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Description:	Presentation slides from the November 14, 2024, ACM Reference Manual and Compliance Manual workshop. 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/workshop/2024-11/2025-acm-reference-manuals-and-2025-compliance-manuals-workshop
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California Energy Commission

2025 Alternative Calculation Method Reference Manuals and Compliance Manuals

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November 14, 2024

Housekeeping Rules

Public Comments

Zoom App/Online

- Click “raise hand”

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- Press *9 to raise hand
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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

Workshop Agenda

Introduction

2025 Alternative Calculation Method (ACM) Reference Manuals

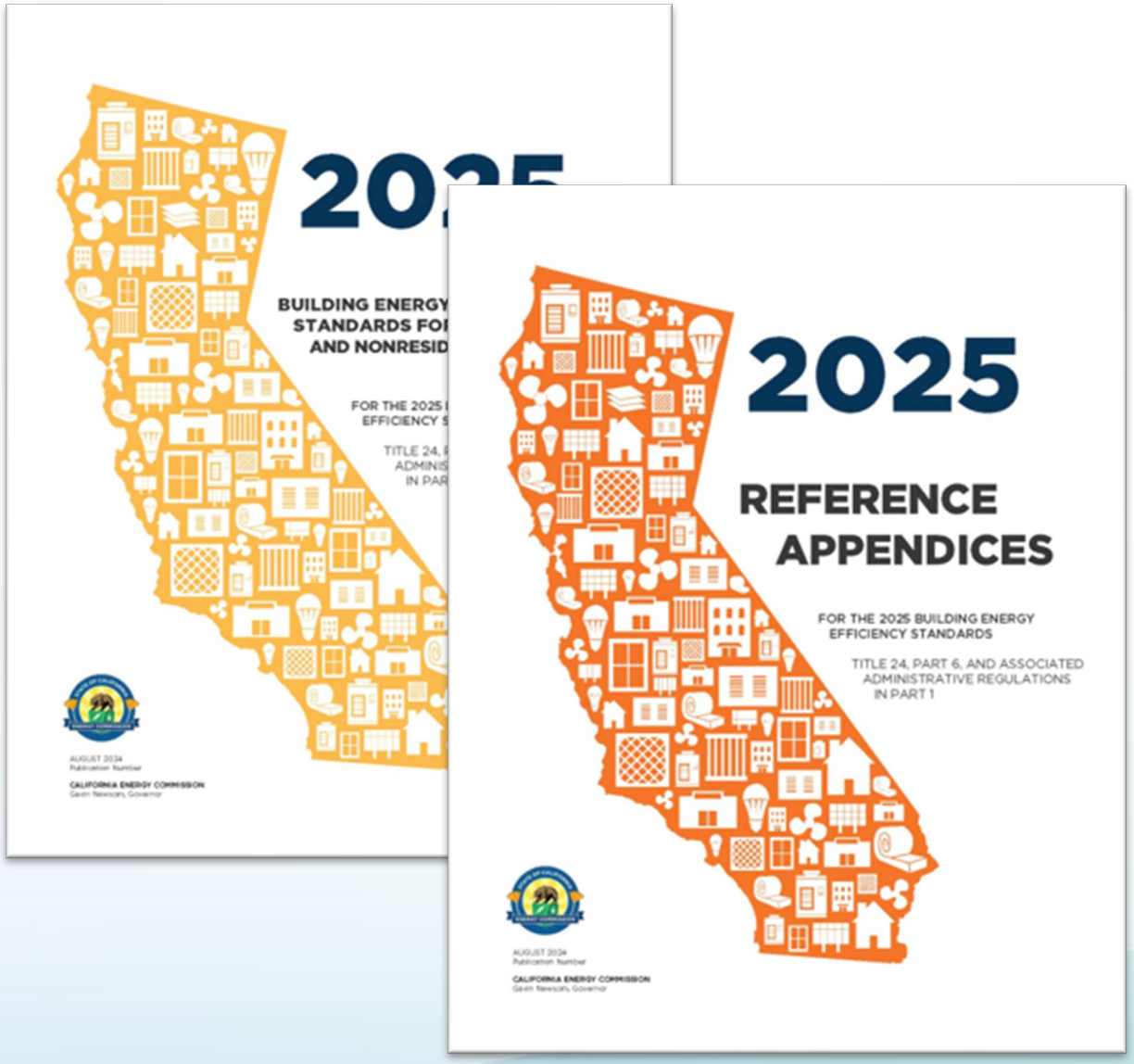
- General Overview
- First Draft ACM Reference Manual Features
- Upcoming updates
  - 2025 ACM Reference Manual Specific Updates
  - Coordination with 2022 ACM Reference Manual Winter Update
  - ACM Enhancement Updates

