2019 Energy Code

Residential Solar Photovoltaic Systems

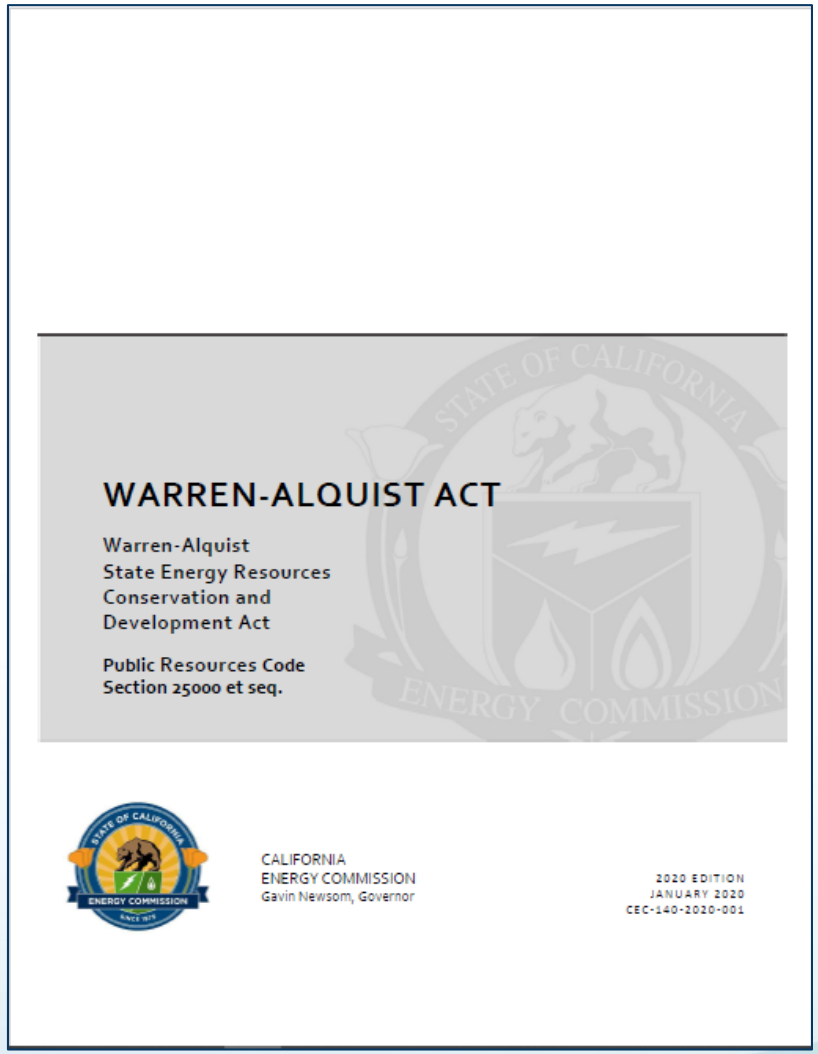
California Energy Commission
Efficiency Division
September 2021

Agenda

- Review Energy Code basics
- Photovoltaic (PV) administrative requirements
- PV prescriptive requirements
- PV performance method
- Solar ready requirements
- Plan check and inspection
- Resources

2019 Energy Code Basics

Energy Code History



The Warren-Alquist Act established CEC in 1974

- Authority to develop, adopt, and maintain Energy Code
- Updated every 3 years
- Energy Code must be cost-effective over the economic life of the building

2019 Energy Code

Effective January 1, 2020

- Building permit applications submitted on or after effective date
- Must use 2019 software and forms

2019 Documents Online

- Energy Code
- Reference Appendices
- Compliance Manuals
- Forms
  - Fillable dynamic
  - Energy Code Ace

Demonstrating Compliance

Compliance forms confirm Energy Code is met

- Completed by designers, consultants, builders, contractors, technicians, HERS raters, etc.
- Submitted to enforcement agencies for verification

Type of form	Residential
Certificate of compliance	CF1R
Certificate of installation	CF2R
Certificate of verification	CF3R

Energy Code Requirements

Mandatory measures

- Minimum efficiency requirements must always be met
- Can never trade-off

Prescriptive measures

- Predefined efficiency requirements
- May supersede mandatory measures
- Different requirements for newly constructed buildings, additions, and alterations

Compliance Approaches

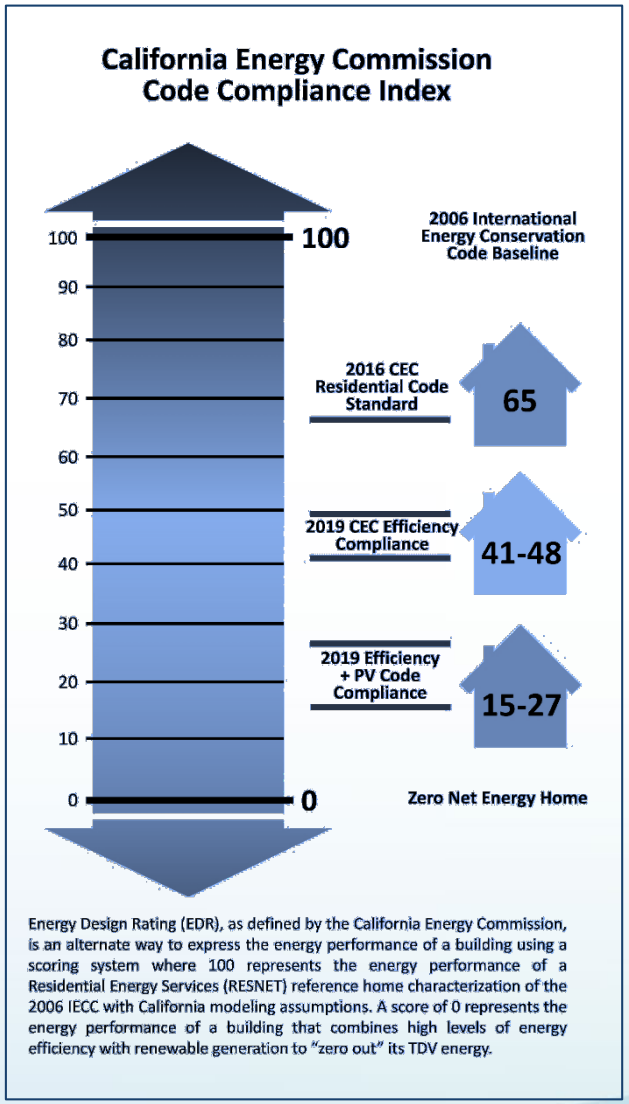
Prescriptive approach

- Simple approach, no trade-offs
- Match the standard building baseline
- More common for alterations

Performance approach

- Most flexible approach, allows for trade-offs
- Must meet all mandatory requirements
- Requires the use of CEC approved software
- Residential new construction
  - Proposed efficiency EDR ≤ standard building design
  - Total EDR (includes PV) ≤ standard building design
- Additions and alterations
  - Proposed TDV ≤ standard building design

Energy Design Rating (EDR)



Energy Design Rating (EDR), as defined by the California Energy Commission, is an alternate way to express the energy performance of a building using a scoring system where 100 represents the energy performance of a Residential Energy Services (RESNET) reference home characterization of the 2006 IECC with California modeling assumptions. A score of 0 represents the energy performance of a building that combines high levels of energy efficiency with renewable generation to "zero out" its TDV energy.

