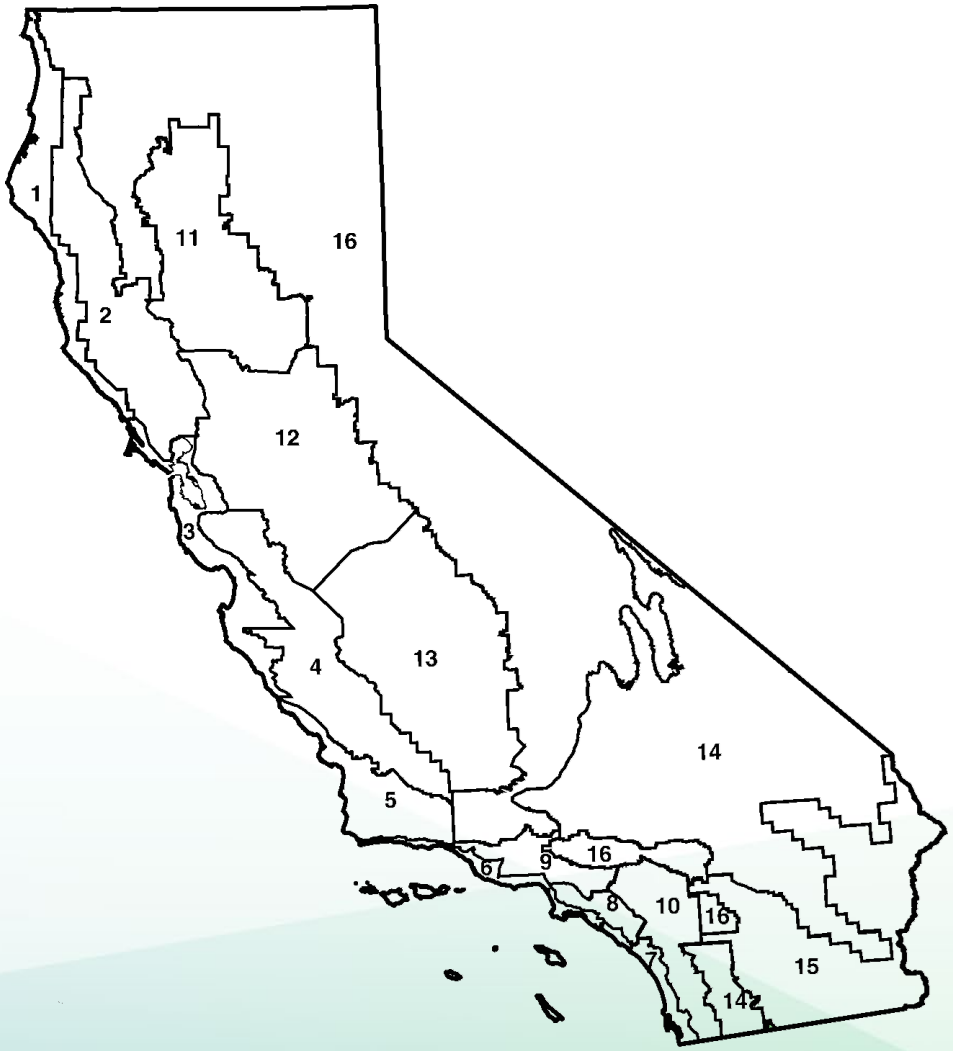
5-Month Average of electricity long run marginal source energy for 2025 Energy Code



# California Climate Zones

**California has 16 climate zones**

- Climate Zones allow software to more accurately simulate variances weather, and as a result, energy consumption of buildings
- A measure's cost effectiveness can vary as a result of weather differences
- Energy Code requirements vary by climate zone as a result



# 2025 Cycle - Work To Date

| Milestones | Timelines |
|---|---|
| Codes & Standards Enhancement (CASE) Team Measure Proposal Efforts<br>• 19 Public Workshops<br>• https://title24stakeholders.com/ | June 2021 – July 2023 |
| CEC Updated Weather Data, LSC, and Source Energy Metrics<br>• 2 Public Workshops | March 2022 – September 2022 |
| CEC Pre-Rulemaking Workshops<br>• 9 Public Workshops<br>• https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=22-BSTD-01 | March 2023 – September 2023 |
| CEC Released Draft Express Terms | November 2023 |
| CEC released 45-day Rulemaking Language | March 29, 2024 |

# 2025 Cycle Participation

## Stakeholder Participation

- Over 60 different stakeholder groups participated
- Groups included:
  - Energy Consulting
  - Trade Groups
  - Engineering/Architecture Firms
  - Manufacturers
  - Building Industry
  - Environmental
  - ADU Advocates
  - Labs

# 2025 Energy Code Work To Come

| Milestones | Timelines |
|---|---|
| Rulemaking 45-Day Public Comment Period | March 29, 2024 – May 13, 2024 |
| Three-Day Lead Commissioner Hearings | April 16, 2024 – April 18, 2024 |
| Rulemaking 15-Day Comment Period | June 2024 |
| Adoption of 2025 Energy Code | August 14, 2024 |
| Building Standards Commission Approval of 2025 Energy Code | December 2024 |
| Manuals, Software, and Forms Updates | July 2024 – March 2025 |
| 2025 Energy Code Effective Date | January 2026 |

# 2025 Energy Code Senior Staff Contacts

- **Javier Perez** – Project Manager
- **Payam Bozorgchami** – Technical Lead, Envelope, Additions and Alterations, ADUs
- **Haile Bucaneg** – Covered Process, Demand Response, Nonresidential and Residential ACM
- **Muhammad Saeed** – Solar Photovoltaic and Energy Storage Systems
- **Bach Tsan** – HVAC Systems, Refrigeration
- **Michael Shewmaker** - Supervisor, Standards Development Unit
- **Gypsy Achong** – Branch Manager, Building Standards
- **Email Convention at the Energy Commission:** firstname.lastname@energy.ca.gov

# 2025 Building Energy Efficiency Standards (Title 24, Part 6)

## Proposed Changes to Section 150.0, Single-Family Mandatory Measures

Presenter(s): Stephen Becker, EIT, Mechanical Engineer

Date: April 18, 2024

# Section 150.0(c) – Mandatory Wall Insulation

## Section 150.0(c) – Mandatory Wall Insulation

- Reduce maximum U-factor as follows:
  - For 2x4 framing to U-0.095
    - Equivalent to R-15 cavity insulation in a 2x4 wood framed assembly.
  - For 2x6 or greater framing to U-0.069
    - Equivalent to R-21 cavity insulation in a 2x6 wood framed assembly.

These same changes also apply to Multifamily, Section 160.1(b).

# Section 150.0(h) – Mandatory Space Conditioning Equipment

## Section 150.0(h)1 - Building cooling and heating loads

- Added new exception that allows for use of block loads when sizing space conditioning equipment for additions

## Section 150.0(h)2 - Design conditions

- Specifies that outdoor design conditions can be taken from the ASHRAE Handbook, the SMACNA Residential Comfort System Installation Standards Manual, or ACCA Manual J in addition to Joint Appendix JA2
- Outdoor design temperature for heating shall be no lower than the 99.0 percent Heating Dry Bulb or the Heating Winter Median of Extremes values.

# Section 150.0(h) – Mandatory Space Conditioning Equipment

## Section 150.0(h)5 - System Selection

New section specifies requirements for space conditioning equipment sizing and selection:

- Systems size based on ACCA Manual S-2023
- Cooling Capacity Limits: No limits on minimum cooling capacity
- Heating Capacity Limits:
  - Furnaces size based on ACCA Manual S – 2023, Table N2.5
  - Heat pump heating capacity shall meet minimum CBC requirements not including supplementary heating
  - No limit on heat pumps' maximum heating capacity

# Section 150.0(h) – Mandatory Space Conditioning Equipment

## Language Correction for Section 150.0(h)5Biii

The proposed language incorrectly states that there is no limit on the minimum capacity for heat pump heating capacity:

- "**iii. Heat Pump Heating Capacity:** There is no limit on the minimum capacity."

Fixed Language:

- "**iii. Heat Pump Heating Capacity:** ~~There is no limit on the minimum capacity~~."

