

Participant Handout

June 2025









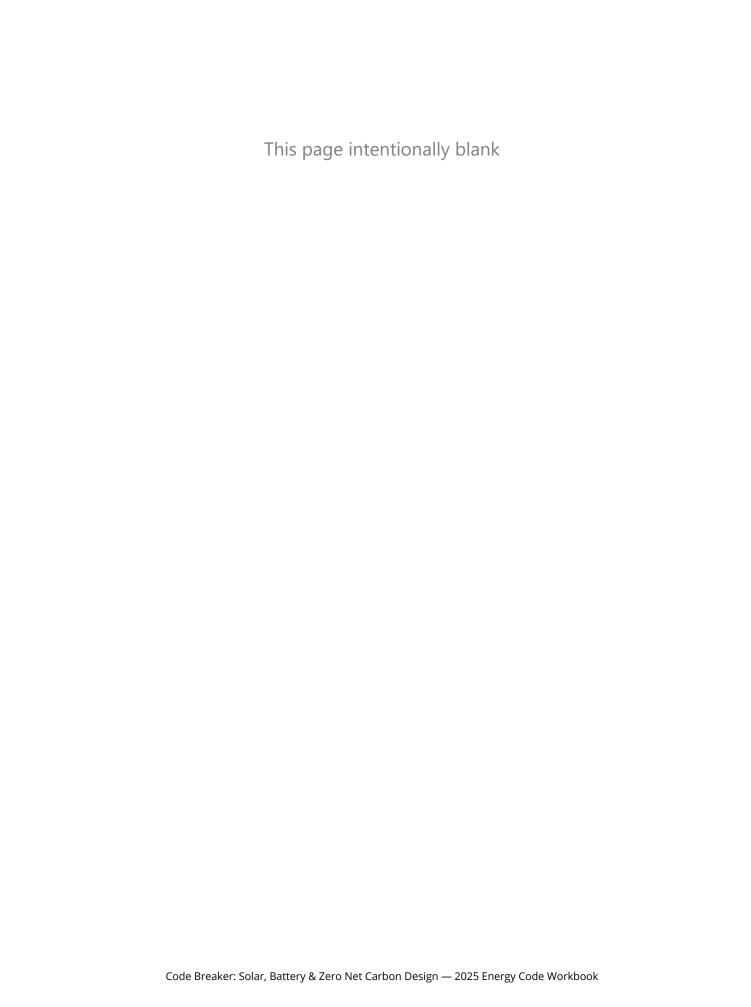


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LEGAL NOTICE

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ABOUT THE STATEWIDE CODES AND STANDARDS PROGRAM

The Statewide Codes and Standards Program (C&S Program) is jointly managed by the Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas and Electric Company. The C&S Program saves energy on behalf of ratepayers by directly influencing standards and code-setting bodies to strengthen energy efficiency regulations, by improving compliance with existing codes and standards, and working with local governments to develop ordinances that exceed statewide minimum requirements.

This class is one of many free courses, tools, and resources that the C&S Program offers.

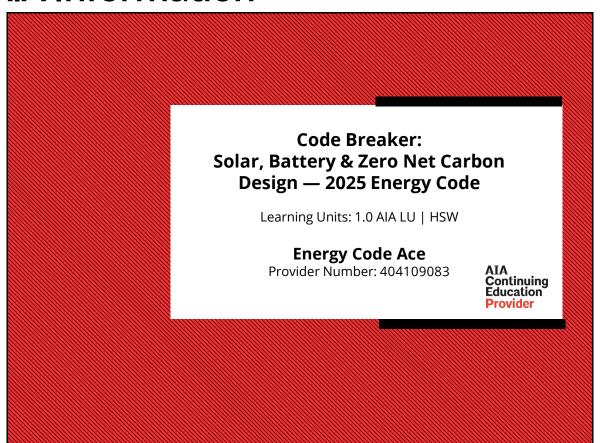
Please visit http://energycodeace.com/ or contact info@energycodeace.com to find out more about all program offerings.







AIA Information



Course Description

Join us for this one-hour presentation to review the 2025 Energy Code (Title 24, Part 6, the California Building Energy Efficiency Standards) requirements that support the goals of a Zero Net Carbon Design (ZNCD) project.

We will review updated requirements for solar photovoltaic (PV) and battery energy storage system (BESS), domestic hot water system requirements supporting electrification, pool and spa requirements supporting heat pump technology, limits on Indoor Air Quality (IAQ) design options, and additional heat pump design requirements. We'll also explore the new Performance Approach compliance metric "Long-term System Cost" (LSC), which converts the predicted site energy use to long-term dollar costs to California's energy system.

Course Objectives

- · Recognize when solar photovoltaic and battery systems are required in single-family homes
- Recognize when solar photovoltaic and battery systems are required in Nonresidential buildings and Multifamily buildings
- Explain how solar and battery systems improve grid harmony of buildings and onsite consumption of solar energy
- Understand how alternative design options for single-family homes and nonresidential buildings can achieve ZNCD using efficiency measures, solar, and battery systems
- · Identify online resources for more guidance on these topics

Continuing
Education
Provider

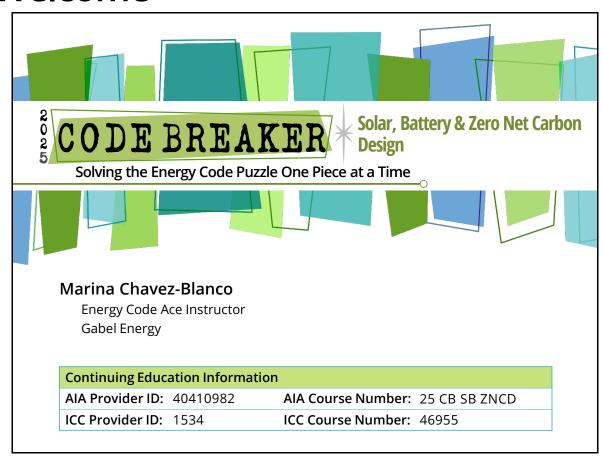
Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



Welcome

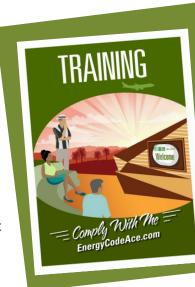


Documenting Continuing Education Units (CEUs)

- Attendees who meet the completion criteria receive "standard" certificates of completion:
 - ♦ Typically sent within two weeks of course delivery
 - ♦ Certificate includes:
 - Course IDs (AIA & ICC)
 - Energy Code Ace Provider info (AIA & ICC)
- You may use this certificate to "self-certify" with a number of organizations in addition to AIA & ICC
 - If you entered your AIA member number when you registered, we will submit your course-completion information to AIA for you
- If you want a certificate specific to ZNCD, contact us at online.training@energycodeace.com

Please include the following, which is called for in the ZNCD certificate:

- ♦ Your CA Architect license number
- ♦ The date when your license expires
- ♦ The course title and delivery date