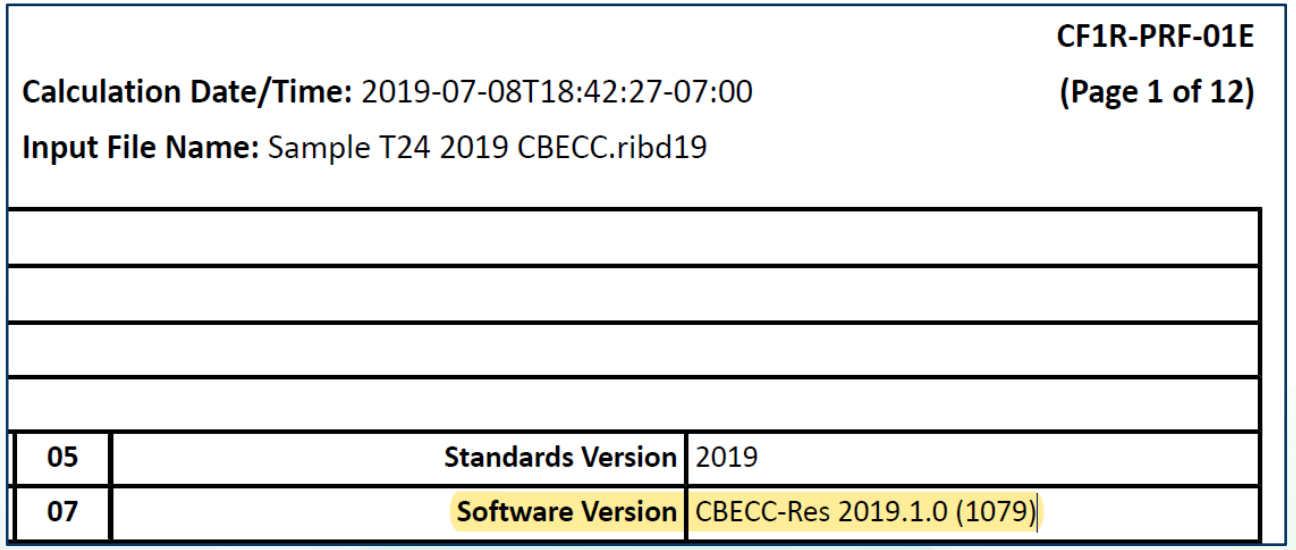
Low-rise residential EDR score for newly constructed buildings based on total estimated energy use

- 100 represents a home built to 2006 IECC
- 0 represents a zero net energy home
- Two types of EDR must be met independently
  - **Efficiency EDR**: Includes energy savings for space heating, space cooling, ventilation, and water heating measures
  - **Total EDR**: Includes efficiency EDR minus compliance credit for PV, battery, and other demand flexibility measures

2019 Compliance Software

Performance approach compliance use most recently approved versions

- Residential
  - CBECC-Res 2019.1.3
  - EnergyPro 8.2 Residential
  - Right-Energy 2019.1.1



CF1R-PRF-01E

Calculation Date/Time: 2019-07-08T18:42:27-07:00 **(Page 1 of 12)**

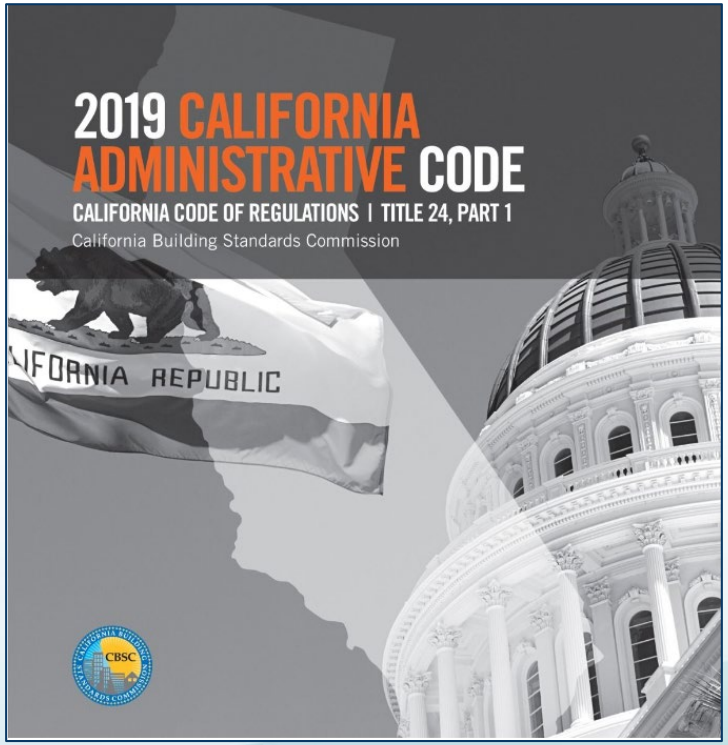
Input File Name: Sample T24 2019 CBECC.ribd19

05	**Standards Version**	2019
07	**Software Version**	CBECC-Res 2019.1.0 (1079)

Title 24 – California Building Code

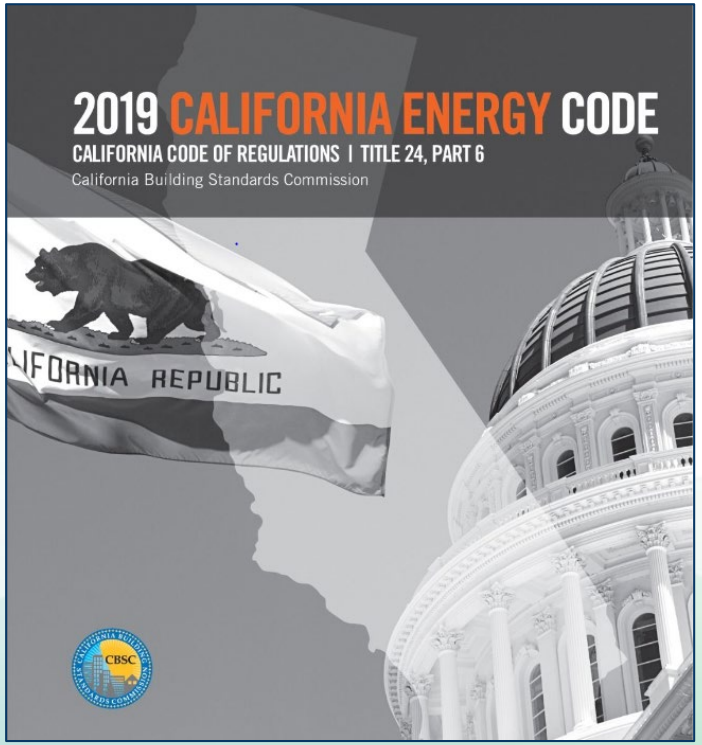
Part 1 - Administrative Code

- Chapter 10
- §§ 10-101 - 10-115
- Administrative requirements



Part 6 - Energy Code

- Subchapters 1 - 9
- §§ 100.0 - 150.2
- Technical requirements



Part 6 Energy Code

All Buildings § 100.0 - Table 100.0-A

TABLE 100.0-A APPLICATION OF STANDARDS

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations
General Provisions for All Buildings		100.0, 100.1, 100.2, 110.0			
Low-Rise Residential	General	150.0	150.1(a, c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
		110.6, 110.7, 110.8, 150.0(q)			
	HVAC (conditioned)	110.2, 110.5, 150.0(h), 150.0(i), 150.0(j), 150.0(m), 150.0(o)			
	Water Heating	110.3, 150.0(j, n)			
	Indoor Lighting (conditioned, unconditioned and parking garages)	110.9, 130.0, 150.0(k)			
	Outdoor Lighting	110.9, 130.0,150.0(k)			
	Pool and Spa Systems	110.4, 150.0(p)	N. A.	N.A.	150.2(a), 150.2(b)
	Solar Ready Buildings	110.10	Solar Ready Buildings	110.10	

General Provisions for All Buildings | 100.0, 100.1, 100.2, 110.0

150.1(a, c)

Residential relevant sections

§ 100.1 Definitions

§ 110.10 Solar ready

§ 150.1 Prescriptive requirements

Low-Rise Residential Buildings

- Single family and duplexes
  - Any number of stories
- Multifamily and townhouses
  - No more than 3 habitable stories

CALIFORNIA'S 2019 RESIDENTIAL

BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION

The state's energy efficiency standards for new buildings and appliances have saved consumers billions in lower electricity and natural gas bills. The 2019 Building Energy Efficiency Standards for residential buildings includes a first-in-the-nation requirement to install solar photovoltaic systems. Other features enable homes to reduce the electricity demand from the grid, helping to reduce energy bills and the carbon footprint.