# Section 150.0(h) – Mandatory Space Conditioning Equipment

## Section 150.0(h)6 - Defrost

New section adds requirements for heat pumps with defrost delay timers:

- Delay timer must be set greater than or equal to 90 minutes
- Requires installer certification on CF2R that control configuration has been tested
- Exception 1 to 150.0(h)6 : Dwelling units in climate zones 6 and 7
- Exception 2 to 150.0(h)6 : Dwelling units with conditioned floor area ≥ 500 ft2 or less in climate zones 3, 5 – 10, and 15

# Section 150.0(h) – Mandatory Space Conditioning Equipment

## Section 160.3(b)7 - Defrost

Requirements in Section 150.0(h)6 also apply to space conditioning systems in multifamily residential buildings – Section160.3(b)7

- Exception 1 to Section 160.3(b)7: Dwelling units in climate zones 1, 6 – 10, 15, and 16

# Section 150.0(h) – Mandatory Space Conditioning Equipment

## Section 150.0(h)7 - Supplementary heating control configuration

New section adds suppletory heating control requirements for heat pumps:

- Supplementary heat must be locked out above outdoor air temperature of 35°F except during defrost or emergency operation
- Requires installer certification on CF2R that control configuration has been tested
- Exception 1 to Section 150.0(h)7: Room air-conditioner heat pumps
- Exception 2 to Section 150.0(h)7: Dwelling units in climate zones 7 and 15
- Exception 3 to Section 150.0(h)7: Dwelling units with conditioned floor area ≤ 500 ft2 or less

# Section 150.0(h) – Mandatory Space Conditioning Equipment

## Section 150.0(h)8 - Sizing of electric resistance supplementary heat

New section adds suppletory heating sizing requirements for heat pumps:

- Creates supplementary heater size limits for heat pumps that utilize electric resistance supplementary heating
- Capacity of the electric resistance supplementary heater shall not exceed the following:

$$Heat\ Pump\ Nominal\ Cooling\ Capacity\ \times 2.7\ [kW\ per\ ton]$$

# Section 150.0(h) – Mandatory Space Conditioning Equipment

## Section 150.0(h)9 and 160.3(b)8 - Capacity variation with third-party thermostats

New section adds requirements for variable and multi-speed space conditioning systems to ensure compatibility with third-party thermostats:

- Must be capable of responding to heating and cooling loads by modulating compressor speed when using third-party thermostats
- Requires installer certification on CF2R that control configuration has been tested

Note: Requirements also apply to space conditioning systems in multifamily residential buildings – Section160.3(b)8

# Section 150.0(i) – Mandatory Thermostats

## Section 150.0(i)2 - Thermostats that are applied to heat pumps with supplemental heating

New section adds thermostat control requirements for heat pumps with supplementary heating:

- Thermostat must receive and display outdoor air temperature from a sensor or internet weather service
- Supplementary heat must be locked out according to requirement in 150.0(h)7
- Thermostat must indicate supplementary or emergency heat
- Requires installer certification on CF2R that control configuration has been tested

# Section 150.0(i) – Mandatory Thermostats

**Section 150.0(i)2 - Thermostats that are applied to heat pumps with supplemental heating.**

Exceptions:

- When supplementary heat is locked out above 35°F by another device
- Room air conditioner heat pumps

# Section 150.0(k) – Mandatory Residential Lighting

## Section 150.0(k) Mandatory Lighting Features and Devices

- Add “lamps and light sources” to luminaire efficacy.
- Delete the “Screw-based luminaires” section.
- Delete Table 150.0-A - Classification of High Luminous Efficacy Light Sources.
  - Retain the default high efficacy light sources - list them as an exception.
- Add lighting integral to “ceiling fan kits” to Exception 1 to the luminaire efficacy requirements.
- Clarify Section (k)1C and 1D – about downlights & recessed luminaires
- These changes apply to Multifamily Section 160.5(a)1.

# Section 150.0(k) – Mandatory Residential Lighting

## Section 150.0(k)3 – Residential Outdoor Lighting

- Clarify Section 150.0(k)3A.
  - energy management control system (EMCS); and
  - other controls can meet the outdoor lighting control requirements

## Section 160.5(a)3 - Outdoor Lighting Controls

- Changes in Section 150.0(k)3 also apply to lighting controls in multifamily residential buildings – Section160.5(a)3

# JA8 & JA10 Requirements for Light Sources

**Joint Appendix JA8 - Qualification Requirements for High Luminous Efficacy Light Sources**

- Remove the portion of the JA8 performance criteria and the test requirements for incandescent lamps and fluorescent lamps.
- Remove reference to the ENERGY STAR test methods – the start time test and the noise test. Add the test methods to JA8.

**Joint Appendix JA10 – Flicker Test**

- Remove the portion of the test criteria and the test requirements for fluorescent lamps

# Section 150.0(m) – Mandatory Air-Distribution and Ventilation System Ducts, Plenums, and Fans

## Section 150.0(m)13 - Space conditioning system airflow rate and fan efficacy

- Changes to Exception 1 to Section 150.0(m)13C, which allows certain systems to demonstrate compliance with Section 150.0(m)13C's airflow and fan efficacy requirements by operating the system at maximum compressor capacity and system fan speed with all zones calling for conditioning.
  - Exception no longer applies to single speed compressor systems
  - Exception now only applies to multispeed and variable speed compressor systems that incorporate controls that vary fan speed according to the number of zones calling
  - Ability to vary fan speed according to the number of zones calling shall be certified by the installer.

# Section 150.0(o) – Mandatory Requirements for ventilation and indoor air quality

**Section 150.0(o)1C - Whole-dwelling unit Mechanical Ventilation for Single-family Detached and Townhouses**

**Section 150.0(o)1Civ - Requirements for balanced and supply only ventilation systems**

- Section 150.0(o)1Civa adds requirements for Indoor air quality (IAQ) filter and heat/energy recovery ventilator system accessibility
- Add language to specify accessibility requirements for regular service and replacement.
- Add an **exception to §150.0(o)1Civa** to specify accessibility requirements for systems that require servicing from inside the attic.

**To view ASHRAE Standards, including ASHRAE Standard 62.2, visit:**
https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards

# Section 150.0(o) – Mandatory Requirements for ventilation and indoor air quality

## Section 150.0(o)1Civ - Requirements for balanced and supply only ventilation systems (continued)

## Section 150.0(o)1Civb IAQ system component accessibility

- Add language to specify serviceable components shall meet all applicable requirements of California Mechanical Code 304.0.

## Section 150.0(o)1Civc Outdoor air intake design

- Add language to specify outdoor air intake designs shall meet all applicable requirements of California Mechanical Code 402.4.1.

# Section 150.0(o) – Mandatory Requirements for ventilation and indoor air quality

## Section 150.0(o)1Civ - Requirements for balanced and supply only ventilation systems (continued)

## Section 150.0(o)1Civd Outdoor air intake location and accessibility

- Add language to specify outdoor air intakes located not more than 10 feet above a walking surface should be accessible for regular service and if located on roofs shall meet the requirements of the California Mechanical Code Section 304.3.1.
- Add an **exception to §150.0(o)1Civd** including outdoor air intake serving equipment with a Fault Indicator Display (FID) meeting requirements of Reference Joint Appendix (JA)17.

# Section 150.0(o) – Mandatory Requirements for ventilation and indoor air quality

## Section 150.0(o)1G Local Mechanical Exhaust

- **Table 150.0-E Demand-controlled local ventilation exhaust airflow rates and capture efficiency**
  - Remove "or a capacity of 5 air changes per hour (ACH)" for enclosed kitchens.
  - Enclosed and non-enclosed kitchen compliance criteria will be the same and include other kitchen exhaust fans, including downdraft: **300 cfm (150 L/s).**

# Section 150.0(p) – Mandatory Pool Systems and Equipment Installation

**Section 150.0(p)1A Pump sizing and flow rate for single family buildings**

- Add references to dedicated-purpose pool pumps and replacement dedicated-purpose pump motors, and update references to the applicable appliance standards

**Section 150.0(p)1D**

- Delete section due to outdated reference

**Section 150.0(p)1D and 1E after renumbering**

- Add references to dedicated-purpose pool pumps and replacement dedicated-purpose pump motors

# Section 150.0(q) – Mandatory Fenestration Products

## Section 150.0(q) – Mandatory Fenestration Products

- Align requirements for all fenestration products, including skylights.
- Reduce max U-factor to U-0.40.

(q) **Fenestration products.** Fenestration, including skylight products, separating conditioned space from unconditioned space or outdoors shall ~~meet the requirements of either Item 1 or 2 below:~~

1. ~~Fenestration, including skylight products, must~~ have a maximum weighted average U-factor of ~~0.45~~0.40.

   **Exception 1 to Section 150.0(q)~~1~~:** Up to 10 square feet of fenestration area or 0.5 percent of the conditioned floor area, whichever is greater, is not required to comply with ~~exempt from~~ the maximum U-factor requirement.

   **Exception 2 to Section 150.0(q)~~1~~:** For dual-glazed greenhouse or garden windows, up to 30 square feet of fenestration area is not required to comply with ~~exempt from~~ the maximum U-factor requirement.