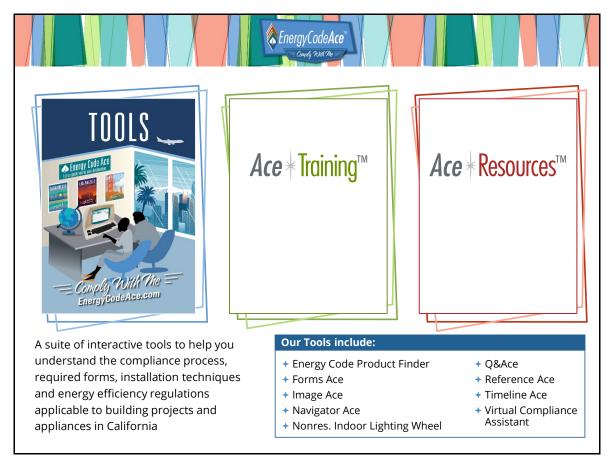


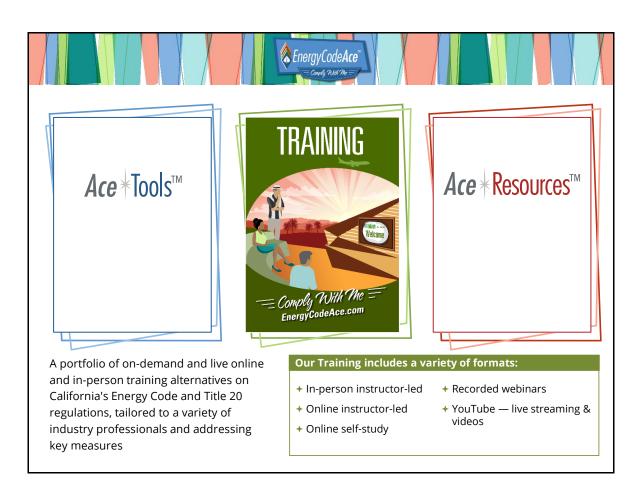
Training Objectives:

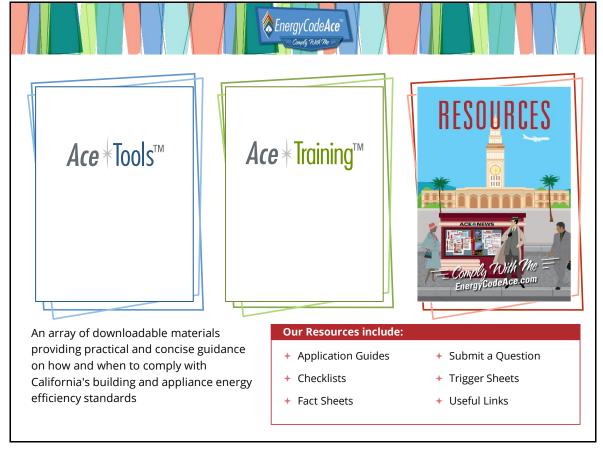
- Recognize when solar photovoltaic and battery systems are required in single-family homes
- Recognize when solar photovoltaic and battery systems are required in Nonresidential buildings and Multifamily buildings
- Explain how solar and battery systems improve grid harmony of buildings and onsite consumption of solar energy
- Understand how alternative design options for single-family homes and nonresidential buildings can achieve ZNCD using efficiency measures, solar, and battery systems
- Identify online resources for more guidance on these topics













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Energy Code Basics

2025 Code Breaker: Solar & Battery & ZNCD

1. Energy Code Basics

- 2. Why Renewables are Required
- 3. Single Family & Multifamily ≤3 Stories Requirements
- 4. Nonresidential & Multifamily ≥4 Stories Solar Requirement
- 5. Nonresidential & Multifamily ≥4 Stories Battery Requirement
- 6. Next Steps

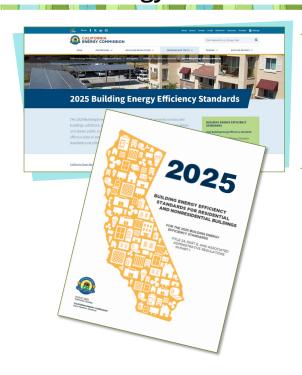
2025 Energy Code Schedule

- ★ Energy Code Language Adoption
- Occupancies Subject to Energy Code
- → New Performance Metrics

Structure of the Energy Code

 Mandatory, Prescriptive and Performance

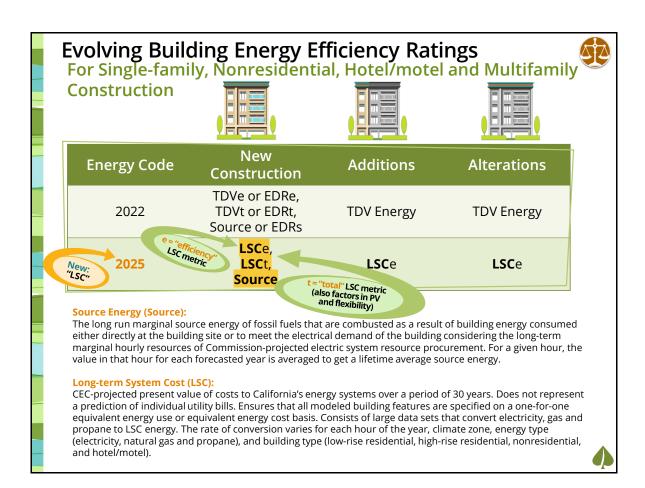
2025 Energy Code

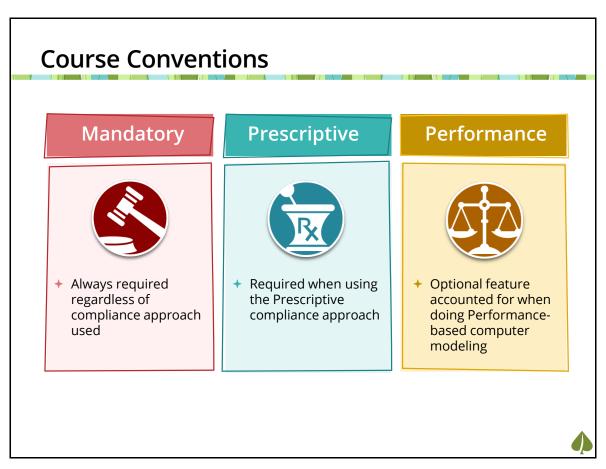


- **→** Implementation Date
 - **♦ January 1, 2026**
 - Any projects that apply for a permit on or after this date will be subject to the 2025 Energy Code requirements
- Information and documents available on the CA Energy Commission website at:
 - https://www.energy.ca.gov/progra ms-and-topics/programs/buildingenergy-efficiency-standards/2025building-energy-efficiency



Group	Occupancy Type	Examples
Α	Assembly	Theaters, churches, arenas, amusement parks
В	Business	Office buildings, banks, schools above 12th grade
С	Organized Camps	Outdoor group living experience (exempt from Energy Code)
E	Education	K-12 schools
F	Factory	Food processing, airports, dry cleaning, foundries
Н	High Hazard	Detonation, accelerated burning, health hazards
ı	Institutions	Convalescent homes, board and care (24 hours), hospitals
	I-2	Hospitals and 24-hour medical care facilities
	I-3	Correctional facilities (exempt from Energy Code)
	I-4	Daycare facilities (exempt from Energy Code)
L	Laboratories	Buildings with one or more lab suites Grocery stores, department stores Grozery stores, department stores
М	Mercantile	Grocery stores, department stores
R	Residential	Any building used for sleeping purposes:
Uses NR	code R-1	Hotels, motels and similar businesses
Uses MF	code R-2	Apartment buildings, dormitories and multi-user residences with more than 2 dwelling units
Uses SF o	MF R-3	Single-family homes and duplexes, as well as other permanent dwellings
Uses MF c	ode R-4	Care facilities and similar businesses
S	Storage	Home goods, tires, food products, parking garages
U	Miscellaneous	Agricultural, barns, greenhouses, carports





Performance Approach



Performance



 Optional feature accounted for when doing Performancebased computer modeling

- → PV & Battery are Prescriptive requirements. Using the Performance Approach can:
 - Can reduce the size of PV system through added efficiency
 - Can reduce the size of PV system by adding battery and vise-versa
 - Can reduce the size of battery through added efficiency
 - ♦ More ability to downsize battery than PV
- Modeling can also inform design of PV/battery:
 - ♦ For utility cost savings
 - ♦ For Zero Net Carbon and other goals
 - ♦ For Grid Harmony metrics
 - ♦ For above-code program goals





Check Your Understanding 1.1

What do you think?