$19,000 SAVINGS OVER A 30 YR. MORTGAGE | INITIAL COST $9,500

SOLAR PHOTOVOLTAIC SYSTEM

Promote installing solar photovoltaic systems in newly constructed residential buildings. The systems include smart inverters with optional battery storage. This will increase the self-utilization of the electricity generated to power the home's electricity loads including plug-in appliances. California is the first state in the nation to require smart systems on homes.

DEMAND RESPONSE COMPLIANCE OPTIONS

Encourage battery storage and heat pump water heaters that shift the energy use of the house from peak periods to off-peak periods. Utilities moving to time-of-use pricing assists the grid to meet the state's climate change goals and helps homes reduce energy bills.

HEALTHY INDOOR AIR QUALITY

Enable using highly efficient filters that trap hazardous particulates from both outdoor air and cooking and improve kitchen ventilation systems. Moving air around and in and out of the home while filtering out allergens and other particles makes the home healthier.

BUILDING ENVELOPE

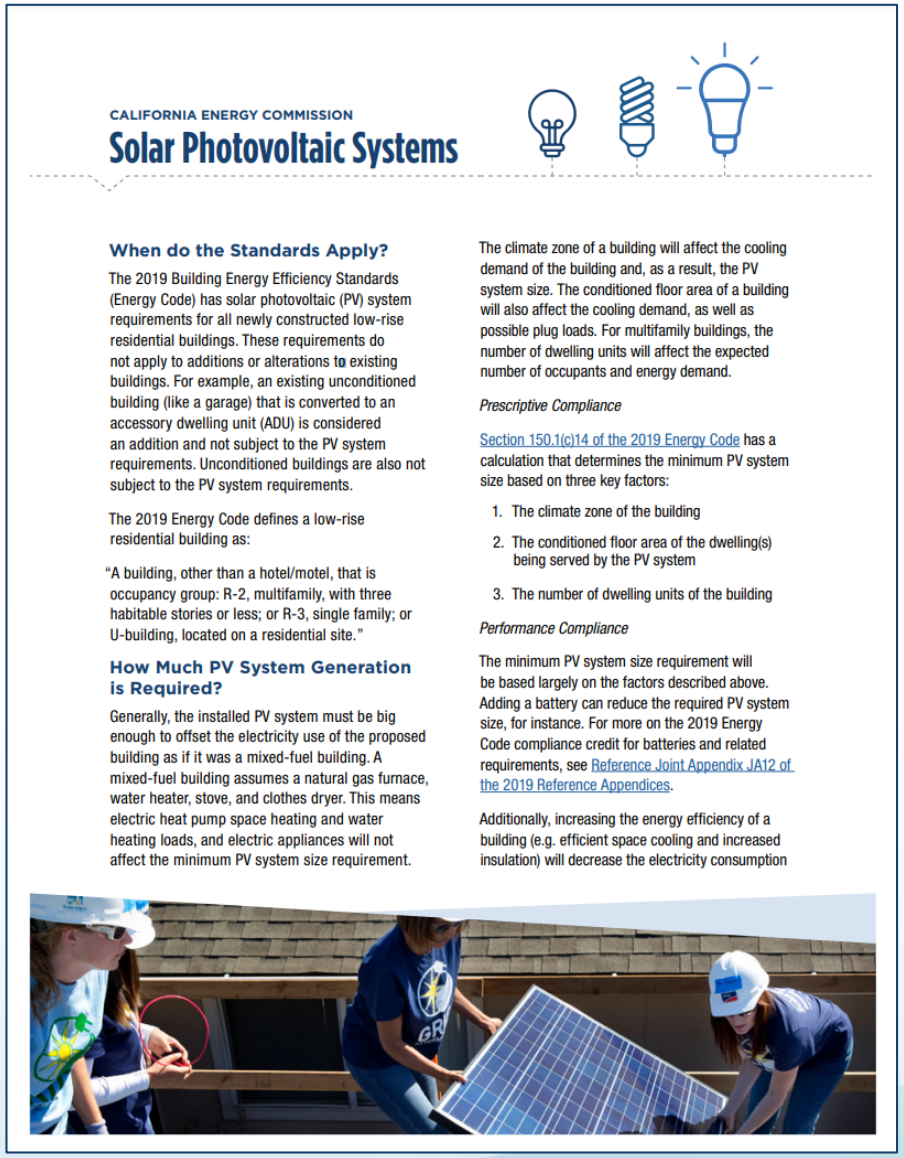
Strengthen insulation in attics, walls and windows to improve comfort and energy savings. Keeping the heat out during the summer and warm air during the winter makes a home more resilient to climate change.

2019 Energy Savings

Low-rise residential

- 7% more efficient than 2016 Standards
- Energy consumption reduced by an average 53% with PV
- Monthly lifecycle cost is $40 with savings of $80 for typical home
- GHG emission reduction of 700k metric tons over 3 years

Solar PV Systems Fact Sheet



CALIFORNIA ENERGY COMMISSION

Solar Photovoltaic Systems

When do the Standards Apply?

The 2019 Building Energy Efficiency Standards (Energy Code) has solar photovoltaic (PV) system requirements for all newly constructed low-rise residential buildings. These requirements do not apply to additions or alterations to existing buildings. For example, an existing unconditioned building (like a garage) that is converted to an accessory dwelling unit (ADU) is considered an addition and not subject to the PV system requirements. Unconditioned buildings are also not subject to the PV system requirements.

The 2019 Energy Code defines a low-rise residential building as:

"A building, other than a hotel/motel, that is occupancy group: R-2, multifamily, with three habitable stories or less; or R-3, single family; or U-building, located on a residential site."

How Much PV System Generation is Required?

Generally, the installed PV system must be big enough to offset the electricity use of the proposed building as if it was a mixed-fuel building. A mixed-fuel building assumes a natural gas furnace, water heater, stove, and clothes dryer. This means electric heat pump space heating and water heating loads, and electric appliances will not affect the minimum PV system size requirement.

The climate zone of a building will affect the cooling demand of the building and, as a result, the PV system size. The conditioned floor area of a building will also affect the cooling demand, as well as possible plug loads. For multifamily buildings, the number of dwelling units will affect the expected number of occupants and energy demand.

Prescriptive Compliance

Section 150.1(c)14 of the 2019 Energy Code has a calculation that determines the minimum PV system size based on three key factors:

1. The climate zone of the building
2. The conditioned floor area of the dwelling(s) being served by the PV system
3. The number of dwelling units of the building

Performance Compliance

The minimum PV system size requirement will be based largely on the factors described above. Adding a battery can reduce the required PV system size, for instance. For more on the 2019 Energy Code compliance credit for batteries and related requirements, see Reference Joint Appendix JA12 of the 2019 Reference Appendices.

Additionally, increasing the energy efficiency of a building (e.g. efficient space cooling and increased insulation) will decrease the electricity consumption

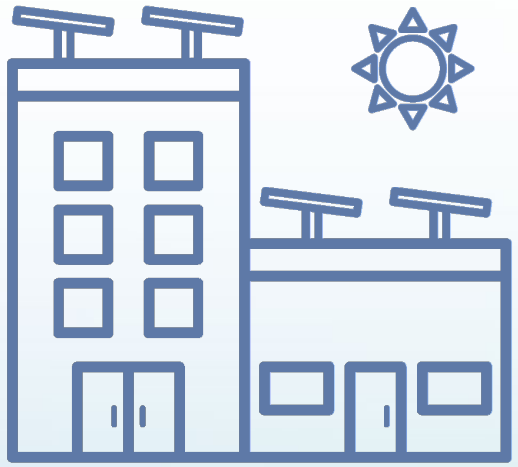
- When do PV systems requirements apply?
- How much generation is required?
- Where can the PV system be installed?
- Are there exceptions?