2. ~~The area-weighted average U-factor of all fenestration, including skylight products shall not exceed 0.45.~~

# Section 150.0(s) – Mandatory Battery Energy Storage System (BESS) Ready Requirements

| Existing 2022 Standards | 2025 Proposed Standards |
|---|---|
| Energy storage ready requirements for all newly constructed single-family buildings, including newly constructed ADUs | **No BESS ready requirement if:**<br><br>• Energy storage system is already installed.<br>• The load serving entity is providing service of 125 amps or less |

# Questions/Public Comment Period

**Zoom App/Online**

- Click “raise hand”

**Telephone**

- Press *9 to raise hand
- Press *6 to Mute/Unmute


**When called upon**

- CEC will open your line
- Unmute on your end
- Spell name and state affiliation, if any
- 2 minutes or less per speaker, 1 speaker per entity

# 2025 Building Energy Efficiency Standards (Title 24, Part 6)

Proposed Changes to Section 150.1, Single-Family New Construction

Presenter(s): Danny Tam, Associate Mechanical Engineer

Date: April 18, 2024

# Section 150.1(c)

**Section 150.1(c)3A – Prescriptive Fenestration**

- Exception 1
  - Add exception for new dwelling units with conditioned floor area < 500-ft$^2$ in CZs 5-10 & 15 – max U-factor or U-0.30.

- Exception 3 (after renumbering)
  - Restrict exceptions to CZs 2, 4, & 6-15, and reduce max U-factor to U-040.
  - Specify that there is no SHGC requirement for CZs 1, 3, 5, & 16.

# Section 150.1(c)

**Table 150.1-A – Prescriptive Single-Family Standard Building Design**

- Option C – increase ceiling insulation requirement in CZs 8-10 to R-38.
- Slab Perimeter Floors – correct U-factor to F-factor.
- Fenestration – reduce max U-factor to U-0.27 in CZs 1-5, 11-14 & 16.

# Table 150.1-A Prescriptive Component Package

**Section 150.1(c)1A**

- Specify inclusion of cathedral ceiling insulation requirements under existing Option C which currently outlines ceiling insulation requirements for vented attics referenced by climate zone in Table 150.1-A.

**Table 150.1-A, Option C**

- Revise the prescriptive Option C of Table 150.1-A, Chapter 8 of Title 24, Part 6 to
  - Introduce insulation requirements for roof constructions with either above or below roof deck insulation, and
  - Increase the prescriptive requirement for ceiling insulation to R-38 for Climate Zone 8 through 10.

*TABLE 150.1-A COMPONENT PACKAGE – Single-Family Standard Building Design*

| **Building Component**<br>**Roofs and Ceilings** | **CZ 1** | **CZ 2** | **CZ 3** | **CZ 4** | **CZ 5** | **CZ 6** | **CZ 7** | **CZ 8** | **CZ 9** | **CZ 10** | **CZ 11** | **CZ 12** | **CZ 13** | **CZ 14** | **CZ 15** | **CZ 16** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roof Deck Insulation for Cathedral Ceilings[1,4] | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 |
| Option C[14]<br>Ceiling Insulation for vented attics | R 38 | R 30 | R 30 | R 30 | R 30 | R 30 | R 30 | R 380 | R 380 | R 380 | R 38 | R 38 | R 38 | R 38 | R 38 | R 38 |

# Section 150.1(c)6 & Table 150.1-A – Prescriptive Heat Pump Space Heating

**Section: 150.1(c)6 – Heating System Type:**

- 2022 Prescriptive Requirements:
  - Heat pump space heater in climate zones 3, 4, 13, and 14
- 2025 Proposal:
  - Heat pumps space heater in all climate zones

**Table 150.1-A – Single-Family Standard Building Design:**

- Change the space heating standard design to “NA” for “if gas, AFUE” in all climate zones

# Section: 150.1(c)8 – Prescriptive Heat Pump Water Heating

- Remove **Exception 1 to Section 150.1(c)8** for gas instantaneous water heaters in climate zones 3, 4, 13, and 14.
  - 2022 Requirements:
    - Heat pump water heater or solar water heating system in all climate zones with exceptions to CZ3, 4, 13, and 14
  - 2025 Proposal:
    - Heat pumps water heater or solar water heating system in all climate zones
- **Exception 1 to Section 150.1(c)8 (after renumbering)**
  - Remove the word “instantaneous”. All electric water heater with Point-of-Use distribution is now applicable for this exception for new dwelling units with CFA of 500 square feet or less.

# Section 150.1(c)7 – Space Conditioning Equipment

## Section 150.1(c)7 – Refrigerant Charge

- Option to comply using fault indicator display (FID) has been removed
- Climate zones' refrigerant charge verification requirements now depend on whether system is a heat pump or air conditioner
- Refrigerant charge verification requirements by climate zone:
  - Air Conditioners: Climate zones 2 and 8 – 15
  - Heat Pumps: All climate zones

# Section 150.1(c)15 – Ventilation System Fault Indicator Display (FID).

- **Section 150.1(c)15 - Ventilation System Fault Indicator Display (FID).**
  - Add language to require all heat/energy recovery ventilator (HRV/ERV) systems that serve individual dwelling units to have a fault indicator display (FID) system field verified as specified in Joint Appendix JA17

- **Table 150.1-A Component package for Single-family Standard Building Design.**
  - Add a row under HVAC systems to specify that HRV/ERV systems shall meet requirements in Section150.1(c)15

# Section 150.1(c)14 – Photovoltaic Requirements - 2022 Requirements

**2022 Energy Code Existing Requirements:**

- **Prescriptive Approach:**
  - PV system size based on equation:
    - PV Size = (CFA x **A**)/1000 + (Dwelling units x **B**)
    - Where A and B are capacity factors that vary depending on climate zone
- **Performance Approach:**
  - PV system standard design size based on annual load of mixed fuel building as determined by CBECC-Res software simulations.
- **PV Size Reduction by SARA:**
  - If the solar access roof area is limited, the PV size depends on the maximum PV system that can be installed on the roof's Solar Access Roof Area (SARA).

# Section 150.1(c)14 – Photovoltaic Requirements - 2025 Proposed Requirements

Equation and multipliers updated. However, the $PVkW_{dc}$ sizing remains the same as of 2022 Energy Code, assuming EER2 is 11.7 or greater

- Updated PV system size equation:

$$kW_{pv} = \frac{CFA \times A}{1000} + (N_{DU} \times B) - \frac{CFA \times C \times EER2_{Adj}}{1000}$$

- ***A*** = CFA adjustment factor
- ***B*** = Dwelling unit adjustment factor
- ***C*** = EER2 adjustment factor coefficient
- $\frac{CFA \times C \times EER2_{Adj}}{1000}$: This represents a reduction in PV system size where EER2 rating of HVAC system is higher than 7, and up to 11.7
- $EER2_{Adj}$ = Smaller of (EER2 – 7), or 4.7

# Single-Family PV System Sizing – 2025 Proposed Requirements

- **Performance Approach:**
  - Standard design determined according to prescriptive calculation
- **For Solar Access Roof Area (SARA) Limitations:**
  - Roof pitch < 2:12: Min PV required = SARA x 14 w/ft$^2$
  - Roof pitch ≥ 2:12: Min PV required = SARA x 18 w/ft$^2$

# Single-Family PV System Sizing – 2025 Proposed Requirements – Example

## Example PV system size for a 2700 sf² prototype

| CZ | EER2 = 11.7 | EER2 = 10 | EER2 = 9 | EER2 = 7 |
|---|---|---|---|---|
| 1 | 3.41 | 3.41 | 3.41 | 3.41 |
| 2 | 2.89 | 2.89 | 2.89 | 2.89 |
| 3 | 2.81 | 2.81 | 2.81 | 2.81 |
| 4 | 2.79 | 2.81 | 2.82 | 2.84 |
| 5 | 2.63 | 2.63 | 2.63 | 2.63 |
| 6 | 2.82 | 2.83 | 2.83 | 2.83 |
| 7 | 2.69 | 2.69 | 2.69 | 2.70 |
| 8 | 2.94 | 2.97 | 2.98 | 3.01 |
| 9 | 3.01 | 3.04 | 3.06 | 3.09 |
| 10 | 3.09 | 3.16 | 3.20 | 3.27 |
| 11 | 3.69 | 3.84 | 3.92 | 4.10 |
| 12 | 3.05 | 3.07 | 3.09 | 3.12 |
| 13 | 3.91 | 4.08 | 4.18 | 4.38 |
| 14 | 3.26 | 3.36 | 3.42 | 3.54 |
| 15 | 5.67 | 6.13 | 6.40 | 6.94 |
| 16 | 2.81 | 2.81 | 2.81 | 2.81 |

# JA12 – Qualification Requirements for Battery Energy Storage Systems – Single-Family

## Definitions:

- **Battery Energy Storage System (BESS)** is a stationary equipment that receives electrical energy and then utilizes batteries to store that energy for later use to supply electrical energy when needed. The BESS consists of one or more modules, a power conditioning system, and balance of plant components
- **Cycling Capacity** is the battery energy storage capacity in kWh available for daily cycling.
- **Compliance Cycling Capacity** is the cycling capacity in kWh of the BESS that is programmed during the installation/commissioning of the system. Once programmed, the ratio between compliance cycling capacity and usable capacity shall be maintained for the life of the BESS.
- **Reserve Level** is the battery energy storage capacity in excess of the compliance cycling capacity, is available for other functions, and is not subject to the control requirements in section JA12.3.3.
- **Usable Capacity** is the energy storage capacity in kWh that a manufacturer allows to be used for charging and discharging.