- 1. Which energy efficiency rating is used to evaluate Multifamily building performance under 2025 Energy Code?
 - a) EDR (Energy Design Rating)
 - b) LSC (Long-term System Cost)
 - c) TDV (Time Dependent Valuation)
 - d) LCC (Life Cycle Cost)





Why Renewables?

2025 Code Breaker: Solar & Battery & ZNCD

1. Energy Code Basics

2. Why Renewables

- 3. Single Family & Multifamily ≤3 Stories Requirements
- 4. Nonresidential & Multifamily ≥4 Stories Solar Requirement
- 5. Nonresidential & Multifamily ≥4 Stories Battery Requirement
- 6. Next Steps

Why Does the Energy Code Require Renewable Solar & Battery Systems in New Buildings?

- → California's climate goals
- The grid transition to clean forms of energy supply
- → Energy affordability

Timeline: Energy Code & Solar & Battery



No PV or battery allowance

Submitted for Permit Through Dec. 2019

- ♦ PV credit for Single Family & Multifamily < 4 stories</p>
- No battery credit

2

0

3

2

0

0

0

2

0

Submitted for Permit Through Dec. 2022

- ▶ PV required for Single Family & Multifamily < 4 stories</p>
- Battery credit for Single Family & Multifamily < 4 stories
- No requirement for Nonresidential & Multifamily ≥ 4 stories

Submitted for Permit Through Dec. 2025

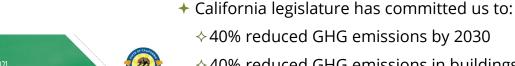
- + PV AND battery storage required for most Nonresidential building types and Multifamily ≥ 4 stories
- Emissions included in compliance metrics

Submitted for Permit Starting Ian. 2026

- PV AND battery storage requirements added for more Nonresidential building types and sizing requirements increased for many building types
- Compliance metrics revised to support long term system impact of the proposed building



Why Energy Code Requires Renewables

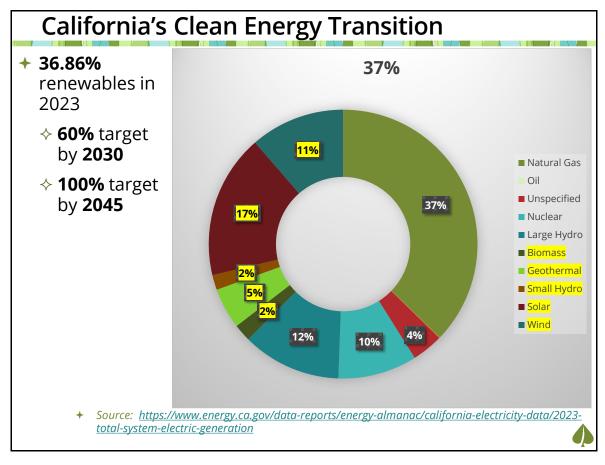


- ♦ 40% reduced GHG emissions in buildings by 2030
- ♦ 100% renewable electric grid by 2045
- → Onsite renewable energy production reduces greenhouse gas emissions and can provide for Zero Net Carbon buildings.
- Onsite PV on rooftops have advantages over utility scale PV (less distribution losses, improved resiliency when paired with batteries)
- Solar plus storage has Grid harmony, selfconsumption, and resiliency benefits

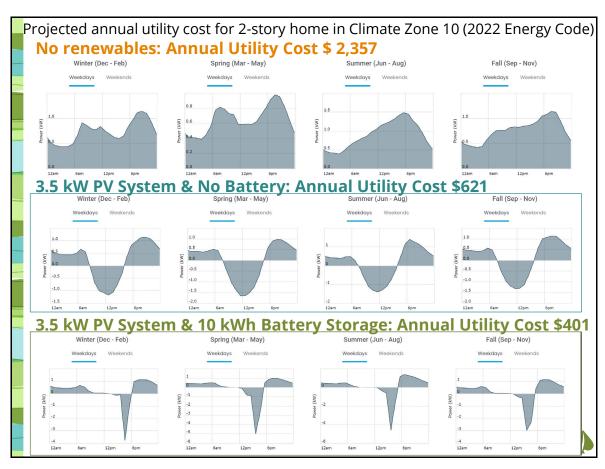


Source: https://www.energy.ca.gov/datareports/energy-almanac





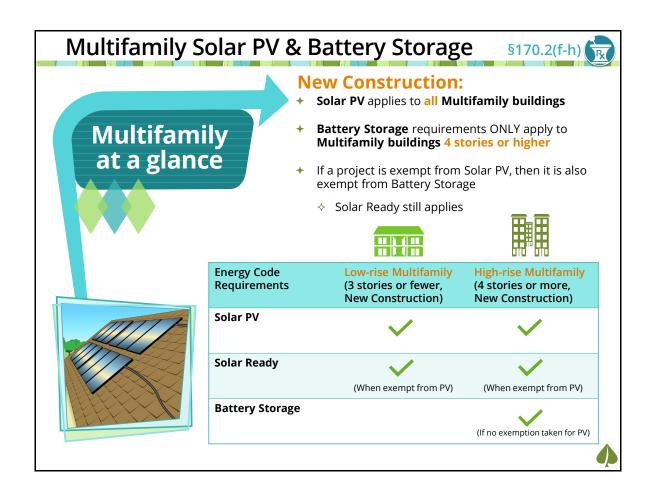
If you add in the zero-emissions Large Hydro and Nuclear, you get to 59% clean energy on our electric grid!