2025 Compliance Manuals

- Proposed 2025 update strategy

Introduction

2025 Energy Code



Milestones	Timelines
Business Meeting Adoption	September 2024
California Building Standards Commission (CBSC) Approval	December 2024
2025 Energy Conservation Manual Adoption	May/June 2025
Effective Date	January 2026

2025 Alternative Calculation Method (ACM) Reference Manuals

ACM Reference Manuals Overview

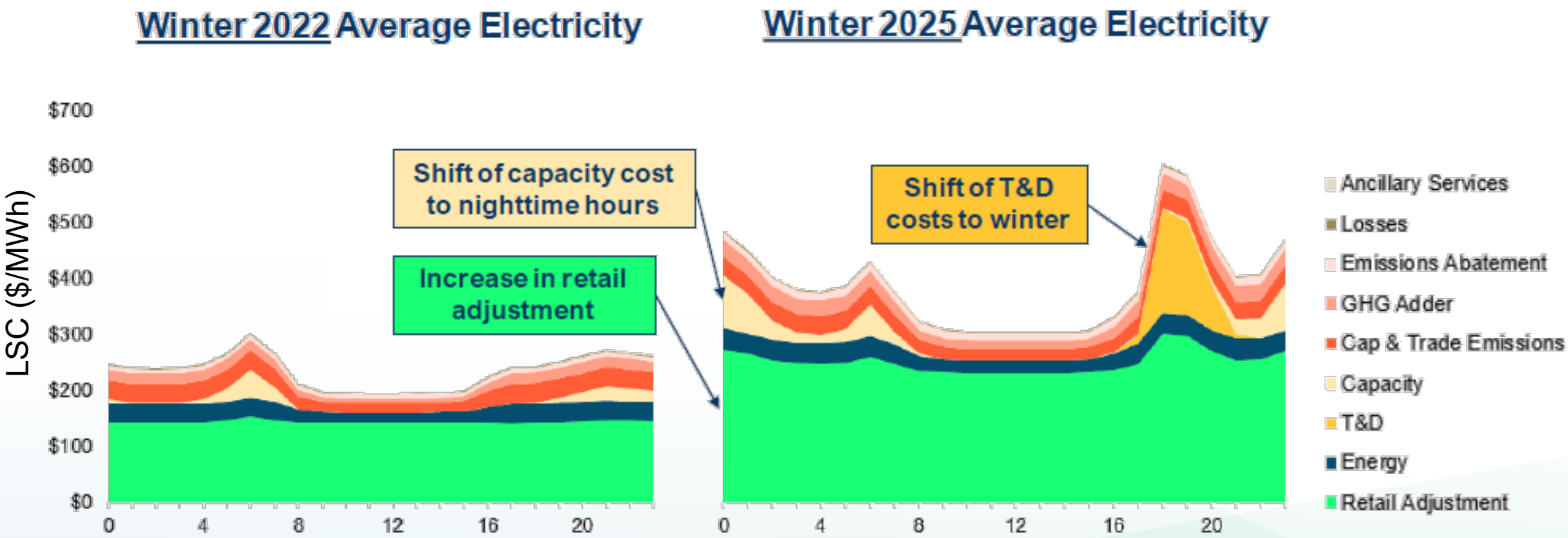
- ACM Reference Manual defines rules for compliance software
  - Single-family ACM Reference Manual
  - Nonresidential and Multifamily ACM Reference Manual
- Update process includes two steps
  - First draft
    - Focus on 2025 Energy Code revisions
      - Peak cooling
      - HP EER2 baseline
      - MZ space conditioning
  - Future draft
    - 2025 ACM Reference Manual
      - HPWH generic curves scaled by UEF
      - Compliance software test requirements
    - Coordination with 2022 ACM Reference Manual winter update
      - VRF efficiency rating
      - PRE
      - Computer room HVAC equipment efficiency
    - Structural enhancements