# JA12 – Qualification Requirements for Battery Energy Storage Systems – Single-Family

## JA12.3.1 Safety Requirements:

- Added reference of UL1741 Supplement SB

## JA12.3.2 Minimum System Performance Requirement:

- Removed minimum 5 kWh requirement from prescriptive compliance
- Clarify that under performance compliance the minimum 5 kWh requirement is per building, therefore combination of smaller energy storage units can be used

# JA12 – Qualification Requirements for Battery Energy Storage Systems – Single-Family

## JA12.3.3 General Control Requirements:

- Removed subsection (c) and (d) regarding requirements for twice a year reset and backup behavior
- **[Single-family only]** New 72 hour reset requirements if the cycling capacity drops below compliance cycling capacity. This does not impact reserve levels changes controlled because of PSPS or severe weather events

## JA12.5 System Labeling – Single-Family Residential Buildings:

- New labeling requirement to identify the compliance cycling capacity and total cycling capacity. Installer to set compliance cycling capacity in the field and attach a permanent label on the BESS

# JA12 – Qualification Requirements for Battery Energy Storage Systems – Single-Family

**JA12.6 Interconnection and Net Energy Metering Requirements:**

- Section removed

**JA12.6 Enforcement Agency (after renumbering)**

- Add reference to new single-family labeling requirement specified in JA12.5

**JA12.7 Certification Documentation Requirements**

- New section to clearly describe documentation needed for JA12 certification.
- Includes specification sheet and documentation on control strategy and 72 hour reset

# Status Update - Single-Family Peak Cooling

**Post Pre-Rulemaking Workshop Activities**

- After the pre-rulemaking workshop, staff collaborated with various stakeholders including the building industry and energy consultants.
- Staff determined that additional flexibility is needed to address orientation, fenestration allocations, and varying construction practices.

**New Proposed Performance Path Peak Cooling Energy Calculation:**

- New calculations for peak cooling energy in specified climate zones achieving 120% or less of the peak cooling energy of the 2025 single family prototype used in the prescriptive path would be used to demonstrate compliance.

**While the Peak Cooling Energy Calculation was mentioned in Draft 2025 Energy Code Express Terms, staff now proposes that this calculation is more appropriate for 2025 Single-Family Residential ACM Reference Manual.**

# CBECC-Res Status Update

**Software Updates**

- The 2025 CBECC-Res research version has been updated to reflect the proposed 120% standard design Peak Cooling Energy Calculation

- Updated version, CBECC-Res 2025.0.9b RV, can be found at:

  https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2025-energy-code-compliance-software

# Questions/Public Comment Period

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# Comments on the 2025 Codes

- **Comments on Todays Hearing**
- **Due Date: May 13, 2024, by 5:00 PM**

- **Comments to be submitted to: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=24-BSTD-01**

- Thank you for participating!

# 15-minute Break

We will resume at 10:20

# 2025 Building Energy Efficiency Standards (Title 24, Part 6)

Proposed Changes to Section 150.2, Additions and Alterations

Presenter(s): Bach Tsan, P.E., Senior Mechanical Engineer

Date: April 18, 2024

# Additions: HVAC

# Section 150.2(a) – Additions – Prescriptive Space Heating System

**Section: 150.2(a) Exception 7– Space Heating System:**

- Deletes exception 7 to accommodate dual heat pump baseline

> ***2022 Exception : Exception 7 to Section 150.2(a):*** *Space heating system. New or replacement space heating system serving an addition may be a heat pump or gas heating system.*

- Prescribes heat pumps for new or replacement space heating systems serving additions.
  - Aligns additions with newly constructed buildings
  - Prioritize energy efficiency in space heating systems
- Exceptions being considered for challenging scenarios
  - Colder Climates
  - Electrical constraints

# Section 150.2(a)1E – Prescriptive Requirements for Space Conditioning Equipment - Additions

## Section 150.2(a)1E – Space-Conditioning Load Calculations and System Capacity for Additions

- Minimum capacities defined in Section 150.0(h)5 apply
- Adds maximum capacity limits for space conditioning systems that depend on:
  - Calculated heating design load (HL)
  - Calculated cooling design load (CL)
  - Space conditioning system type
  - Duct sizing
- Establishes limits for envelope leakage assumptions that have not been established through verification and testing

# Section 150.2(a)1E – Prescriptive Requirements for Space Conditioning Equipment - Additions

## Section 150.2(a)1E – Continued

## Space Conditioning System Capacity Limits:

- When airflow is verified to be at least 350 cfm/ton, there is no maximum capacity limit
- When airflow has not been verified to be at least 350 cfm/ton
  - Maximum capacity limits in Table 150.2-A apply for heating
  - Maximum capacity limits in Table 150.2-B apply for cooling

# Section 150.2(a)1E – Space Conditioning Equipment for Additions

## Section 150.2(a)1E – Continued

### Table 150.2-A Maximum Heating Capacity:

| System Type | Maximum Heating Capacity for Heating Only Systems | Heat Pump Maximum Heating Capacity when HL is greater than CL | Heat Pump Maximum Heating Capacity when CL is greater than HL by less than 12 kBtuh | Heat Pump Maximum Heating Capacity when CL is greater than HL by 12 kBtuh or more |
|---|---|---|---|---|
| Single Speed System Capacity | HL + 6 kBtuh | No Maximum | HL + 12 kBtuh | No Maximum |
| Variable or Multi Speed System Maximum Capacity | HL + 6 kBtuh | No Maximum | HL + 12 kBtuh | No Maximum |
| Variable or Multi Speed System Capacity at Lowest Speed | 80% of HL | 80% of HL | No Maximum | No Maximum |

Note: HL and CL refer to calculated heating design load and cooling design load respectively

# Section 150.2(a)1E – Space Conditioning Equipment for Additions

## Section 150.2(a)1E – Continued

### Table 150.2-B Maximum Cooling Capacity:

| System Type | Maximum Cooling Capacity for Cooling Only Systems | Heat Pump Maximum Cooling Capacity when HL is greater than CL | Heat Pump Maximum Cooling Capacity when CL is greater than HL by less than 12 kBtuh | Heat Pump Maximum Cooling Capacity when CL is greater than HL by 12 kBtuh or more |
|---|---|---|---|---|
| Single Speed System Capacity | CL + 6 kBtuh | No Maximum | CL + 6 kBtuh | CL + 6 kBtuh |
| Variable or Multi Speed System Maximum Capacity | CL + 6 kBtuh | No Maximum | CL + 6 kBtuh | CL + 6 kBtuh |
| Variable or Multi Speed System Capacity at Lowest Speed | 80% of CL | No Maximum | 80% of CL | 80% of CL |

Note: HL and CL refer to calculated heating design load and cooling design load respectively

# Section 150.2(a)1E – Space Conditioning Equipment for Additions

## Section 150.2(a)1E – Continued

## Envelope Leakage Assumption Limits:

- Envelope leakage values used in load calculations shall be no greater than the values shown in Table 150.2-C
- Exception:
  - When leakage has been established through field verification and diagnostic testing, the tested values may be used

# Section 150.2(a)1E – Space Conditioning Equipment for Additions

## Section 150.2(a)1E – Continued

### Table 150.2-C Maximum Infiltration Air Changes Per Hour for Load Calculations:

| Floor Area of Conditioned Space | Single Story Heating | Single Story Cooling | Two Story Heating | Two Story Cooling | Townhouse or Condominium Heating | Townhouse or Condominium Cooling |
|---|---|---|---|---|---|---|
| ACH for ≤900 $ft^2$ | 0.61 | 0.32 | 0.79 | 0.41 | 0.69 | 0.36 |
| ACH for 901- 1500 $ft^2$ | 0.45 | 0.23 | 0.80 | 0.30 | 0.50 | 0.27 |
| ACH for 1501-2000 $ft^2$ | 0.38 | 0.20 | 0.50 | 0.26 | 0.43 | 0.23 |
| ACH for 2001-3000 $ft^2$ | 0.32 | 0.16 | 0.41 | 0.21 | 0.36 | 0.19 |
| ACH for ≥3001 $ft^2$ | 0.28 | 0.15 | 0.37 | 0.19 | 0.32 | 0.17 |
| CFM for one Fireplace | 20 | 0 | 20 | 0 | 20 | 0 |

# Section 150.2(a)1E – Space Conditioning Equipment for Additions

## Section 150.2(a)2D:

- All requirements in described in Section 150.2(a)1E also apply to Additions using the Performance Approach in Section 150.2(a)2D

# Section 150.2(b) – Fenestration Alterations

## Section 150.2(b)1A – [Alterations] Prescriptive Added Fenestration

- Exception 1 – remove old exception and add new exception.
  - Add exception for alterations that add vertical fenestration in CZ15 – maximum SHGC value of 0.23.