Community Shared Solar or Battery Systems \$10-115 Allows a common shared system to offset solar and/or battery requirements Must be operational before final permit signed off on building Must provide equivalent or better performance than what is specified for building Must provide benefit to the building for 20 years minimum Cannot transfer benefit to another building Located on a distribution system of the participating buildings No larger than 20 MW

Single Family & Multifamily ≤ 3 Stories Requirements

2025 Code Breaker: Solar & Battery & ZNCD 1. Energy Code Basics **Solar Photovoltaic (PV) Requirement for Single Family &** 2. Why Renewables are ≤ 3 Story Multifamily Buildings Required PV Compliance Options 3. Single Family & Multifamily ≤3 Stories ♦ Solar Access Roof Area (SARA) ♦ Solar PV System Size 4. Nonresidential & Multifamily ≥4 Stories ♦ Solar PV Exceptions Solar Requirement 5. Nonresidential & **→** Battery Credit Multifamily ≥4 Stories Battery Requirement ♦ Battery Readiness 6. Next Steps



Photovoltaic Compliance Options

Newly Constructed buildings shall have a new PV system with output no less than the smaller of **CFA or SARA Method**:

Based of Conditioned Floor Area (CFA Method)

- Single-family: Using Prescriptive Equation 150.1-C or Performance software
- Low-rise Multifamily: Using Prescriptive Equation 170.2-C or Performance software

Based on Solar Access Roof Area (SARA Method)

- Maximum PV system size that can be installed on the building's Solar Access Roof Area (SARA)
 - Areas excluded from SARA
 - Obstructed areas (such as HVAC equipment)
 - Occupied roofs
 - Areas not allowed to be obstructed by PV by other Building Code requirements such as fire egress, equipment access, setbacks
 - Areas not allowed to be obstructed due to a local ordinance (must be approved by CEC)



PV System Size - Single Family & Low-rise Multifamily

Table 150.1-C: CFA and Dwelling Unit Adjustment Factors

§150.1(c)14 & 1	70.2(f)
----------	---------	---------



Climate Zone	A – CFA	B - Dwelling Units
1	0.793	1.27
2	0.621	1.22
3	0.628	1.12
4	0.586	1.21
5	0.585	1.06
6	0.594	1.23
7	0.572	1.15
8	0.586	1.37
9	0.613	1.36

0.627

0.836

0.613

0.894

0.741

1.56

0.59

Equation 150.1-C or 170.2-C: Annual PV Electrical Output

- DC Rating = (CFA x A) / 1000 + (N_{DU} x B)
 - CFA = Conditioned floor area
 - ♦ N_{DU} = Number of dwelling units
 - A = CFA adjustment factor from Table 150.1-C
 - B = Dwelling unit adjustment factor from Table 150.1-C



Solar Photovoltaic (PV):

Single Family & Low-rise Multifamily

1.41

1.44

1.40

1.51

1.26

1.47

1.22



New formula for Prescriptive PV sizing using SARA

No change to table in 2025

+ SARA includes:

10

11

13

14

15

16

- ♦ The area of a building's roof space capable of structurally supporting a PV system AND
- The area of all roof space on covered parking areas, carports and all other newly constructed structures on the site that are compatible with supporting a PV system per CA Building Code §1511.2
- → Solar PV requirement is expressed as a kW (DC Rating)
 - Formula using Solar Access Roof Area (SARA):
 - ♦ Low-sloped SARA x 14 W/ft²
 - ♦ Steep-sloped SARA x 18 W/ft²



 If a project involves both low- and steep-sloped roofs, these results would be summed together



SARA: Calculating Annual Solar Access: Single Family & Low-rise Multifamily



Which obstructions shall be considered for annual solar access calculations?

- **→** Steep-sloped Roofs:
 - Only shading from existing permanent obstructions external to the dwelling
 - Natural or manmade
 - Includes trees, hills, adjacent structures
- **→** Low-sloped Roofs:
 - All obstructions that are part of the building design and elevation features





PV Exceptions: Single Family & Low-rise Multifamily

§150.1(c)14 §170.2(g)



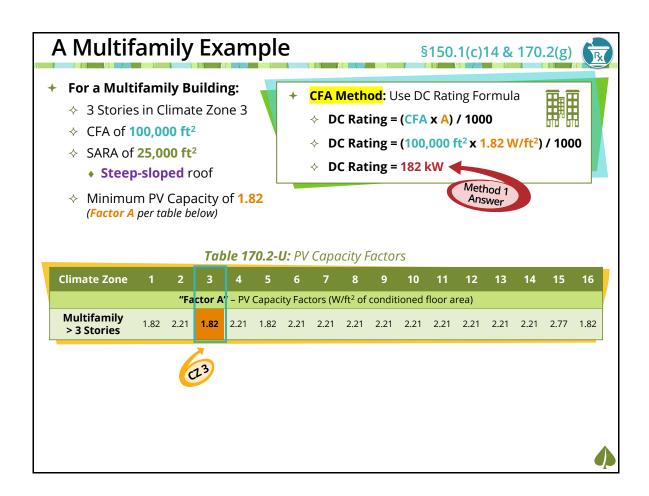
No PV system is required if:

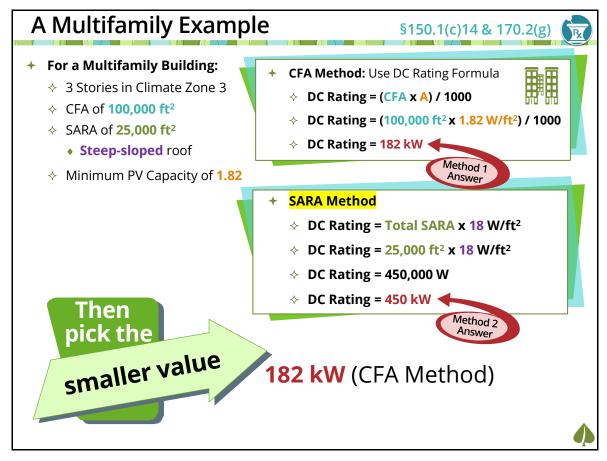
- The SARA is < 80 contiguous square feet</p>
 - For steep-sloped roofs, SARA shall not consider roof areas with a northerly azimuth that lies between 300 degrees and 90 degrees from true north
- → The minimum PV system size specified by §150.1(c)14 is < 1.8 kWdc
- + The building has an enforcement-authority-approved roof design, and the enforcement authority determines it is **not possible** for the PV system to meet **ASCE 7-16**, **Chapter 7**, **Snow Loads**
 - "PV System" includes panels, modules, components, supports and attachments to the roof structure
- The building is approved by the local planning department prior to January 1, 2020 with mandatory conditions for approval

Required minimum PV system may be reduced by 25% if:

- Installed in conjunction with a battery energy storage system
 - Battery storage system shall meet Joint Appendix JA12 qualification requirements and have a minimum cycling capacity of 7.5 kWh





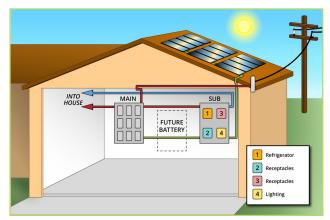


Battery Readiness §150.0(s) **New Exception in Mandatory Measures for Battery Readiness** Battery Readiness applies to all **new single-family** residences with one or two dwelling units: ♦ Duplex Single-family home ♦ Single-family home with Accessory Dwelling Unit (ADU) **Exceptions:** Battery Readiness is NOT required if electrical service for the dwelling unit is 125 amps or less New Also **NOT required** in buildings that have a Battery Energy Storage System (BESS) installed

Battery Readiness: Single-family



- At least one of the following shall be provided:
 - Interconnection equipment with a minimum backed-up capacity of 60 amps OR
 - A dedicated raceway from the main service to a subpanel that supplies the branch circuits
- A minimum of four branch circuits shall be identified feeding:
 - 1. Refrigerator
 - 2. One lighting circuit near the primary egress
 - 3. A sleeping room receptacle outlet
 - 4. One wherever desired



- Main panel must be minimum 225 amps busbar rating (new exception for dwelling units having an electrical service 125 amps or less)
- Sufficient space shall be reserved to allow future installation of a system isolation equipment or transfer switch within 3 feet of the main panelboard
- + Raceways shall be installed between the panelboard and the system isolation equipment or transfer switch location to allow the connection of backup power source





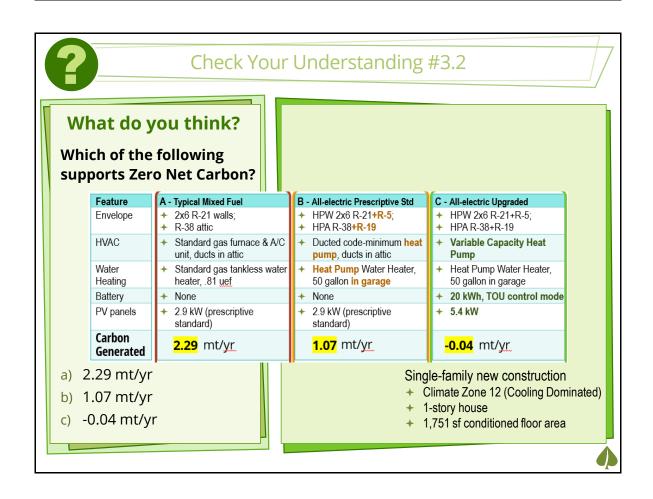
Check Your Understanding #3.1

What do you think?