Photovoltaic
All Buildings

Administrative §§ 10-109, 10-115

Solar PV Definitions

- Photovoltaic (PV) system - all components including array of panels, inverters, and balance of system components required to deliver power to building
- Annual solar access - the ratio of solar insolation including shading over the solar insolation without shading
- Effective annual solar access - is 70% or greater of the output of an unshaded PV array on an annual basis
- Azimuth - the orientation in degrees from true north
- Low-sloped roof - has a ratio of rise to run of less than 2:12
- Steep-sloped roof - has a ratio of rise to run of 2:12 or greater



Photovoltaic Administrative Requirements

All Buildings § 10-109

Local jurisdictions can apply for PV exclusion

- Written application must be submitted to the CEC
- Requires public review within jurisdiction of entity, or service area of utility prior to application
- Must show not cost-effective for specific buildings
  - Implementation of public agency rules regarding utility system cost and revenue requirements
  - Compensation for customer-owned generation
  - Interconnection fees
- Current exceptions for Trinity Public Utility District and Needles, CA

Community Shared Solar Administrative Requirements

All Buildings § 10-115

Community shared solar or battery storage

- Must be installed and available for inspection by final
- Must provide equal or better energy performance than required for building
- Must provide energy saving benefits directly to buildings
  - Actual reduction in consumption of dedicated building
  - Utility energy reduction credits
  - Payments to the building
- Minimum 20-year benefit
- Must be approved by the CEC
- Sacramento Municipal Utility District (SMUD) is approved for community solar option

Photovoltaic Residential

Prescriptive: § 150.1(c)14

Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14

All new low-rise residential to have PV system

- PV system sized to offset annual kWhs of mixed-fuel home
- Based on projected annual electrical usage
- Climate zone specific
- Equation 150.1-C
  - kWpv = (CFA x A)/1000 + (NDwell x B)
    - kWpv = kWdc size PV system
    - CFA = Conditioned floor area
    - NDwell = Number of dwelling units
    - A = CFA adjustment factor from Table 150.1-C
    - B = Dwelling adjustment factor from Table 150.1-C

Note: oversized PV will not result in performance credit

Photovoltaic Prescriptive Requirements

PV Sizes for Mixed Fuel Homes. 2700 SF Prototype			
CZ	Efficiency EDR without PV, based on 2019 Efficiency Measures	Total EDR with PV	kW PV Size for Displacing kWh Electric Only
1 - Humboldt	48.0	26.5	3.4
2 - Santa Rosa	41.2	18.0	2.9
3 - San Francisco	46.9	22.7	2.8
4 - San Jose	43.1	22	2.9
5 - Santa Maria	42.5	20.2	2.7
6 - Costal LA	48.0	20.9	2.9
7 - San Diego	48.0	14.9	2.7
8 - Disneyland	43.0	14.6	2.9
9 - Burbank	46.2	23.3	3.1
10 - Riverside	45.2	23.5	3.3
11- Redding	43.3	23.4	3.8
12 - Sacramento	43.1	24.5	3.1
13 - Fresno	44.8	22.1	4.0
14 - Palmdale	44.6	21.3	3.4
15 - Palm Springs	48.0	17.9	5.7
16 - Tahoe	46.3	27.5	3.0

PV sizes for mixed-fuel home

- 2,700 square foot prototype
- Varies by climate zone
- Average PV size will be 2.8 kW

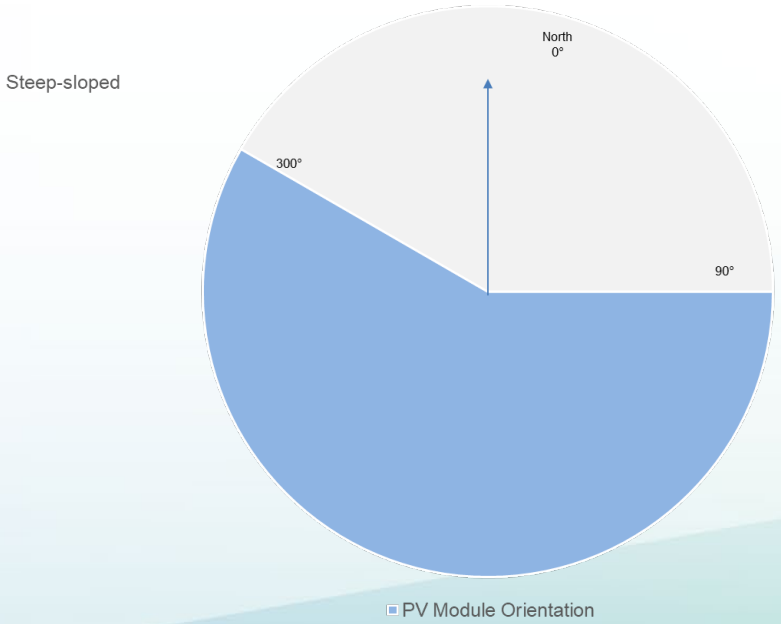
Note: average PV size for similar existing home is 7.2 kW

Photovoltaic Prescriptive Requirements

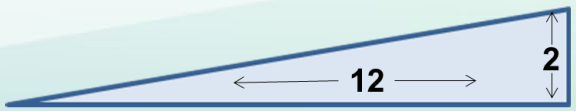
Residential § 150.1(c)14, JA11.2

System orientation per Reference Joint Appendix JA11.2

- All PV modules on steep-sloped roofs shall be oriented between 90 degrees and 300 degrees of true north



If PV modules are located on a sloped roof with a rise to run ratio of 2:12 or greater, then the solar zone area must face between 90° and 300°.