- Exception 2 – modify existing exception.
  - Remove exception for maximum U-factor and maximum SHGC.

# Section 150.2(a)1E – Additions - Space Conditioning Equipment

## Section 150.2(a)1E – Space-Conditioning Load Calculations and System Capacity for Additions

- Minimum capacities defined in Section 150.0(h)5 apply
- Adds maximum capacity limits for space conditioning systems that depend on:
  - Calculated heating design load (HL)
  - Calculated cooling design load (CL)
  - Space conditioning system type
  - Duct sizing
- Establishes limits for envelope leakage assumptions that have not been established through verification and testing

# Additions: Water Heating

# Section 150.2(a)1D – Additions – Prescriptive Additional Water Heaters

| Existing 2022 Standards | Proposed 2025 Standards |
|---|---|
| **Section 150.2(a)1D – Additional Water Heaters in Additions:**<br>Language applied to only "second" water heater.<br>**Section 150.2(a)1D – Prescriptive Water Heater Options:**<br>i. A single heat pump water heater.<br>ii. A single heat pump water heater that meets the requirements of NEEA Advanced Water Heater Specification Tier 3 or higher<br>*iii. A gas or propane instantaneous water heater*<br>iv. Instantaneous electric with point of use for additions $\leq$ 500 $ft^2$<br>v. Water heating system using no more energy than those specified above | **Section 150.2(a)1D – Additional Water Heaters in Additions:**<br>Language changed to "additional" water heaters.<br>**Section 150.2(a)1D – Prescriptive Water Heater Options:**<br>• Remove iii prescriptive option for gas instantaneous water heaters<br>• Subsequent sections are renumbered<br>Aligns prescriptive requirements for water heater additions with newly constructed building requirements |

# Additions: Envelope

# Section 150.2(a) - Fenestration

## Section 150.2(a)1 – [Additions] Prescriptive Approach

- Add exception for alterations that add vertical fenestration in CZ 15.
  - Maximum SHGC value of 0.23.

**Exception to Section 150.2(b)1Aii:** Alteration that adds fenestration area of shall have a Maximum SHGC value of 0.23 in Climate Zone 15.

# Section 150.2(b) - Fenestration

**Section 150.2(b)1B – [Alterations] Prescriptive Replacement Fenestration**

- Exception 2 – modify existing exception
  - Reduce maximum U-factor to U-0.40.

- Exception 3 – add new exception
  - Add exception for alterations that add vertical fenestration in CZ15 – maximum SHGC value of 0.23.

# Section 150.2(b) – Ceilings and Attics

## Section 150.2(b)1Jiv – Prescriptive Ceiling Insulation

- Specify attic ventilation shall comply with California Residential Code, Title 24, Part 2.5, Section R806.

iv. Attic ventilation shall comply with the ~~California Building Code requirements~~California Residential Code, Title 24, Part 2.5, Section R806.

# Table 150.2-G – Performance, Fenestration

## Table 150.2-G – Performance Standard Design for Altered Component

- Fenestration
  - Without Third-Party Verification – requirements of 150.1(c)3A.
  - With Third-Party Verification – existing fenestration U-factor and SHGC values.

- Window Film
  - Without Third-Party Verification – requirements of 150.1(c)3A.

# Single Family AC to HP Requirement: Moved to Part 11

# A/C to HP Replacement Update

**Alterations to Air Conditioning Systems Pre-rulemaking Proposal**

- Prescriptively requires a heat pump (HP) when replacing an air-conditioner (A/C) in existing single-family homes
  - Supplemental heating can be provided by a new or existing gas furnace
  - Standard air-conditioners can continue to be installed if paired with additional energy efficiency measures

**Proposal moved to Part 11 as a voluntary measure**

- Proposal incurs costs on residents rather than builder/developers
- Aligns with influx of public subsides coming to support HP installations
- Provides time for industry professionals to gain more familiarity with HPs
- Heat pump partnerships with HP manufacturers initiated
- Offers a framework for progressive local governments
- Sets up this important measure for success in 2028

# Questions/Public Comment Period

**Zoom App/Online**

- Click “raise hand”

**Telephone**

- Press *9 to raise hand
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- Thank you for participating!

# Lunch

We will resume at 1:00

# 2025 Building Energy Efficiency Standards (Title 24, Part 6)

Proposed Changes to Sections 160.0 – 160.9, Multi-family Mandatory Measures

Presenter(s): Anushka Raut, Air Pollution Specialist

Date: April 18, 2024

# Section 160.1(b) – Mandatory Wall Insulation Requirements

## Section 160.1(b) – Mandatory Wall Insulation

Reduce maximum U-factor as follows:

- For metal framing to U-0.148.
- For 2x4 framing to U-0.095
  - Equivalent to R-15 cavity insulation in a 2x4 wood framed assembly.
- For 2x6 or greater framing to U-0.069
  - Equivalent to R-21 cavity insulation in a 2x6 wood framed assembly.

# Section 160.1(g) – Slab Edge Insulation

## Section 160.1(g) – Slab Edge Insulation, Mandatory Installation Criteria

- Reproduced slab edge installation criteria already applicable to single-family buildings.

- Minimum specifications added for:
  - Water absorption rate
  - Water vapor permeance
  - Physical and UV damage protection
  - Heated slab insulation requirement reference to Section 110.8(g)

# Section 160.2 – Mandatory Requirements for Ventilation and Indoor Air Quality (IAQ)

- **§160.2(b)2Aivb - Whole-dwelling unit mechanical ventilation requirements**
  - Revise language to require new construction multifamily dwelling units to have **balanced or supply-only** ventilation **AND** meet a compartmentalization requirement of **≤ 0.3 cfm** at 50 pascals per square foot (cfm50/ft$^2$) of dwelling unit enclosure area.

# Section 160.2(b)2Axi – Mandatory Requirements for Balanced and Supply Ventilation Component Accessibility

- **§160.2(b)2Axia - IAQ filter and heat/energy recovery ventilation system HRV/ERV accessibility**
  - Add accessibility requirements for regular service and replacement.
  - Add an **exception to §160.2(b)2Axia** to specify accessibility requirements for systems that require servicing from inside the attic.

- **§160.2(b)2Axib - IAQ system component accessibility**
  - Add language to specify serviceable components shall meet all applicable requirements of California Mechanical Code 304.0.

# Section 160.2(c)2 – Mandatory Requirements for Natural Ventilation for Common Use Areas

- **Section 160.2(c)2 - Natural Ventilation**
  - Editorial changes
  - Moving mechanical ventilation requirements from the section header into the list of requirements under subsection D for clarity
  - Updating language to similar language used in ASHRAE 62.1 - 2022 when referenced
  - Moving the subsection exceptions to mechanical ventilation to reference the new subsection D.

# Section 160.2(c)3 – Mandatory Requirements for Mechanical Ventilation for Common Use Areas

- **Section 160.2(c)3 & Table 160.2-B – Mechanical Ventilation**
  - Editorial changes.
  - Implementing the greater of the Area Method vs the Person Method and updating Table 160.2-B to reflect the changes with Occupant Load Density and Minimum Area-based Ventilation Rates.

# Section 160.2 – Mandatory Requirements for Common Use Areas (Continued)

- **Section 160.2(c)5E Occupied - Standby Zone Controls**
  - Clarify the requirements when occupant sensors are required.