When does the 2025 Energy Code mandate the installation of battery energy storage systems in new single-family homes?

- a) Never
- b) Starting January 1, 2026
- c) Only if the main panel is 125 amps or greater







Check Your Understanding #3.3

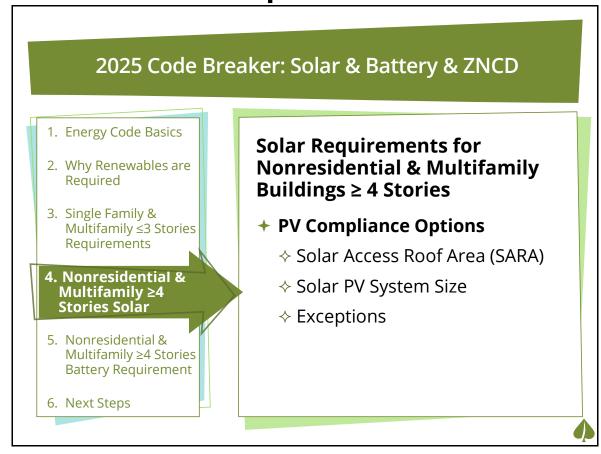
What do you think?

If you were building a new home in CZ12 and had modeled Carbon emissions of **2.29 mt/yr** for a typical mixed fuel design, **what upgrades would you choose from the list as part of a Zero Net Carbon package?**

- a) Battery only
- b) Additional PV panels
- c) All of these features

			Total CO2 Po (excl. Solar (metric	& Flexibility)	CO2 Saved by Sol Self Consumed (metric tons/yr)	ar Electricit Exported (metric to	to Grid	O2 Generated: Total netric tons/yr)	Excluding Exports (metric tons/yr)
St	andard [Design	1.7	75	0.10	0.0	4	1.60	1.65
or.	oposed I	Design	2.4	14	0.10	0.0	5	2.29	2.34
		Featu	ıre	Upgr	ade		Carbo Emissi Saving		/r)
		Envel	ope		performan and attic	ice	(0.20	
		HVAC	-		ed code- num heat		(
		Wate Heati	-		Pump Wat er 50 gallor		(0.53	
		Batte	ry		Wh in Time control mod		(0.34	
		PV pa	nels	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ional 1.5 k\ anels)	W	(0.01	

Nonresidential & Multifamily ≥ 4 Stories Solar Requirements



Photovoltaic Compliance Options:

Highrise Multifamily and Nonresidential

Newly Constructed buildings shall have a new PV system with output no less than the smaller of **CFA or SARA Method**:

Based of Conditioned Floor Area (CFA Method)

- Highrise Multifamily: Using Prescriptive Equation 170.2-E or Performance software
- Nonresidential: Using Prescriptive Equation 140.10-A or Performance software

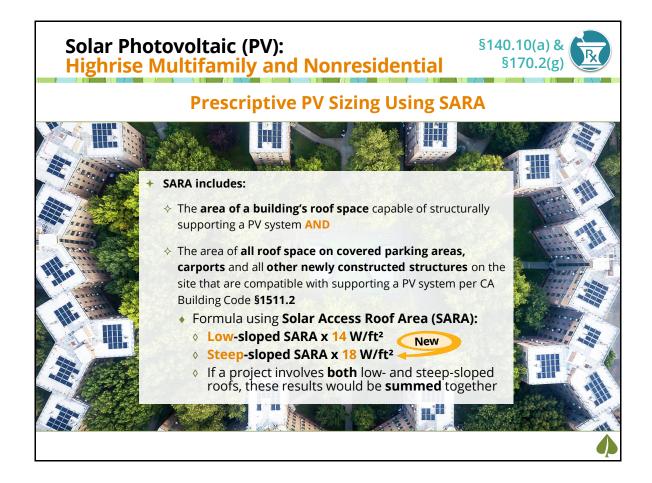
Based on Solar Access Roof Area (SARA Method)

- Maximum PV system size that can be installed on the building's Solar Access Roof Area (SARA)
 - Areas excluded from SARA
 - Obstructed areas (such as HVAC equipment)
 - Occupied roofs
 - Areas not allowed to be obstructed by PV by other Building Code requirements such as fire egress, equipment access, setbacks
 - Areas not allowed to be obstructed dur to a local ordinance (must be approved by CEC)



			Tak	ole 14	10.10	-A: P	/ Cap	acity	Facto	ors			New	or incred lid black categori n blue		
Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ne	W		PV	Capaci	ity Fact	ors (W	//ft² of	conditi	ioned t	floor a	ea)					
Events & Exhibits	3.48	4.28	3.66	4.32	3.77	4.05	4.28	4.83	4.63	4.80	5.04	4.44	4.95	4.36	5.48	3.3
Library	0.39	3.23	2.59	3.25	2.48	2.74	3.04	3.49	3.32	3.69	3.79	3.32	3.79	3.37	4.49	2.8
Hotel/Motel	1.69	1.90	1.66	1.97	1.69	1.87	1.94	2.22	2.09	2.20	2.30	2.05	2.30	2.02	2.72	1.7
Office, Financial Inst., Unleased Tenant Space	2.59	3.13	2.59	3.13	2.59	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.80	2.5
Medical Office Building/Clinic	2.59	3.13	2.59	3.13	2.59	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.80	2.5
Restaurants	8.55	9.32	8.16	9.65	8.21	8.73	9.11	10.18	9.75	10.28	10.85	9.73	10.69	9.73	12.25	8.4
2022 Restaurants	0.39	0.44	0.39	0.44	0.39	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.58	0.39
					Note for incr	how Planter to the control of the co	I factors Ints have onsidera 2025	elibiy								