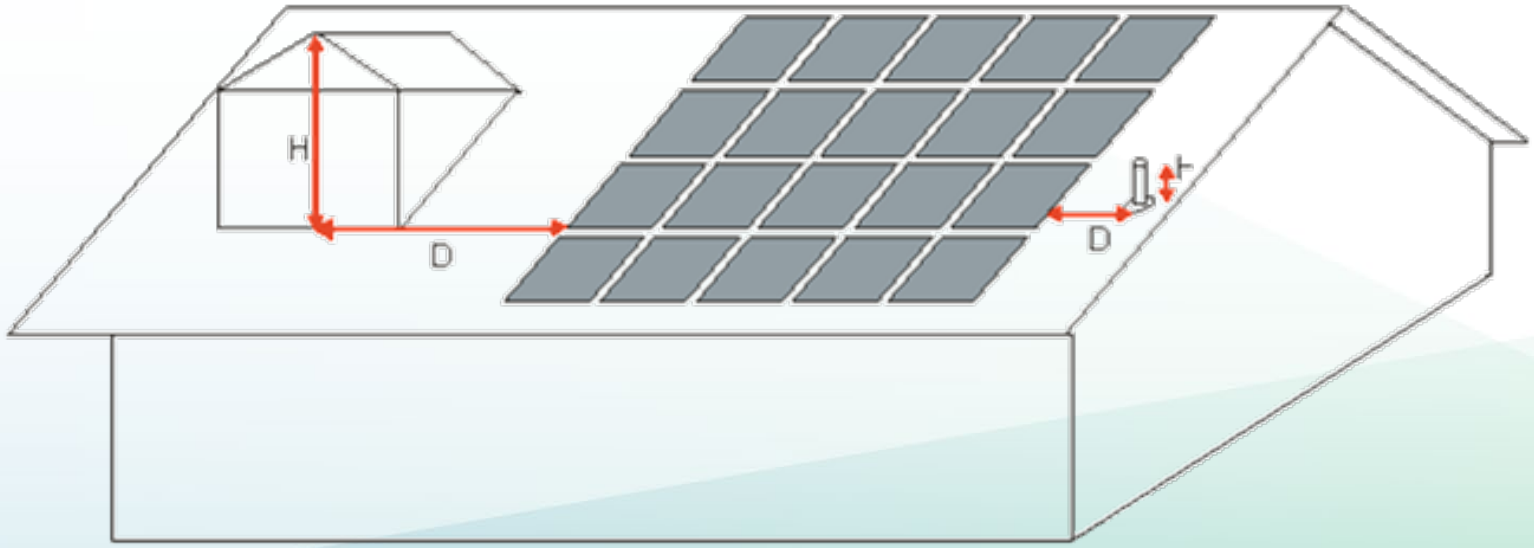


Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14, JA11.3

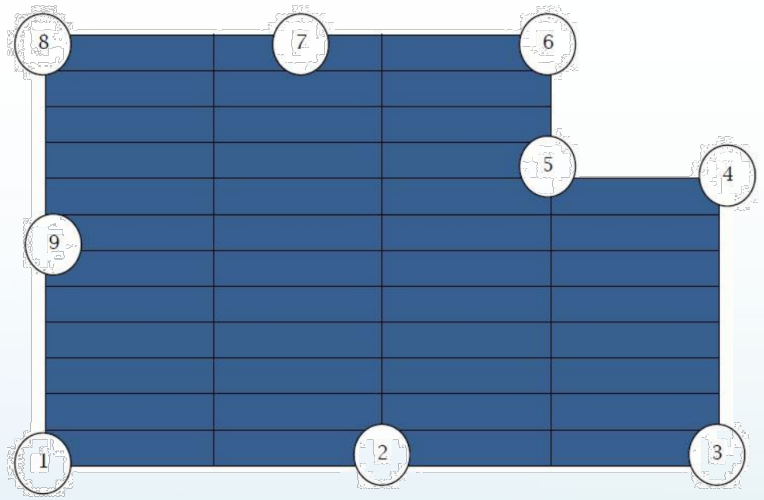
Minimal shading criteria per JA11.3

- Distance between edges of arrays and any obstruction must be at least twice the height of obstruction that extends above PV array



Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14, JA11.4



Solar access verification per JA11.4

- Use available CEC-approved solar access tools
  - Model physical features of building and shading conditions
  - Calculate solar potential using historical weather data
- Alternative methods
  - Aerial satellite or drone images
  - Supporting documentation

Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14, JA11.5

Remote monitoring capability required per JA11.5

- Web-based portal and mobile app
  - Nominal kW rating of PV system
  - Number of PV modules and nominal watt rating of each module
  - Hourly (or 15-minute interval), daily, monthly, and annual kWh production in numeric and graphic formats
  - Running total of daily kWh production
  - Daily kW peak power production
  - Current kW production of entire PV system

Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14, JA11.6

Interconnection requirements per JA11.6

- Inverters tested per UL1741 and UL1741 Supplement A
- PV system, components, inverters to comply with Rule 21 requirements per CPUC

Photovoltaic System Exceptions

Residential § 150.1(c)14

Exception 1

- PV not required if the effective annual solar access is restricted to less than 80 contiguous square feet from existing permanent natural or manmade barriers
  - Shading such as trees, hills, and adjacent structures, etc.
  - Effective annual solar access 70% or greater output of unshaded PV

Photovoltaic System Exceptions

Residential § 150.1(c)14

Exception 2

- Climate zone 15 only
- Smaller PV allowed
  - Sized per effective annual solar access or Equation 150.1-C, whichever is less
  - No less than 1.5 Watt per square foot

Photovoltaic System Exceptions

Residential § 150.1(c)14

Exceptions 3 and 4

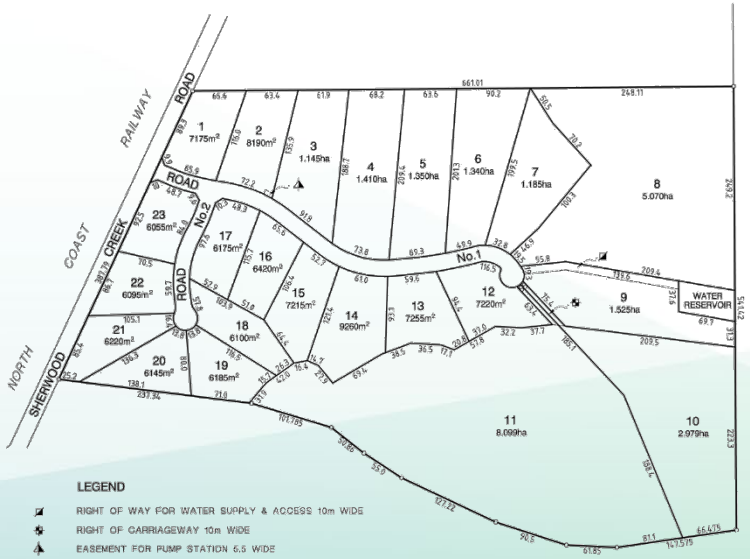
- Variances allowed for multi-story buildings with limited roof space
- Smaller PV allowed
  - Sized per effective annual solar access or Equation 150.1-C, whichever is less
- Two-story
  - No less than 1.0 Watt per square foot
- Three-story or more
  - No less than 0.8 Watt per square foot

Photovoltaic System Exceptions

Residential § 150.1(c)14

Exception 5

- Dwelling unit plan approved prior to January 1, 2020
- Solar ready zone between 80-200 square feet
- PV sized per effective annual solar access or Equation 150.1-C, whichever is less



Photovoltaic System Exceptions

Residential § 150.1(c)14, JA12

Exception 6

- PV size may be reduced 25% with battery storage system
- Meet JA12 requirements
- Minimum capacity of 7.5 kWh

Photovoltaic System Battery Storage Requirements

Residential § 150.1(c)14, JA12

Battery storage requirements per JA12

- Tested per UL1973 and UL9540
- Performance
  - Capacity 5 kWh or more
  - Single charge-discharge cycle AC to AC efficiency 80% or more
  - Energy capacity retention of 70% covered by warranty
- Controls
  - Capable of remote programming
  - Programmed to meet electrical load during discharge
  - Use control strategy
    - Basic control
    - Time-of-use control
    - Advanced demand response control
- Interconnection and net metering per CPUC

Photovoltaic System Exceptions

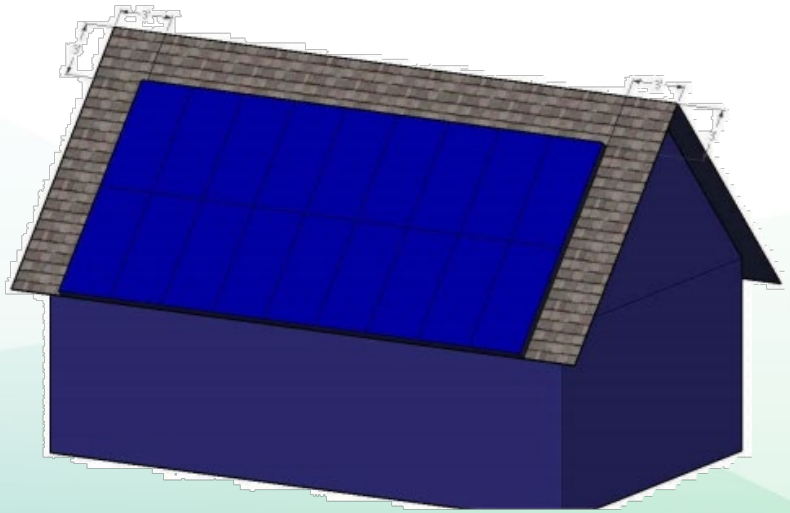
Disaster area rebuilds

- Assembly Bill 178 (AB 178, Dahle, 2019)
  - Projects that repair, restore, or replace residential building damaged or destroyed as result of declared disaster before January 1, 2020
  - Comply with any PV requirements in effect when originally constructed
  - Exempt from additional or conflicting PV requirements in effect at time of rebuild
  - Only applies when
    - Income of homeowner is at or below the median income
    - Construction does not exceed square footage of damaged home
    - New construction is located on same site of damaged home
    - Homeowner did not have code upgrade insurance when home was damaged
  - Applicable until January 1, 2023

Photovoltaic System Exceptions

High snow loads

- No PV requirement for buildings that cannot meet PV system structural requirements in CBC and CRC due to high snow loads
- Meet design and installation requirements for high snow loads in American Society of Civil Engineers (ASCE) Standard 7-16
- Simultaneous compliance with Energy Code, CBC, and CRC
- Best effort to address high snow loads
  - Specific characteristics of PV modules
  - Method of installation
  - Roof slope and design
  - PV module location
- See Blueprint 133



Test Your Knowledge

Is solar PV mandatory on newly constructed houses?