- **Removing Table 160.2-A – Infiltration Effectiveness Weather and Shielding Factors.**

- **Table 160.2-D – Updates to table to match ASHRAE 62.1 - 2022.**

# Section: 160.4 – Mandatory Requirements for Water Heating Systems

- **Section 160.4(a) - Heat Pump Water Heater Ready**
  - Heat pump water heater ready section moved to Section 160.9(e)

- **Section 160.4(e)1 - Pipe Insulation General Requirements** [renumbered]
  - Add a comprehensive list of mandatory pipe insulation requirements, including explicitly naming components that would require insulation.

- **Section 160.4(e)2 - Insulation Thickness**
  - Specify alternative insulation thickness requirements if the insulation conductivity is outside the range of Table 160.4-A.

# Section: 160.4 – Mandatory Requirements for Water Heating Systems (Continued)

- **Exception 1 to Section 160.4(e)1 Pipe Insulation General Requirements**
  - Delete exception. Pipe insulation for space conditioning equipment is already covered under Section 160.3(c)1.

- **Section 160.4(e)3 - Insulation Protection**
  - Clarify pipe appurtenance shall also be protected with a cover and be removable and re-installable.

- **Section 160.4(e)4 - Insulation Quality Verification**
  - New mandatory requirement for field verification of insulation quality as specified in new RA3.6.3.

# Section: 160.9 – Mandatory Requirements for Electric Ready Buildings

- **Section 160.9(a) - General Requirements**
  - New general requirements ensures the entire building's electrical system have sufficient capacity to supply full rated amperage for all electric ready appliance in accordance with the California Electrical Code.

- **Section 160.9(d)2A - Electric Cloths Dryer Ready**
  - Delete sizing requirement for electrical system. Covered under Section 160.9(a)

# Section: 160.9 – Mandatory Requirements for Electric Ready Buildings (Continued)

- **Section 160.9(e)- Individual Heat Pump Water Heater Ready**
  - Section relocated from 160.4. Additional new ventilation requirement and designate space for future location of individual heat pump water heater. 10 AWG copper branch circuit has been changed to rated 30 amps minimum.

- **Section 160.9(f) - Central Heat Pump Water Heater Ready**
  - New electric ready requirements for central heat pump water heater. This includes space reserved for heat pump, storage tank, condensate drainage piping, and electrical bus.

# Section: 160.9 – Mandatory Requirements for Electric Ready Buildings (Continued)

- **Appendix JA15 – Qualification Requirements for Central Heat Pump Water Heater Ready**
  - New appendix to support the central heat pump water heater ready requirement. Provides sizing requirements, for electric ready infrastructure installed with gas or propane water heating systems to meet the requirement.

# Questions/Public Comment Period

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# 2025 Building Energy Efficiency Standards (Title 24, Part 6)

## Proposed Changes to Section 170.0 – 170.2,

## Multifamily Newly Constructed Buildings

Presenter: Javier Perez, Energy Commission Specialist III

Date: April 18, 2024

# Section 170.1(a) – Energy Budget Updates

## Multifamily Energy Budget Updates

- Updating terminology to match uniform changes across code language
- Identifying Long-term System Cost and Source Energy as the two metrics for determining the energy budget for multifamily buildings
- Removed Language related to Time-Dependent Valuation (TDV) language

# Section 170.1(b)2 – Field Verification Compliance Credit Updates

**Multifamily Field Verification of individual dwelling unit systems**

- **Added:** Thermal balancing valve verification criteria, where performance compliance credit is taken for these systems
- **Modified:** Measures previously limited to multifamily buildings with three or fewer habitable stories expanded to all multifamily buildings
  - Low leakage air handling units
  - Variable capacity heat pumps (VCHPs)
- **Removed:**
  - Compliance credits for whole house fans, central fan ventilation cooling systems, pre-cooling
    - These measures were uncommon or not applicable to multifamily buildings

# Multifamily Prescriptive Envelope Updates

# Section 170.2(a) – Fenestration Visible Transmittance

## Section 170.2(a)3Aiv – Multifamily Prescriptive Fenestration, Visible Transmittance (VT)

- Exception 4 – modify existing exception.
  - Remove restriction to buildings three habitable stories or fewer.

**Exception 4 to Section 170.2(a)3Aiv:** Fenestration in dwelling units ~~of buildings that are three habitable stories or fewer~~ is not required to comply with the VT requirements.

## Update to Table 170.2-A

- Refine minimum VT applicability to only fenestration serving common use areas

# Table 170.2-A – Fenestration Relative Solar Heat Gain (RSHGC)

**Multifamily Prescriptive Standard Building Design – Table 170.2-A**

Curtain Wall/Storefront

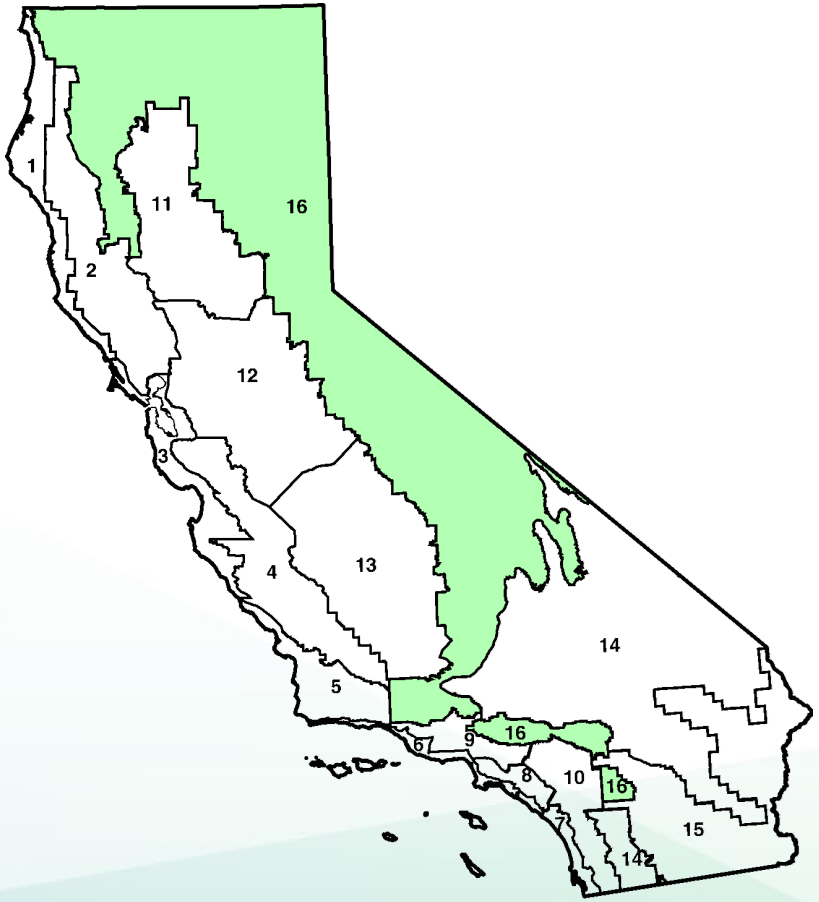
- Align max RSHGC values – 4 stories or more with 3 stories or less; RSHGC=0.26
- Update VT standards – applicable to common use areas; VT=0.46.

- NAFS 2017 Performance Class AW
  - Align max RSHGC values – 4 stories or more with 3 stories or less; RSHGC=0.24
  - Update VT standards – applicable to common use areas; VT=0.37.
- All Other Fenestration
  - Reduce maximum U-factor to U-0.28 in CZs 1, 3-5, 11, and 13-16.
  - Align max RSHGC values – 4 stories or more with 3 stories or less; RSHGC=0.23

# Section 170.2(a)5 – Slab Perimeter Insulation

## Multifamily Prescriptive Slab Floor Perimeter Insulation

- 2022/2025 proposed requirement only applies to buildings in climate zone 16
- Proposed changes:
  - Remove restriction to buildings three habitable stories or fewer
  - Correct U-factor to F-factor
  - Updates proposed to Table 170.2-A reflecting these changes



# Table 170.2-A – Roofing Products

**Table 170.2-A – Prescriptive Multifamily Standard Building Design**

- Option B, Steep-sloped roofs:
  - Aged Solar Reflectance (ASR) = 0.25 in CZs 10, 11, 13 & 15
  - Solar Reflectance Index (SRI) = 23 in CZs 10, 11, 13 & 15

- Option D, Low-sloped roofs, Aged Solar Reflectance (ASR)
  - Aged Solar Reflectance (ASR) = 0.63 in CZs 2, 4, 6-8 & 12
  - Thermal Emittance (TE) = 0.75 in CZs 2, 4, 6-8 & 12
  - Solar Reflectance Index (SRI) = 75 in CZs 2, 4, 6-8 & 12

# Multifamily Prescriptive Ventilation Updates

# Section 170.2(c) – Prescriptive Requirements for Ventilation Systems

## §170.2(c)3Biv – Multifamily prescriptive requirements for balanced ventilation systems with heat/energy recovery ventilation HRV/ERV systems

- Revise language to require new construction multifamily units in Climate Zones 1, 2, 4, 11-14, and 16 to use balanced ventilation with HRV/ERV systems.
- Other language revisions to include the cost-effective Climate Zones.