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			Tak	ole 14	10.10	-A: P\	/ Cap	acity	Facto							
Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
New PV Capacity Factors (W/ft² of conditioned floor area)																
Events & Exhibits	3.48	4.28	3.66	4.32	3.77	4.05	4.28	4.83	4.63	4.80	5.04	4.44	4.95	4.36	5.48	3.38
Library	0.39	3.23	2.59	3.25	2.48	2.74	3.04	3.49	3.32	3.69	3.79	3.32	3.79	3.37	4.49	2.8
Hotel/Motel	1.69	1.90	1.66	1.97	1.69	1.87	1.94	2.22	2.09	2.20	2.30	2.05	2.30	2.02	2.72	1.7
Office, Financial Inst., Unleased Tenant Space	2.59	3.13	2.59	3.13	2.59	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.80	2.59
Medical Office Building/Clinic	2.59	3.13	2.59	3.13	2.59	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.80	2.5
Restaurants	8.55	9.32	8.16	9.65	8.21	8.73	9.11	10.18	9.75	10.28	10.85	9.73	10.69	9.73	12.25	8.4
Retail, Grocery	3.14	3.49	3.01	3.61	3.05	3.27	3.45	3.83	3.65	3.81	4.09	3.64	3.99	3.71	4.60	3.2
School	1.27	1.63	1.27	1.63	1.27	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	2.46	1.2
Warehouse	0.39	0.44	0.39	0.44	0.39	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.58	0.39
Religious Worship	4.25	4.65	3.49	4.52	3.72	4.29	4.64	5.89	5.30	5.67	5.89	4.99	5.78	4.63	7.57	3.90
Sports & Recreation	2.47	1.97	1.54	2.03	1.60	1.84	1.98	2.63	2.47	2.60	2.75	2.20	2.72	2.15	4.03	1.8 ⁻
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

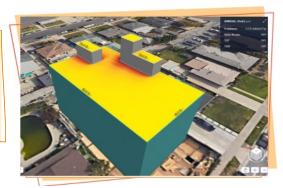


SARA: Calculating Annual Solar Access Highrise Multifamily and Nonresidential



Which obstructions shall be considered for annual solar access calculations?

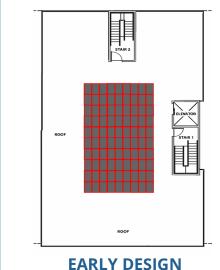
- + All roof types:
 - ♦ All obstructions including those that are external to the building, and obstructions that are part of the building design and elevation features





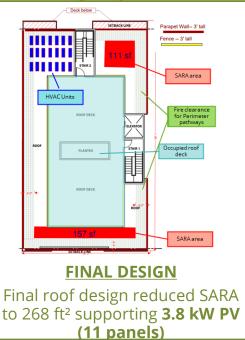
Documenting SARA Example

Roof conditions have big impact

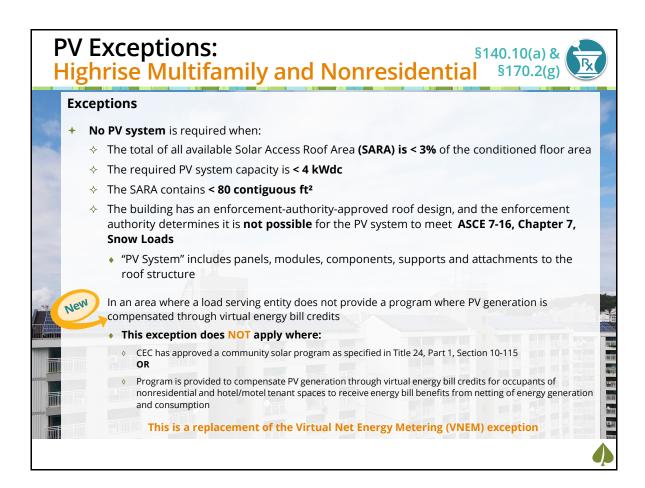


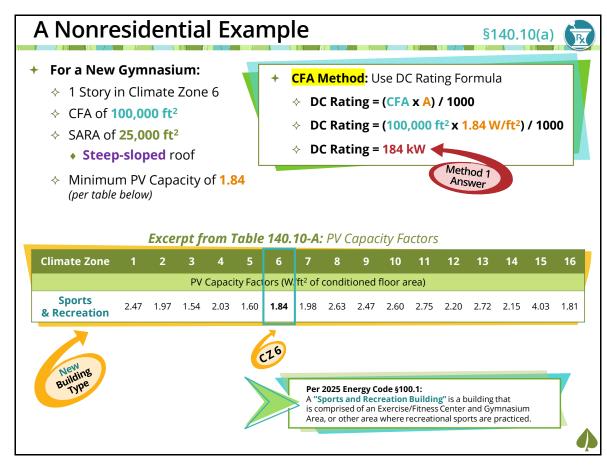
EARLY DESIGN

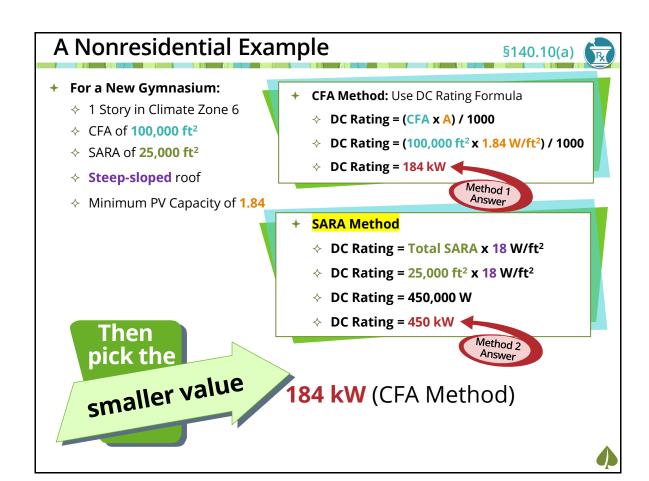
Unobstructed early roof design meant 36 kW PV in the center of the roof (103 panels)

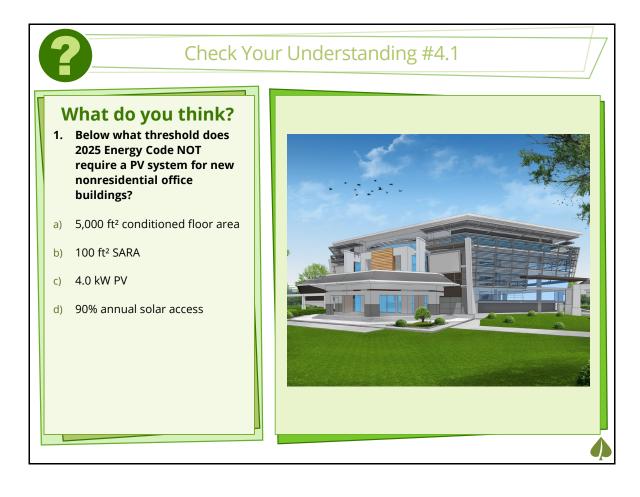














Check Your Understanding #4.2

What do you think?

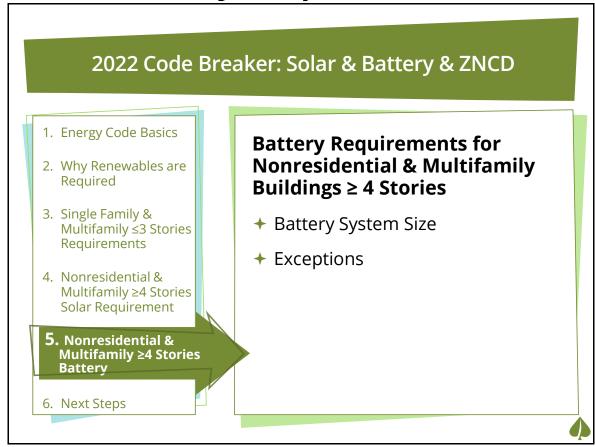
The compliance modeling software can be used to design for lower Carbon emissions and Zero Net Carbon.