- No. Solar PV is a prescriptive measure giving it some flexibility in terms of PV size and location.
- Most new residential projects will have solar, unless meeting an exception.

Photovoltaic Residential

Performance Method

Photovoltaic Performance Method

Residential ACM Reference Manual 2.1.5.5

Self-utilization credit for battery storage system with PV

- Allows modest trade-off with efficiency EDR score
- Minimum 5 kWh battery storage capacity
- Varies by building type and climate zone
- Meet requirements in JA12
- Approved battery storage systems are listed on the CEC Solar Equipment Lists webpage

Photovoltaic Performance Method

CBECC-Res User Manual 4.4.2

California flexible installation (CFI)

- More applicable to subdivisions
- No requirement to include the specific orientation, tilt, and shading conditions
- Roof slopes between 0:12 and 7:12
- Performance based on an average orientation and tilt
  - CFI1 allows the PV installation anywhere from 150 to 270 degrees
  - CFI2 allows the PV installation anywhere from 105 to 300 degrees

Test Your Knowledge

Does the performance method allow tradeoffs between PV systems and energy efficiency measures?

- No. Installing a larger PV system in exchange for less energy efficiency measures is not allowed
- A smaller PV system is allowed in exchange for adding additional energy efficient features, demand responsive measures, battery storage, or thermal storage systems

Solar Ready Requirements

Residential

Mandatory § 110.10(a-e)

Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(a)1

Covered occupancies - single family residential

- Located in subdivisions with 10 or more single family residences
- Tentative subdivision map application approved
- No solar PV system installed

Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(a)1

Covered occupancies - single family residential

- Townhouses and duplexes considered single family residences
- Each unit complies separately
- Applies to subdivisions with 10 or more single family residences

Low-rise multifamily is included with nonresidential

Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(b)1

Solar zone minimum area

- Comply with all access, pathway, smoke ventilation, and spacing requirements in Title 24, Part 9 or other parts
- Comply with all local jurisdiction requirements

Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(b)1

Solar zone minimum area

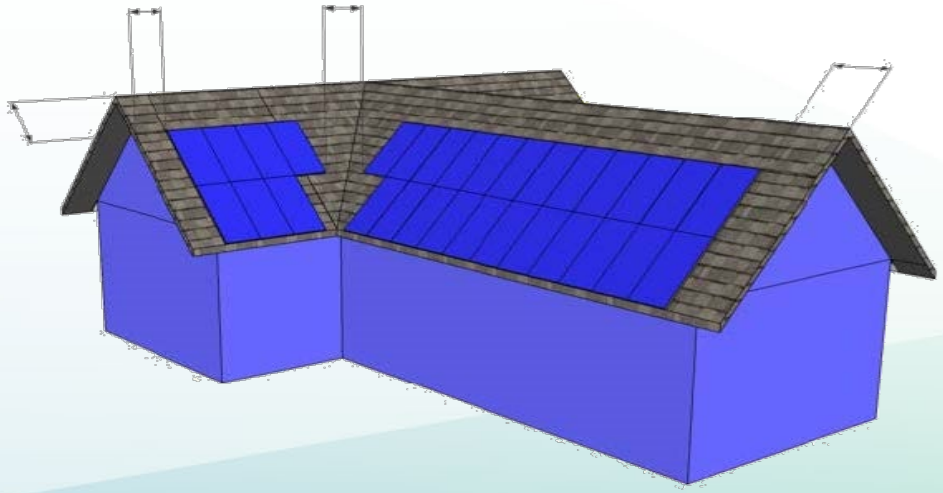
- Each dimension is 5 feet or more in length
- Area – depends on the size of the roof
  - Total roof area is 10,000 square feet or less
    - 80 square feet or more total solar zone
  - Total roof area is more than 10,000 square feet
    - 160 square feet or more total solar zone
- Multiple subareas can make up total area
  - No less than 5 feet

Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(b)1A

Solar zone minimum area - single family residential

- Located on the building's roof or overhang
- Total area at least 250 square feet
- Exceptions may reduce or eliminate required solar area



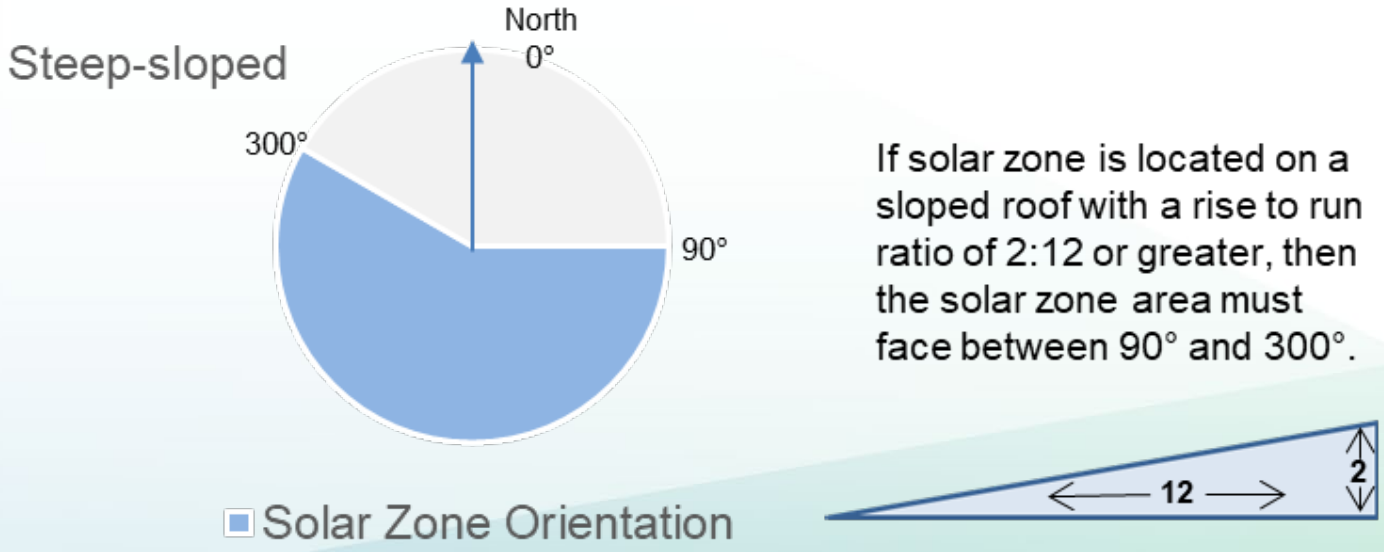
Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(b)2

Solar zone azimuth

- All solar zone sections on steep-sloped roofs shall be oriented between 90 degrees and 300 degrees of true north.