Peak Cooling Considerations

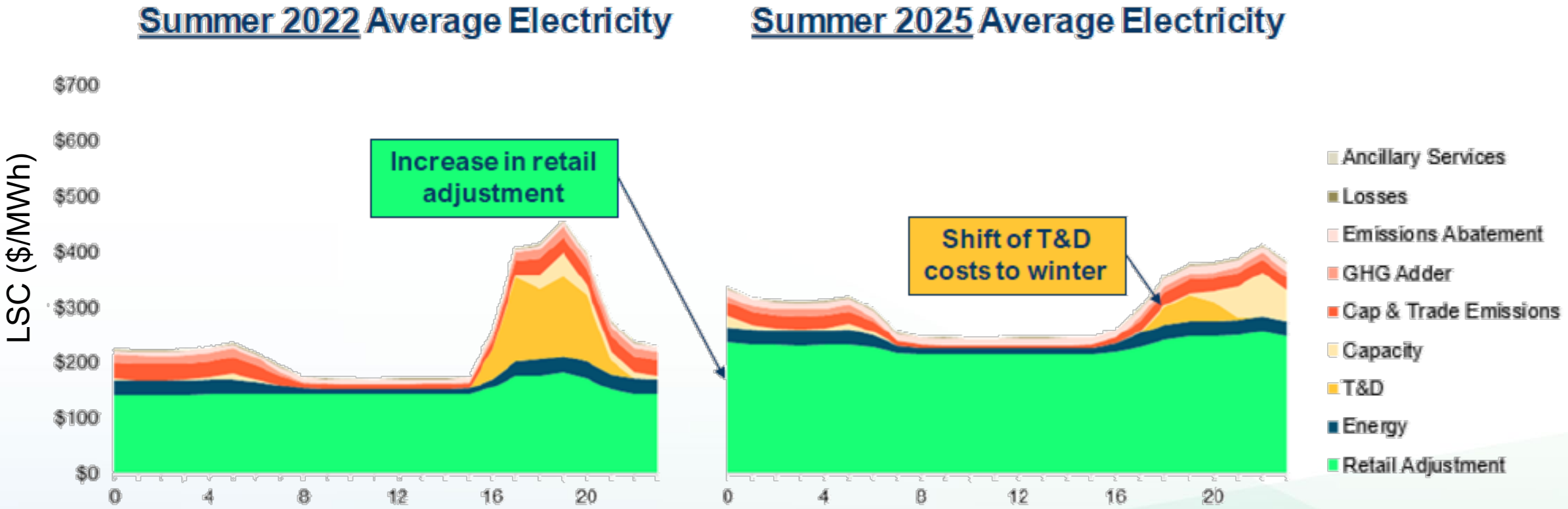
- **Intent:** Ensure that newly constructed buildings do not unnecessarily exacerbate challenges related to weather-driven peak events
- **Challenge:** Weather trends point towards higher frequency of peak events
- **Resiliency:** Higher demand on the grid during high temperature events leads to increased stress on the utility grid
- **Consumers:** Higher demand during peak times and time-of-use utility rates lead to higher costs to consumers

Peak cooling defined as *mechanical cooling during hours of 4pm - 9pm*

2025 Energy Code Winter Electricity Valuation



2025 Energy Code Summer Electricity Valuation



Shift in electricity value peaks to winter could allow energy tradeoffs that result in significantly higher summer peak cooling for some buildings