If you were building a new school in CZ 9 (LA) and had modeled Carbon emissions of **8.31 mt/yr** for a typical mixed fuel design, **what upgrades would you choose from the list as part of a Zero Net Carbon package?** *Shout out your answer!*

<u>X</u>		
Feature	Upgrade	Carbon Emissions Savings (mt/yr)
Envelope	Mass timber structure (replacing steel) meeting prescriptive U-factor requirements	1.38
HVAC	Single zone VAV utilizing heat pumps instead of gas furnaces	3.43
Battery	Add battery with 64 kWh	1.8
PV	Add 15 kW (~30 panels) to a 15 kW system	1.41

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Nonresidential & Multifamily ≥ 4 Stories Battery Requirements



Battery Energy Storage System (BESS): Highrise Multifamily and Nonresidential



 Batteries store renewable energy produced by onsite PV to promote "self-consumption" of renewable energy onsite later in the day during peak grid periods

Buildings with PV and battery have lower GHG emissions than buildings with PV alone

- Additional demand response controls on battery system can be used to respond to critical peak periods on the grid by exporting electricity back to the grid.
 - JA12.2.3.1 Basic Control: When combined with an on-site solar photovoltaic system, the battery storage system shall discharge only when the photovoltaic system production is less than the on-site electrical load.
 - JA12.2.3.2 Time-of-Use (TOU) Control:
 When combined with an on-site solar photovoltaic system, the battery storage system shall begin discharging during the highest priced TOU hours of the day.
 - JA12.2.3.3 Advanced Demand Flexibility Control: When combined with an on-site solar photovoltaic system, the battery storage control shall meet the demand flexibility control requirements specified in Section 110.12(a).



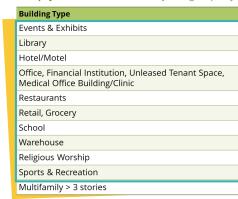
Key Battery Performance Values Think of a bathtub as an analogy for a battery storage system Rated Energy Capacity: The quantity of water that the "tub" can hold is the Energy Capacity measured in kWh. PV/Grid 20 kW Battery Capacity 100 kWh Power out to building and/or to grid 20 kW kW kWh **Battery PV Grid Building** Rated Power Capacity: The flow of water into and out of the "tub" corresponds to the instantaneous Power Capacity measured in kW.

Battery Energy Storage Systems (BESS) §140.10(b) & 170.2(h)



- All new buildings required by §140.10(a) to have a PV system shall also have a battery energy storage system (BESS)
 - Minimum rated energy capacity to be determined by:
 - Equation 140.10-B OR
 - Equation 140.10-C (if SARA method was used to determine PV capacity)
 - ♦ Minimum rated power capacity to be determined by:
 - Equation 140.10-D
 - ♦ If the building includes more than one of the space types listed below:
 - The total battery system capacity for the building shall be the **sum** of the Minimum Rated Usable Energy Capacity for each of the listed building types together

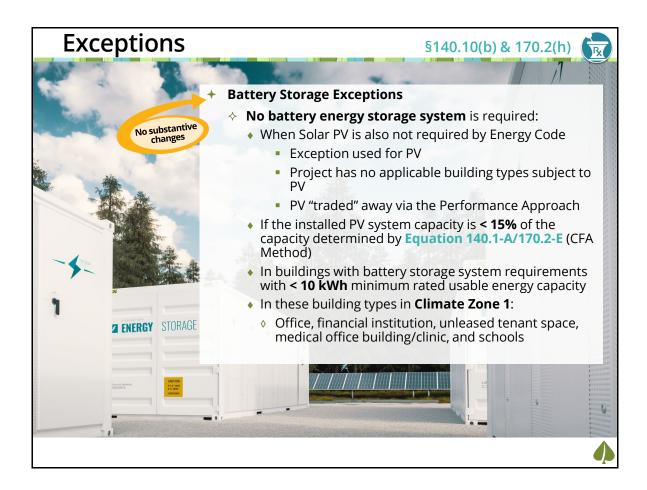
Excerpt from Table 140.10-B: Battery Storage Capacity Factors

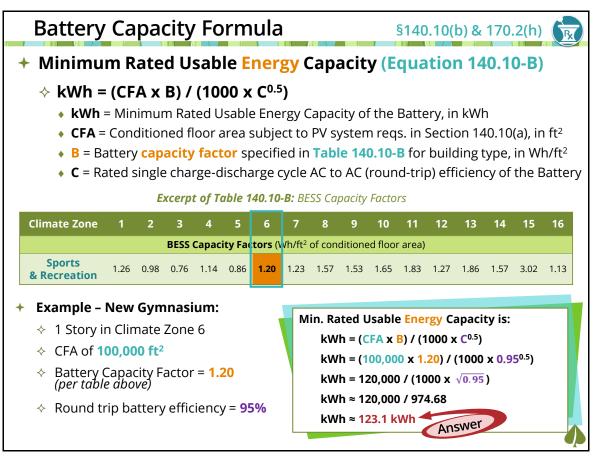






			Tab	le 14	10.10	- B: BE	ESS C	арасі	ty Fa	ctors						
Climate Zone	_1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ne	W		BESS	Capac	ity Fac	tors (W	/h/ft² c	of cond	itioned	d floor	area)					
Events & Exhibits	1.82	1.95	1.74	2.12	1.91	2.13	2.24	2.30	2.36	2.47	2.62	2.16	2.64	2.68	3.22	1.89
Library	0.37	7.17	5.97	6.75	5.64	6.08	6.19	7.13	7.18	7.56	7.17	6.93	6.88	6.81	7.93	6.40
Hotel/Motel	0.86	0.84	0.77	0.92	0.81	0.89	0.90	1.01	1.00	1,11	1.14	0.96	1.18	1.18	1.49	0.85
Office, Financial Inst., Unleased Tenant Space, Medical Office	NOT REQ	5.26	4.35	5.26	4.35 Reva	5.26 mped 1	5.26 able v	5.26 alues	5.26	5.26	5.26	5.26	5.26	5.26	6.39	4.35
Building/Clinic																
Restaurants	4.36	4.11	3.78	4.37	3.89	4.02	4.11	4.49	4.47	4.82	5.05	4.43	5.05	5.24	6.23	4.11
Retail, Grocery	1.89	1.82	2.70	1.82	1.72	1.80	1.76	1.92	1.97	2.05	2.22	1.95	2.16	2.29	2.66	1.91
School	NOT REQ	3.05	2.38	3.05	2.38	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	4.60	2.38
Warehouse	0.37	0.41	0.37	0.41	0.37	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.54	0.37
Religious Worship New	2.21	2.25	1.74	2.42	2.08	2.75	2.94	3.37	3.17	3.37	3.58	2.72	3.62	3.21	4.89	2.37
Sports & Recreation	1.26	0.98	0.76	1.14	0.86	1.20	1.23	1.57	1.53	1.65	1.83	1.27	1.86	1.57	3.02	1.13
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





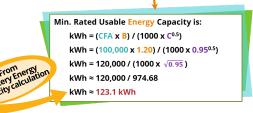
Sample Calculation

§140.10(b) & 170.2(h)



- ★ Alternate Method if SARA method was used to determine PV capacity: Min. Rated Usable Energy Capacity, SARA-Adjusted (Equation 140.10-C)
 - To demonstrate this calculation, let's use a new "SARA-driven" example where:
 - SARA is 3,000 ft² and required SARA-method calculated Solar PV is 54 kW