Figure 7-4: Orientation when solar zone is located on a steep-sloped roof



Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(b)3

Solar zone shading

- No obstructions in the solar zone
- Limited obstructions outside of solar zone
  - Distance from solar zone to obstruction is at least two times the obstruction height
  - Exception: Obstructions north of all points in the solar zone

Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(b)4

Solar zone structural design loads on construction documents

- Roof dead load and live load must be clearly indicated on construction documents (structural plans)
  - Collateral load for future solar installation is not required

Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(c)

Interconnection pathways - single family residential

- Construction documents indicate locations
  - Inverters and meter equipment
  - Conduit route from solar zone to service connection
- Central water-heating systems
  - Plumbing route from solar zone to water-heating system
- Must comply with the California Fire Code solar access requirements

Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(d)

Documentation

- Copy to occupant
  - Construction documents showing the solar zone and pathways to interconnection

Solar Ready Buildings Mandatory Requirements

All Buildings § 110.10(e)

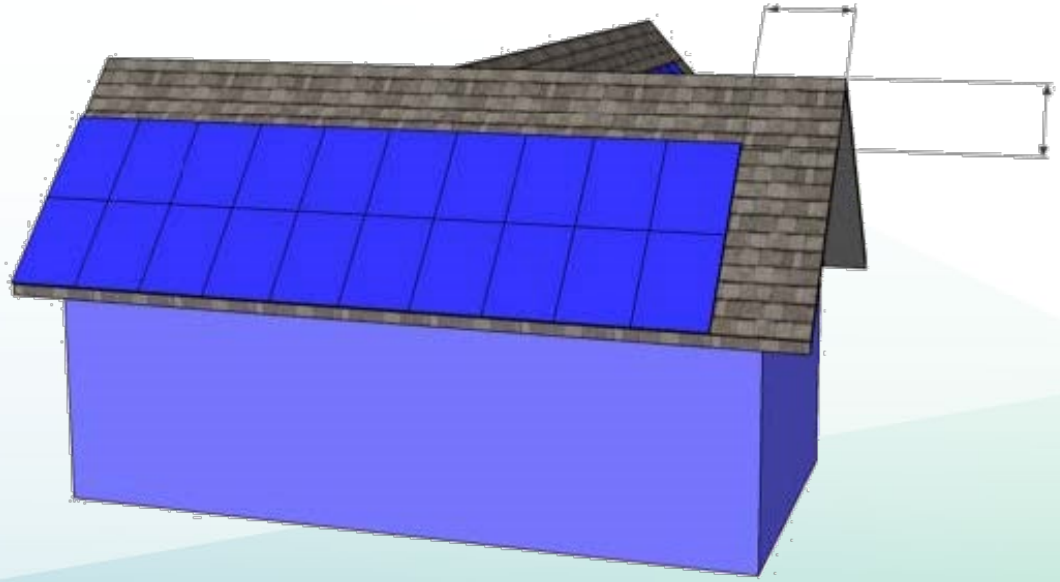
Main electrical service panel - single family residences

- Minimum 200-amp busbar rating
- Space reserved for future double pole circuit breaker
  - At opposite end from input feeder
  - Permanently marked “For Future Solar Electric”

Test Your Knowledge

Is solar ready mandatory on newly constructed houses?

- Yes. Solar ready is a mandatory measure when there is not a PV system installed. Most new residential projects will have PV, unless meeting an exception.



Plan Check and Inspection

Plans Examiners

- Ensure panel cut sheets match designed power ratings
  - Maximum power times number of panels should meet or exceed PV kW requirement
- If specific azimuth designed, plans match
- Climate zones 1 and 16, verify water heater adjustment if heat pump modeled
- Verify no shading from architectural and other features
- Verify perimeter path and clearance to roof ridge according to Fire Code
- Make sure notes are for CA Codes (not NEC)
- If no PV system, CF1R-SRA for solar ready

Project Name: Sample House
Calculation Date/Time: 2019-07-08T18:42:27-07:00
Calculation Description: Title 24 Analysis
Input File Name: Sample T24 2019 CBECC.ribd19

ENERGY DESIGN RATING

	Energy Design Ratings		Compliance Margins	
	Efficiency[1] (EDR)	Total[2] (EDR)	Efficiency[1] (EDR)	Total[2] (EDR)
Standard Design	45.9	24.7		
Proposed Design	45.4	24.2	0.5	0.5

RESULT: [3]: COMPLIES

[1] Efficiency measures include improvements like a better building envelope and more efficient equipment
[2] Total EDR includes efficiency, photovoltaics and batteries
[3] Building complies when all efficiency and total margins are greater than or equal to zero

- Standard Design PV Capacity: 2.68 kW
- PV System resized to 2.68 kWdc (a factor of 0.893) to achieve 'Standard Design PV' PV scaling

ENERGY USE SUMMARY

Energy Use (kTDV/ft^2-yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	18.54	17.25	1.29	7
Space Cooling	28.53	30.02	-1.49	-5.2
IAQ Ventilation	2.79	2.79	0	0
Water Heating	14.18	12.55	1.63	11.5
Self Utilization Credit	n/a	0	0	n/a
Compliance Energy Total	**64.04**	**62.61**	**1.43**	**2.2**

REQUIRED PV SYSTEMS

01	02	03	04	05	06	07	08	09	10	11
DC System Size (kWdc)	Exception	Module Type	Array Type	Power Electronics	CFI	Azimuth (deg)	Tilt Input	Array Angle (deg)	Tilt: (x in 12)	Inverter Eff. (%)
2.68	NA	Standard	Fixed (open rack)	none	true	n/a	n/a	n/a	n/a	96

SMUD Community Solar Sample

CERTIFICATE OF COMPLIANCE

Project Name: 1 Story Example PV+Battery

Calculation Date/Time: 2021-0

Calculation Description: 1 Story Example Rev 3

Input File Name: 1storyExampl

ENERGY DESIGN RATING

	Energy Design Ratings	
	Efficiency[1] (EDR)	**Total[2] (EDR)**
Standard Design	45.1	23.6
Proposed Design	42.9	21.4
RESULT: [3]: COMPLIES		

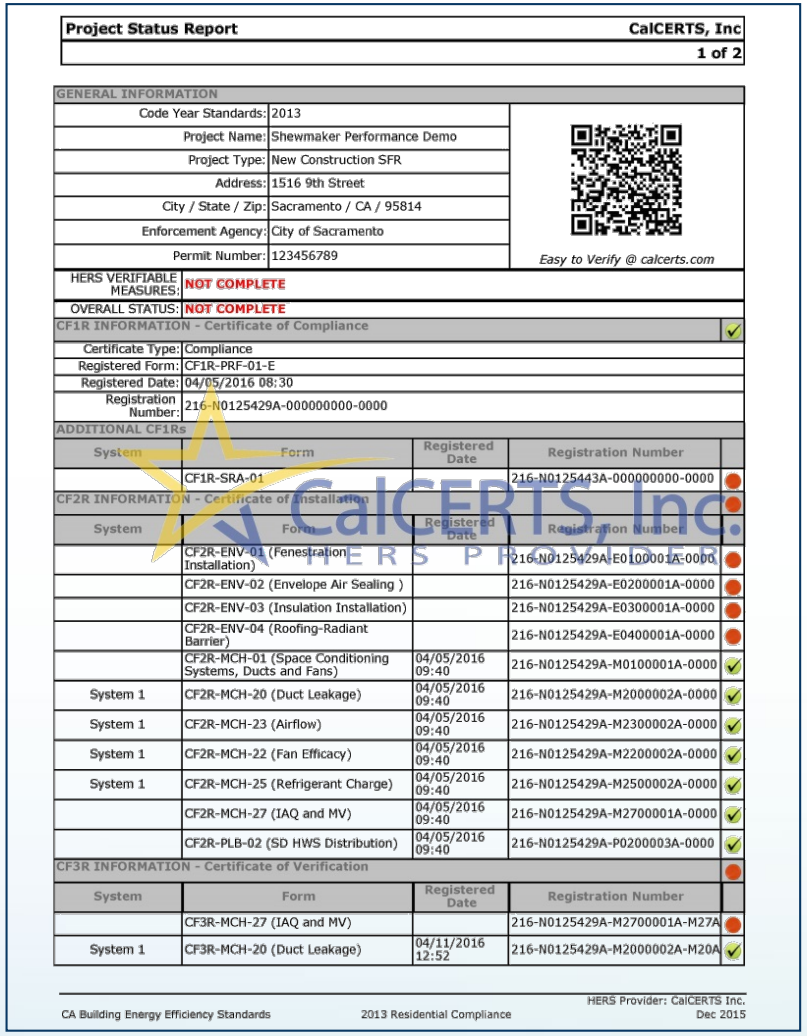
1: Efficiency EDR includes improvements to the building envelope and more efficient equipment
2: Total EDR includes efficiency and demand response measures such as photovoltaic (PV) systems and batteries
3: Building complies when efficiency and total compliance margins are greater than or equal to zero

- Standard Design PV Capacity: 2.65 kWdc
- PV System sized at 1.93 kWdc for Community Solar project 'SMUD Neighborhood SolarShares - Wildflower'