Peak Cooling Strategy

- Single-family Residential ACM Reference Manual

- Proposed language:

  “The compliance software shall calculate peak cooling energy for both the standard design and the proposed design. Peak cooling energy is the total annual mechanical cooling site energy, in kWh, that occurs at peak hours between 4 pm and 9 pm. To comply through the performance compliance approach, the peak cooling energy of the proposed design cannot be greater than 120% of the peak cooling energy of the standard design. Peak cooling is applicable in climate zones 4 and 8 through 15”

Single-family Residential HP

- Standard design for heat pump less than 45,000 BTU
  - SEER2: Federal minimum
  - EER2: Equal to proposed design when proposed design is less than 11.7, and equal to 11.7 when the proposed design is 11.7 or greater.

- Standard design for heat pump 45,000 BTU or larger
  - SEER2: Federal minimum
  - EER2: Equal to proposed design when proposed design is less than 11.2, and equal to 11.2 when the proposed design is 11.2 or greater.

Affect on Compliance

HP < 45,000 BTU	Below Federal Minimum	Equal to Federal Minimum	Above Federal Minimum
SEER2	Non-compliant	No effect on compliance	Compliance credit

HP < 45,000 BTU	Below 11.7 EER2	Equal 11.7 EER2	Above 11.7 EER2
EER2	No effect on compliance	No effect on compliance	Additional compliance credit

- The standard design EER2 is the same as the proposed design EER2 up to 11.7 for HPs less than 45,000 BTUs
- Intent of EER2 standard design approach for HPs:
  - Additional credit for HPs similar to credits received by air conditioners that exceed federal minimum EER2 for air conditioners
  - No affect on compliance when EER2 below 11.7 for HPs less than 45,000 BTU or 11.2 for HPs 45,000 BTU or larger

MZ Space-Conditioning

- New standard design multi-zone space-conditioning systems for office and school buildings
  - Exceptions for buildings 150,000 square feet or greater
  - Exceptions for buildings greater than 5 habitable stories
  - Exceptions for school buildings in climate zones 6 and 7

- Modeling capabilities for:
  - Air-to-water heat pump and parallel fan-powered boxes
  - Variable refrigerant flow heat pump
  - Four-pipe fan coil terminal units

- Modeling restrictions in the ACM Reference Manual

HVAC System Map

- Standard design option for schools and offices based on 140.4(a)3Aiii
- New school system:

150,000 ft²				
School and total building conditioned floor area ≤ 150,000 ft²	4 – 5 floors	2, 4, 8 – 16	No limit	System 15 – VAVAWHP
Warehouse and light	No limit	All	No limit	System 9 – HEAT/VENT

- New office system:

Office, financial institution, and library and total building conditioned floor area < 25,000 ft²	4 – 5 floors	All	No limit	System 15 – VAVAWHP
Office, financial institution, and library- and total building area 25,000 – 150,000 ft²	≤< 5 floors	All	No limit	System 15 – VAVAWHP

MZ Space Conditioning System Description

- Standard design option for schools and offices based on 140.4(a)3Aiii
- New system description:

		way valve for cooling or heating.
System 15 – VAVAWHP	Built-up VAV with AWHP heating	Multi-zone built-up system with variable-air-volume fan, chilled water cooling provided by a central water-cooled chiller and cooling tower, and hot water heating provided by an air to water heat pump (AWHP). See Table 4 for additional system details based on occupancy served and climate zone.