Min. PV Capacity from our prior SARA Method calculation, in kW

PV Capacity from our prior solved Equation 140.10-A, in kW

184 kW

 $kWh \approx 123.1 \ kWh \ x \ (54 \ kW / 184 \ kW)$

Answer

 $kWh \approx 123.1 \, kWh \times 0.29$

kWh ≈ 35.7 kWh **◄**



Battery Power Capacity Formula

§140.10(b) & 170.2(h)



- → Minimum Rated Power Capacity (Equation 140.10-D)
 - \Rightarrow kW = kWh_{batt} / 4
 - **kW** = Minimum Rated Power Capacity of the Battery, in kWdc
 - ♦ **kWh**_{batt} = Minimum Rated Usable Energy Capacity of the Battery, in kWh

Example Calculation

- **+** For our Original CFA-driven example:
 - Minimum Rated Usable Energy Capacity of Battery **Equation 140.10-B** = **123.1** kWh (calculated in earlier slide)
- Minimum rated power capacity is:

OR

- + For SARA-driven example used for PV:
 - Minimum Rated Usable Energy Capacity of Battery Equation 140.10-C = 35.7 kWh (calculated in earlier slide)
- Minimum rated power capacity is:
 - \Leftrightarrow kW = kWh_{batt} / 4
 - \Rightarrow kW = 35.7 / 4



Check Your Understanding #5.1

What do you think?

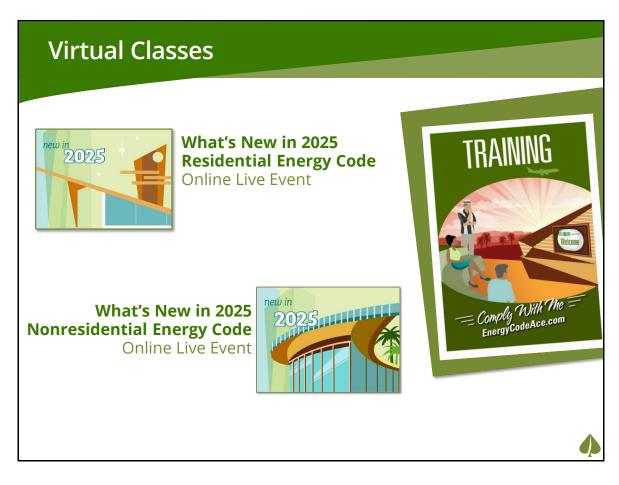
When does the 2025 Energy Code mandate the installation of battery storage systems for new school buildings?

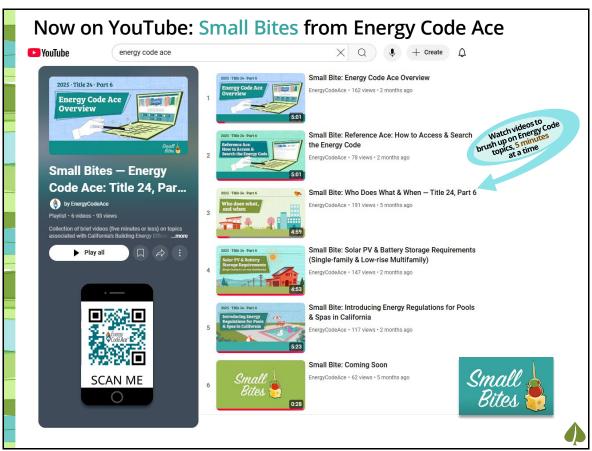
- a) Battery storage will never be required for new nonresidential buildings
- b) When the permit application is submitted as of January 1, 2026
- c) When PV is required and conditioned floor area > 5,000 ft²
- d) When PV is required and required battery storage is ≥ 10 kWh

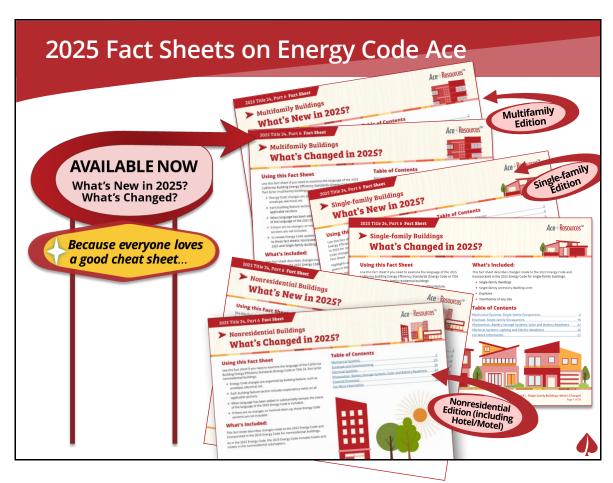


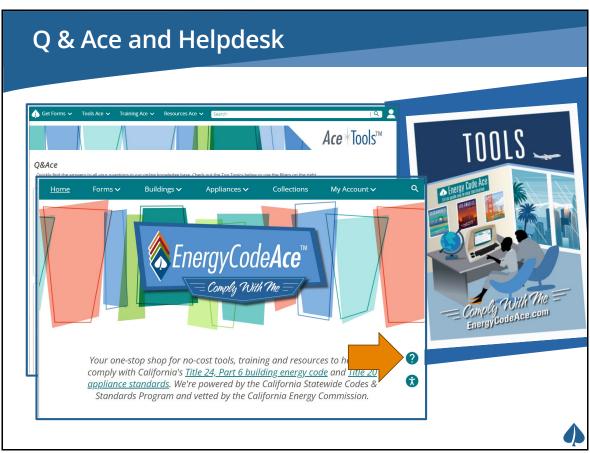
Next Steps

2025 Code Breaker: Solar & Battery & ZNCD 1. Energy Code Basics **Key Points & Next Steps** 2. Why Renewables are ♦ Other Training Required ♦ Resources 3. Single Family & Multifamily ≤3 Stories ♦ Tools Requirements 4. Nonresidential & Multifamily ≥4 Stories Solar Requirement 5. Nonresidential & Multifamily ≥4 Stories Battery Requirement 6. Next Steps









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Course Contacts & Evaluation



Thank you

Please feel free to reach out to us with your questions and comments!

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Energy Code Ace	Multiple	http://energycodeace.com/content/contact				

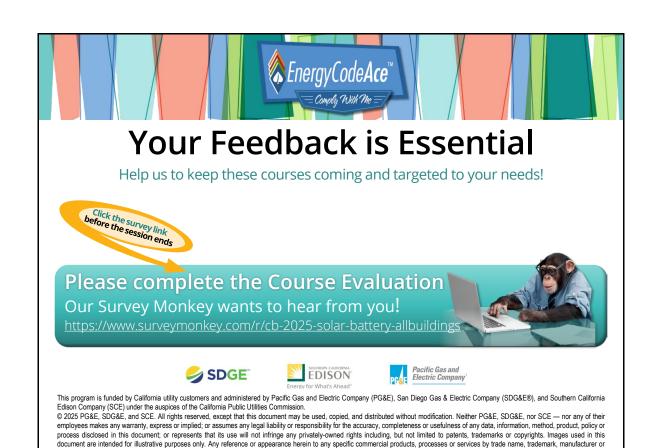






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Please complete our course evaluation: https://www.surveymonkey.com/r/cb-2025-solar-battery-allbuildings

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