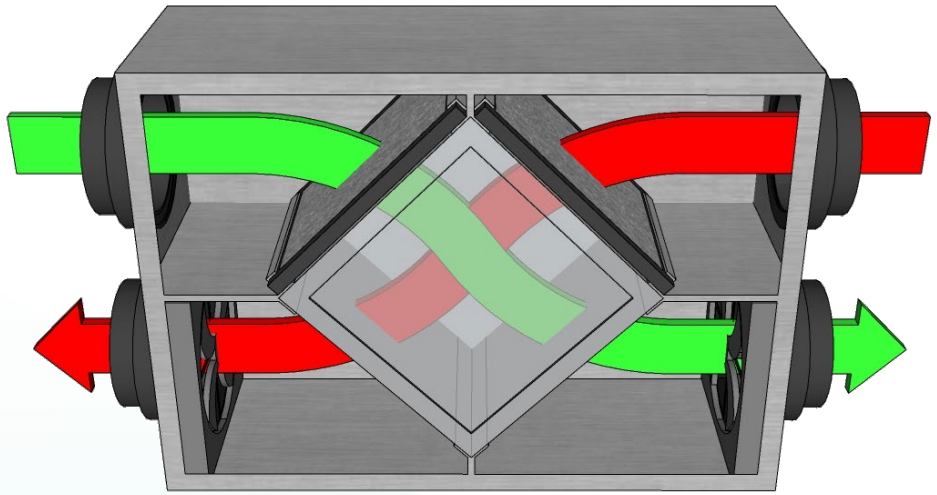
## §170.2(c)3Bv – Multifamily dwelling unit ventilation prescriptive requirements

- Add language to require all HRV/ERV systems serving individual dwelling units to have a Fault Indicator Display (FID) that is field verified as specified in Joint Appendix (JA )17.

# Joint Appendix JA17 – HRV/ERV System Fault Indicator Display

**Joint Appendix 17 Qualification requirements for Indoor Air Quality (IAQ) system Fault Indicator Display (FID).**

- Add new Joint Appendix (JA) 17 to the reference appendices that includes introduction, fault indication categories, fault indication means, instrumentation and reporting and manufacturer certification.



# Reference Residential Appendix RA3 - Indoor Air Quality Testing Procedures

## RA 3.8.3 Enclosure leakage measurement procedures

- Add language to include a multi-point air tightness test as specified in RESNET 380 Section 4.4.2.

## RA 3.8.4 Determination of test results

- Editorial change: add the word "if" to clarify if the leakage airflow test at cfm 50 was determined by one-point air tightness test specified in RESNET 380 Section 4.4.1.

# Reference Nonresidential Appendices, NA2

- **NA 2.3.3 Enclosure leakage measurement procedures**
  - Add language to include a multi-point air tightness test as specified in RESNET 380 Section 4.4.2.

- **NA 2.3.4 Determination of test results**
  - Editorial change: add the word "if" to clarify if the leakage airflow test at cfm 50 was determined by one-point air tightness test specified in RESNET 380 Section 4.4.1.

# Multifamily Prescriptive Water Heating Updates

# Section 170.2(d) – Domestic Hot Water Systems – Heat Pump Water Heaters

- **Section 170.2(d) Domestic Hot Water Systems**
  - Reorganize recirculation requirement into Section 170.2(d)1 and Section 170.2(d)2
- **Section 170.2(d)1 Individual Systems, Heat Pump Water Heating**
  - Set Heat Pump Water Heater as prescriptive baseline for individual systems serving individual dwelling units in multifamily buildings with 3 or fewer habitable stories
    - Remove option C for gas instantaneous water heaters
  - **Exception 1 to Section 170.2(d)1** New exception allows prescriptive compliance with gas instantaneous water heaters for high-rise multifamily buildings.
  - **Exception 2 to Section 170.2(d)1** New exception for 120V heat pump water heater in place of 240V for dwelling with 1 bedroom or less.

# Section 170.2(d) – Domestic Hot Water Systems

- **Section 170.2(d)2A**
  - Update the prescriptive requirements for central heat pump water heaters and add new alternative option for NEEA Advanced Water Heater Specification for commercial heat pump water heater Tier 2 or higher.
  - Specified the primary heat pump water heater to be single-pass
  - Remove primary storage tank plumbing configuration requirement to allow design flexibility
  - Relocate recirculation requirement to Section 170.2(d)2D

# Section 170.2(d) – Domestic Hot Water Systems

## Section 170.2(d)2C

- New requirements for central hot water distribution piping to be sized in accordance with the California Plumbing Code Appendix M

## Section 170.2(d)2D

- New requirements for thermostatic master mixing valves as specified by new RA4.4.19. Existing recirculation language relocated to this section

# Multifamily Prescriptive Photovoltaic and Energy Storage System Updates

# Section 170.2(f) – Low-Rise Multifamily PV System Sizing

- **Prescriptive Approach:**
  - Equation and multipliers updated. However, the $PVkW_{dc}$ sizing remains the same as of 2022 Energy Code, assuming EER2 is 11.7 or greater.
  - $kW_{dc}$ size of the PV system

$$kW_{pv} = \frac{CFA \times A}{1000} + (N_{DU} \times B) - \frac{CFA \times C \times EER2_{Adj}}{1000}$$

    - ***A*** = CFA adjustment factor
    - ***B*** = Dwelling unit adjustment factor
    - ***C*** = EER2 adjustment factor coefficient
    - $\frac{CFA \times C \times EER2_{Adj}}{1000}$**:** This represents a reduction in PV system size where $EER_2$ rating of HVAC system is higher than 7, and up to 11.7
    - $EER2_{Adj}$ = Smaller of (EER2 – 7), or 4.7
- **Performance Approach:**
  - Standard design determined according to calculation above

| CZ | A | B | C |
|---|---|---|---|
| 1 | 0.793 | 1.27 | 0 |
| 2 | 0.628 | 1.220 | 0.002 |
| 3 | 0.629 | 1.12 | 0 |
| 4 | 0.629 | 1.21 | 0.009 |
| 5 | 0.587 | 1.060 | 0 |
| 6 | 0.596 | 1.230 | 0 |
| 7 | 0.575 | 1.150 | 0.001 |
| 8 | 0.612 | 1.370 | 0.005 |
| 9 | 0.645 | 1.360 | 0.007 |
| 10 | 0.696 | 1.410 | 0.015 |
| 11 | 0.965 | 1.440 | 0.027 |
| 12 | 0.668 | 1.400 | 0.012 |
| 13 | 1.029 | 1.510 | 0.029 |
| 14 | 0.833 | 1.260 | 0.020 |
| 15 | 1.892 | 1.470 | 0.071 |
| 16 | 0.591 | 1.220 | 0 |

# Low-Rise Multifamily PV System Sizing – 2025 Proposed Requirements – Example

- Here we calculate size of the PV system for a 2-story prototype with 7,320 ft$^2$ prototype with 8 dwelling unit, considering different EER2

| CZ | EER2 = 11.7 | EER2 = 10 | EER2 = 9 | EER2 = 7 |
|---|---|---|---|---|
| 1 | 15.96 | 15.96 | 15.96 | 15.96 |
| 2 | 14.28 | 14.31 | 14.32 | 14.35 |
| 3 | 13.56 | 13.56 | 13.56 | 13.56 |
| 4 | 13.97 | 14.08 | 14.15 | 14.28 |
| 5 | 12.76 | 12.76 | 12.76 | 12.76 |
| 6 | 14.20 | 14.20 | 14.20 | 14.20 |
| 7 | 13.37 | 13.38 | 13.39 | 13.40 |
| 8 | 15.26 | 15.33 | 15.36 | 15.43 |
| 9 | 15.36 | 15.44 | 15.49 | 15.60 |
| 10 | 15.85 | 16.04 | 16.15 | 16.37 |
| 11 | 17.65 | 17.99 | 18.18 | 18.58 |
| 12 | 15.67 | 15.82 | 15.91 | 16.08 |
| 13 | 18.61 | 18.97 | 19.18 | 19.61 |
| 14 | 15.48 | 15.73 | 15.88 | 16.17 |
| 15 | 23.16 | 24.05 | 24.57 | 25.60 |
| 16 | 14.08 | 14.08 | 14.08 | 14.08 |