- Standard Design criteria:

Table 4: System 15 – VAVAWHP: Standard Design Criteria

Design Criteria	Schools	Offices
Percentage of perimeter zone terminal units utilizing parallel fan powered boxes	All CZ: 100%	CZ 1 – 6, 16: 100% of heating capacity CZ 7-15: 25% of heating capacity
Ventilation System	CZ 2, 4, 11 – 16: HRV	CZ 1, 3, 5: HRV
Max system fan power	CZ 2: 15% lower than 140.4(c)1	CZ 3, 5: 15% lower than 140.4(c)1
Design leaving water temperature	CZ 2: ≤ 120 °F	No requirement

Support for MZ Systems Outside of ACM Reference Manual

- Section 140.4(a)3Av *A space -conditioning system determined by the Executive Director to use no more energy than the systems specified in Section 140.4(a)3.*

- Request input from public:
  - Recommended systems to be included in compliance software for proposed design modeling?
  - https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=24-BSTD-03

Upcoming Updates

- Outstanding 2025 Considerations
  - HPWH generic curves scaled by UEF
  - Compliance software test requirements

- 2022 ACM Reference Manual update
  - VRF efficiency rating
  - PRE
  - Computer room HVAC equipment efficiency

- ACM Reference Manual enhancement project

Additional 2025 Specific Updates

- Generic HPWH curves
  - Use generic performance curves

- Compliance software reference test
  - Ruleset implementation tests
  - Software sensitivity tests

2022 ACM Reference Manual Updates

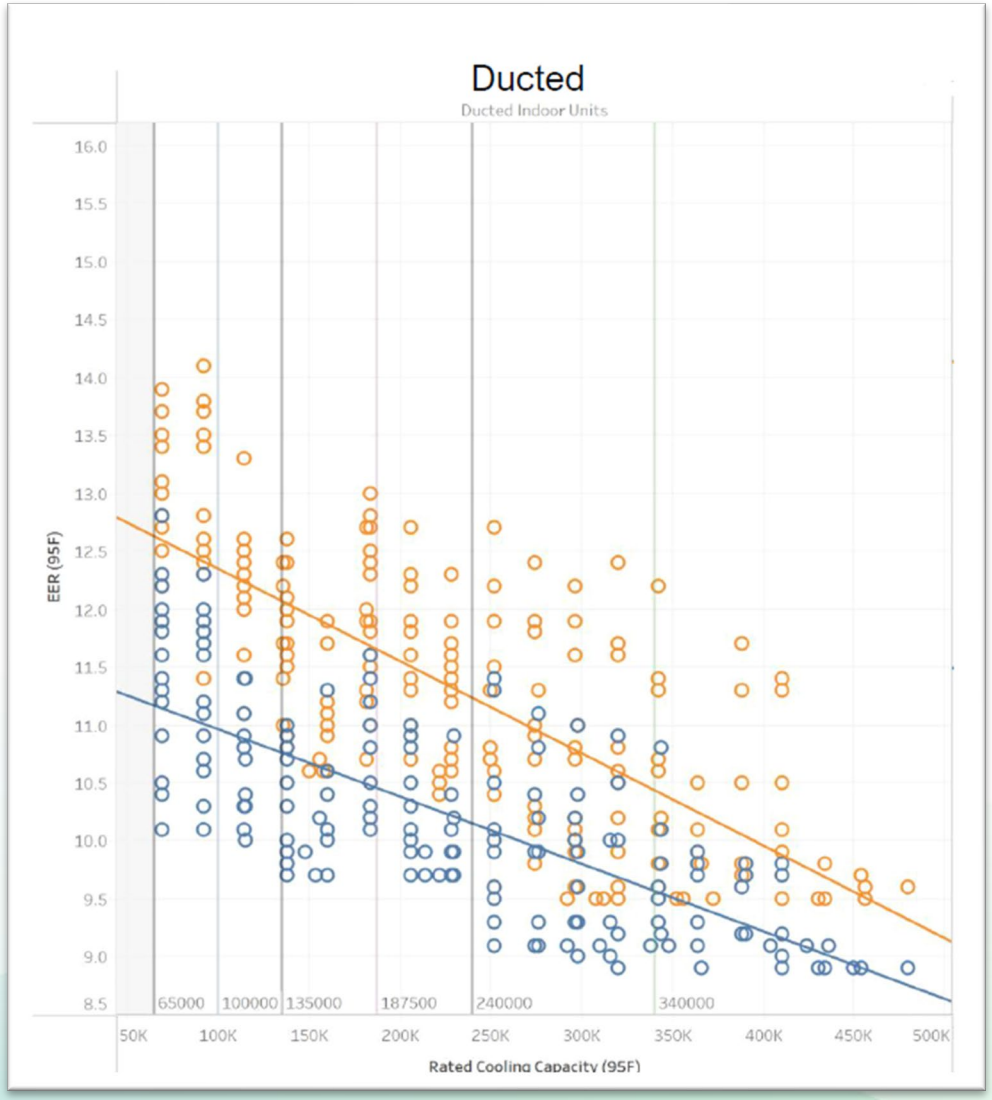
- Winter release
- 2022 ACM Reference Manual updates to be included in 2025 ACM Reference Manual

Nonresidential VRF HP Modeling

- VRF Heat Pumps Efficiency
  - AHRI 1230 test procedures updated, in effect as of January 1, 2024
  - Develop a crosswalk for modeling purposes
  - Plan to continue using existing performance curves
  - Will include in both 2022 and 2025 ACM Reference Manuals

Nonresidential VRF HP Modeling Crosswalk

- Comparison of equipment modeled under 2014 and 2023 test procedures
  - Heat recovery has minimal effect
  - Difference decreased with increased capacity
- Developed a linear equation based on rated cooling capacity to estimate 2014 EER from 2023 EER



Computer Room Cooling Equipment

- Pump refrigerant economizers
  - Rules for pump refrigerant economizers

- Efficiency for computer room HVAC equipment is federally regulated
  - Users to enter federally required metric and software will translate to EER so that existing curves can be used

Enhancement Project

- Structural and organization updates
- Software neutral language
- Clarify and consolidate standard design assumptions

2025 Compliance Manual

Compliance Manuals Overview

- Aid compliance and enforcement of Energy Code
- 2022 Compliance Manuals
  - Single-family
  - Nonresidential and Multifamily

2025 Strategy

- Three compliance manuals
  - Single-family
  - Nonresidential
    - Keep existing Q & A style
    - Revised sections that include changes only
  - Multifamily
    - Code commentary style
    - Revise entire compliance manual

Q & A Style

11.10.2 Mandatory Requirements

§160.4, §160.9

Electric readiness requires the following for the applicable gas appliances list
11.12.

Installation of branch circuits within three ft. of existing gas appliances with no obstructions. These circuits are dedicated to future electric replacement equipment cannot be used for other appliances. Other electrical components must be installed accordance with the *California Electrical Code*.

1. Table 11-80 below describes the different circuit requirements for each gas end-u
2. Dedicated space for double breakers in the main service panel that will serve the fu unit space heating, electric cooktop and in-unit clothes dryers. The code does not r the installation of breakers at time of construction.

Dedicated space in the panel next to the location of the water heater breake accommodate converting it to 240V in the future, per §160.4. The dedicated in the panels must be identified as "Future 240V Use." The code does not re the installation of breakers at time of construction.

Table 11-80 summarizes the electrical capacity, panel, and other equipment requirements for electric-readiness for each natural gas appliance installed i new multifamily building. There are no electric ready requirements for additi

alterations. There are no performance or prescriptive electric ready requirements for multifamily buildings.

Table 11-80: Compliance Requirements for Electric Readiness

Gas or Propane Equipment Installed	Electrical Capacity requirements for new circuit (amps, volts)	Other Equipment Requirements
Furnace (dwelling unit only) §160.9(a)	240V, 30 amp	
Gas tankless or storage water heater (dwelling unit only) §160.4(a)	125V, 20 amp	A Category III or IV or Type B Vent with straight pipe from space where water heater is installed to outside termination Condensate drain no more than 2 inches higher than the base of installed water heater to allow for natural drainage with pump assistance
Gas or propane range (dwelling unit only) §160.9(b)	240V, 50 amp	
Dwelling unit gas clothes dryer §160.9(c)1	240V, 30 amp	
Common use area gas clothes dryer §160.9(c)2	24 amps at 208/240V per dryer or 2.6 kVA for each 10,000 btu/hr of rated gas input or electrical power required to provide equivalent function. This is usually determined by the electrical engineer on the project.	Conductor or raceway from the main electrical panel to within 3 ft. of the future electric equipment. Both ends of conductor labelled "Future 240V Use" Conductors, raceways and intervening electrical equipment must be sized to meet the future electrical load from the service voltage to the utility distribution system connection