# Section 170.2(f) – Low-Rise Multifamily PV System Sizing

- **For Solar Access Roof Area (SARA) Limitations:**
  - If roof pitch < 2:12: Min PV required = SARA x 14 w/ft$^2$
  - If roof pitch ≥ 2:12: Min PV required = SARA x 18 w/ft$^2$
- **Small PV System Exception:**
  - If required PV system size is < 4 kW per building
    - Intent is to align PV exception with high-rise multifamily building requirements

# Section 170.2(g) – High-Rise Multifamily PV System Sizing

- **Prescriptive Approach (unchanged):**
  - PV system size based on equation:
    - Minimum rated PV system capacity in kW
    - $kW_{PVdc,\ min}$= (CFA x **A**)/1000
    - **A** = is the PV capacity factor in W/square foot that varies depending on climate zone and LSC

| Building Type | CZ1 | CZ2 | CZ3 | CZ4 | CZ5 | CZ6 | CZ7 | CZ8 | CZ9 | CZ10 | CZ11 | CZ12 | CZ13 | CZ14 | CZ15 | CZ16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Multifamily >3 stories | 1.82 | 2.21 | 1.82 | 2.21 | 1.82 | 2.21 | 2.21 | 2.21 | 2.21 | 2.21 | 2.21 | 2.21 | 2.21 | 2.21 | 2.77 | 1.82 |

- **Performance Approach (unchanged):**
  - PV system standard design size based on the equation above.
- **<u>Proposed Change</u> For Solar Access Roof Area (SARA) Limitations:**
  - Minimum PV required:
    - Roof pitch < 2:12: SARA x 14 $W/ft^2$
    - Roof pitch ≥ 2:12: SARA x 18 $W/ft^2$

# Section 170.2(h) – High-Rise Multifamily Battery Energy Storage System Sizing

**2025 Energy Code Proposed Requirements:**

- **Prescriptive Approach:**
  - Battery system size based on equation:
    - Minimum Rated Useable Energy Capacity of the BESS in kWh
      - $kWhbatt = ((CFA \times B)/(1000 \times C^{0.5}))$
      - SARA adjusted: $kWhbatt = ((CFA \times B)/(1000 \times C^{0.5})) \times (kW_{PVdc,SARA}/kW_{PVdc})$
    - Minimum Rated Power Capacity of the BESS in kWdc
      $kWh_{batt}/4$

      B = BESS Capacity Factor in Wh/square foot

      C = Rated single charge-discharge cycle AC to AC (round-trip) efficiency of the BESS
- In mixed occupancy buildings, the total battery system capacity for the building shall be determined by applying the Minimum Rated Usable Energy Capacity to each of the listed building types and summing the capacities determined for each.
- **Performance Approach:**
  - PV system standard design size based on the equation above.

# Section 170.2(h) – High-Rise Multifamily Battery Energy Storage System Sizing

B Factor: BESS Capacity Factors (Wh/ft² of conditioned floor area)

| Building Type | CZ1 | CZ2 | CZ3 | CZ4 | CZ5 | CZ6 | CZ7 | CZ8 | CZ9 | CZ10 | CZ11 | CZ12 | CZ13 | CZ14 | CZ15 | CZ16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Multifamily >3 stories | 1.88 | 2.27 | 1.88 | 2.27 | 1.88 | 2.27 | 2.27 | 2.27 | 2.27 | 2.27 | 2.27 | 2.27 | 2.27 | 2.27 | 2.85 | 1.88 |

# Joint Appendix JA12 – Multifamily Energy Storage

## Definitions:

- **Battery Energy Storage System (BESS)** is a stationary equipment that receives electrical energy and then utilizes batteries to store that energy for later use to supply electrical energy when needed. The BESS consists of one or more modules, a power conditioning system, and balance of plant components
- **Field-Assembled BESS** is a BESS with a combination of energy storage modules and inverter components that are installed to operate as a system in the field, and the combination has more than one model number.
- **Integrated BESS** is a BESS that contains both energy storage and inverter components and has a single model number.
- **Usable Capacity** is the energy storage capacity in kWh that a manufacturer allows to be used for charging and discharging.

# Joint Appendix JA12 – Multifamily Energy Storage

**JA12.3.1 Safety Requirements:**

- Added reference of UL1741 Supplement SB

**JA12.3.2 Minimum System Performance Requirement:**

- Removed minimum 5 kWh requirement from prescriptive compliance
- Clarify that under performance compliance the minimum 5 kWh requirement is per building, therefore combination of smaller energy storage units can be used

**JA12.3.3 General Control Requirements:**

- Removed subsection (c) and (d) regarding requirements for twice a year reset and backup behavior

# Joint Appendix JA12 – Multifamily Battery Energy Storage Systems

**JA12.4.5 New Control (Price Optimization Control):**

- A new JA12 controls option introduced in addition to basic, TOU, advanced DR.
- The algorithm will be developed with the help of energy storage industry to address the current practices of the commercial battery storage' behavior for charging and discharging for demand charge reduction, load shifting and other purposes.

**JA12.6 Interconnection and Net Energy Metering Requirements:**

- Section removed

**JA12.7 Certification Documentation Requirements**

- New section to clearly describe documentation needed for JA12 certification.

# Questions/Public Comment Period

**Zoom App/Online**

- Click “raise hand”

**Telephone**

- Press *9 to raise hand
- Press *6 to Mute/Unmute


**When called upon**

- CEC will open your line
- Unmute on your end
- Spell name and state affiliation, if any
- 2 minutes or less per speaker, 1 speaker per entity

# Comments on the 2025 Codes

- **Comments on Todays Hearing**
- **Due Date: May 13, 2024, by 5:00 PM**

- **Comments to be submitted to: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=24-BSTD-01**

- Thank you for participating!

# 15-minute Break

We will resume at 2:45

# 2025 Building Energy Efficiency Standards (Title 24, Part 6)

## Proposed Changes to Section 180.0 – 180.2, Additions and Alterations to Existing Multifamily Buildings

Presenter: Javier Perez, Energy Commission Specialist III

Date: April 18, 2024

# Section 180.1(a)2 – Indoor Air Quality – Multifamily Additions

- **§180.1(a)2 Mechanical ventilation for indoor air quality (IAQ)**
  - Add an exception to §180.1(a)2 to provide clarity that a dwelling unit leakage test is not required for additions.

- **§180.1(a)2Aii Whole dwelling unit mechanical ventilation requirements for additions to an existing dwelling unit that increase conditioned floor area by more than 1,000 square feet**
  - Add an exception to §180.1(a)2Aii to clarify mechanical ventilation systems in additions shall be supply, balanced, or existing ventilation type.

# Section 180.2(b)5 – Ventilation System Alterations

- **§180.2(b)5 Mechanical ventilation and indoor air quality for dwelling units**
  - Add an exception to §180.2(b)5 to provide clarity that a dwelling unit leakage test is not required for alterations.

- **§180.2(b)5A Entirely new or complete replacement ventilation systems**
  - Add an exception to §180.2(b)5A to clarify new or replacement ventilation type shall be supply, balanced, or the existing ventilation type being replaced.

- **§180.2(b)5Bia Whole-dwelling unit ventilation type**
  - Add language to clarify altered ventilation system shall be supply, balanced, or the existing ventilation type.

# Table 180.2-B – Fenestration and Skylights

## Table 180.2-B – Prescriptive Altered Fenestration Max U-factor and Max RSHGC

- Curtain Wall/Storefront/Window Wall
  - Separate out glazed door requirements.
  - Remove RSHGC requirement from CZs 1, 3, 5 & 16.
- NAFS 2017 Performance Class AW – Fixed & Operable
  - Remove RSHGC requirement from CZs 1, 3, 5 & 16.
- All Other Windows and Glazed Doors
  - Reduce maximum U-factor to U-0.28 in CZs 1, 3-5, 11 & 13-16.
  - Remove RSHGC requirement from CZs 1, 3, 5 & 16.
- Skylights
  - Consolidate skylight standards – 3 stories or fewer with 4 stories or more.
  - Remove RSHGC requirement from CZs 1, 3, 5 & 16.

# Questions/Public Comment Period

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- Click “raise hand”

**Telephone**

- Press *9 to raise hand
- Press *6 to Mute/Unmute


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- Thank you for participating!

# Thank you for participating in today's hearing!

## Comments on Lead Commissioner Hearings

- **Due Date: May 13, 2024, by 5:00 PM**
- **Comments to be submitted to: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=24-BSTD-01**
- **Public Assistance with Participation**

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