Source: California Energy Commission

Receptacles are not required for the dwelling unit space heating, laundry, and cooking circuits. However, the unused circuits must have a blank cover identified as "240V ready." Receptacles are required for dwelling unit water heating, and

must be connected to the panel with a 120/240V, 3-conductor 10AWG copper wire with both ends of the unused conductor labeled as *spare* and be electrically isolated.

Example 11-53

Question
Can I receive any compliance credit for making gas appliances electric-ready that are not required by code?

Answer
Because there are not any prescriptive or performance requirements for electric-readiness, you will not receive compliance credit for making a gas appliance electric-ready where not required by code. However, by doing so, you will minimize future retrofit costs. The project engineer should be able to recommend equivalent equipment and electrical requirements to ensure conduit and wires are sized appropriately, along with identifying additional physical space and panel capacity needs to accommodate the future heat pump technology.

Example 11-54

Question
There I am designing an apartment building with natural gas for in-unit water heating, clothes drying, and cooking. How much more electrical capacity can I expect from replacing my existing gas appliances with electrical appliances in the future on a subpanel for a 780 square foot apartment unit?

Answer
The example below demonstrates an estimated additional electrical capacity of 18,264 watts that a designer might account for when sizing panels for electrification of existing gas equipment in the future. The electric appliances that contributed to the additional capacity are shown in bold.

Code Commentary Style

(b) Heat Pump Space Heater Ready. Systems using gas or propane furnaces to serve individual dwelling units shall include the following:

1. A dedicated 240 volt branch circuit wiring shall be installed within 3 feet from the furnace and accessible to the furnace with no obstructions. The branch circuit conductors shall be rated at 30 amps minimum. The blank cover shall be identified as "240V ready." All electrical components shall be installed in accordance with the *California Electrical Code*.
2. The main electrical service panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future heat pump space heater installation. The reserved space shall be permanently marked as "For Future 240V use."

«» Commentary for §160.9(b)2: Installation of branch circuits within three ft. of existing gas appliances with no obstructions. These circuits are dedicated to future electric replacement equipment and cannot be used for other appliances. Other electrical components must be installed in accordance with the California Electrical Code.

Dedicated space for double breakers in the main service panel that will serve the future in-unit space heating, electric cooktop and in-unit clothes dryers. The code does not require the installation of breakers at time of construction.

Dedicated space in the panel next to the location of the water heater breaker to accommodate converting it to 240V in the future, per §160.4. The dedicated space in the panels must be identified as "Future 240V Use." The code does not require the installation of breakers at time of construction.

There are no electric ready requirements for additions or alterations. There are no performance or prescriptive electric ready requirements for multifamily buildings.

Receptacles are not required for the dwelling unit space heating, laundry, and cooking circuits. However, the unused circuits must have a blank cover identified as "240V ready." Receptacles are required for dwelling unit water heating, and must be connected to the panel with a 120/240V, 3-conductor 10AWG copper wire with both ends of the unused conductor labeled as *spare* and be electrically isolated.

Electric Ready requirements for other building systems and appliances, as specified in §§160.9(c)-(f), are described in Chapter 6 – Electrical and Lighting. «»

Reason for Change in Style

- Feedback from public surveys performed by utilities
- More easily understand which code section and code language that is being explained
- Q&A style was too project specific

Next Steps

Submit Comments

- Comments can be submitted to the docket
  - https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=24-BSTD-03
  - Comments due: December 13, 2024
- Future draft posted to docket
  - Comment period will be opened

- 2025 CBECC/CBECC-Res under development

Thank You for Participating!