Field Inspectors

- Verify system matches plans
  - Spec sheets should match, including power, inverter efficiencies, number of panels
- If purlin supports designed, verify installed at rough stage
- Ensure no unnecessary shading from roof penetrations
  - Flues should be at least a distance twice height away from arrays
    - Example: 2-foot-tall flue should be 4 feet from array

Project Status Report



Project Status Report — **CalCERTS, Inc** — 1 of 2

GENERAL INFORMATION	
Code Year Standards:	2013
Project Name:	Shewmaker Performance Demo
Project Type:	New Construction SFR
Address:	1516 9th Street
City / State / Zip:	Sacramento / CA / 95814
Enforcement Agency:	City of Sacramento
Permit Number:	123456789

Easy to Verify @ calcerts.com

HERS VERIFIABLE MEASURES:	NOT COMPLETE
OVERALL STATUS:	NOT COMPLETE

CF1R INFORMATION - Certificate of Compliance ✓

Certificate Type:	Compliance
Registered Form:	CF1R-PRF-01-E
Registered Date:	04/05/2016 08:30
Registration Number:	216-N0125429A-000000000-0000

ADDITIONAL CF1Rs

System	Form	Registered Date	Registration Number	
	CF1R-SRA-01		216-N0125443A-000000000-0000	●

CF2R INFORMATION - Certificate of Installation ●

System	Form	Registered Date	Registration Number	
	CF2R-ENV-01 (Fenestration Installation)		216-N0125429A-E0100001A-0000	●
	CF2R-ENV-02 (Envelope Air Sealing)		216-N0125429A-E0200001A-0000	●
	CF2R-ENV-03 (Insulation Installation)		216-N0125429A-E0300001A-0000	●
	CF2R-ENV-04 (Roofing-Radiant Barrier)		216-N0125429A-E0400001A-0000	●
	CF2R-MCH-01 (Space Conditioning Systems, Ducts and Fans)	04/05/2016 09:40	216-N0125429A-M0100001A-0000	✓
System 1	CF2R-MCH-20 (Duct Leakage)	04/05/2016 09:40	216-N0125429A-M2000002A-0000	✓
System 1	CF2R-MCH-23 (Airflow)	04/05/2016 09:40	216-N0125429A-M2300002A-0000	✓
System 1	CF2R-MCH-22 (Fan Efficacy)	04/05/2016 09:40	216-N0125429A-M2200002A-0000	✓
System 1	CF2R-MCH-25 (Refrigerant Charge)	04/05/2016 09:40	216-N0125429A-M2500002A-0000	✓
	CF2R-MCH-27 (IAQ and MV)	04/05/2016 09:40	216-N0125429A-M2700001A-0000	✓
	CF2R-PLB-02 (SD HWS Distribution)	04/05/2016 09:40	216-N0125429A-P0200003A-0000	✓

CF3R INFORMATION - Certificate of Verification ●

System	Form	Registered Date	Registration Number	
	CF3R-MCH-27 (IAQ and MV)		216-N0125429A-M2700001A-M27A	●
System 1	CF3R-MCH-20 (Duct Leakage)	04/11/2016 12:52	216-N0125429A-M2000002A-M20A	✓

CA Building Energy Efficiency Standards — 2013 Residential Compliance — HERS Provider: CalCERTS Inc. — Dec 2015

- Summarizes status of all required forms
- Available for all projects registered with HERS provider
- Direct access to registry
- Request hard copy at final inspection to verify compliance
- HERS and Overall Status marked **Complete** to pass inspection

Resources

Solar Assessment Tools

Approved solar assessment tools

- Aurora Solar Inc.
- Helioscope
- Scanifly
- Solmetric Suneye

Online Resource Center

Online Resource Center

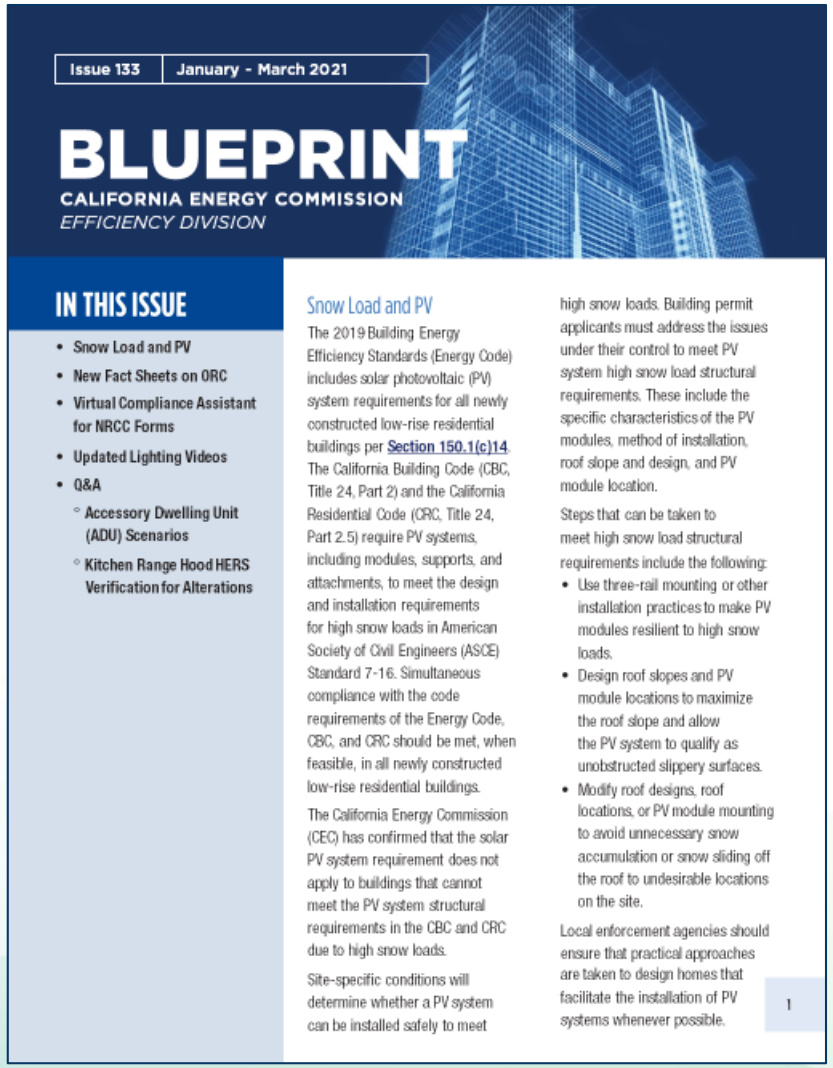
Educational documents and training information for building communities and enforcement agencies to assist with building energy standards compliance.

LEARN MORE >

Blueprint Newsletter

Energy Code Newsletter

- Published quarterly
- Updates
- Clarifications
- Frequently asked questions
- PV resources
  - BP #127
  - BP #129
  - BP #130
  - BP #132
  - BP #133
  - BP #134



Issue 133 | January - March 2021

BLUEPRINT

CALIFORNIA ENERGY COMMISSION

EFFICIENCY DIVISION

IN THIS ISSUE

- Snow Load and PV
- New Fact Sheets on ORC
- Virtual Compliance Assistant for NRCC Forms
- Updated Lighting Videos
- Q&A
  - Accessory Dwelling Unit (ADU) Scenarios
  - Kitchen Range Hood HERS Verification for Alterations

Snow Load and PV

The 2019 Building Energy Efficiency Standards (Energy Code) includes solar photovoltaic (PV) system requirements for all newly constructed low-rise residential buildings per Section 150.1(c)14. The California Building Code (CBC, Title 24, Part 2) and the California Residential Code (CRC, Title 24, Part 2.5) require PV systems, including modules, supports, and attachments, to meet the design and installation requirements for high snow loads in American Society of Civil Engineers (ASCE) Standard 7-16. Simultaneous compliance with the code requirements of the Energy Code, CBC, and CRC should be met, when feasible, in all newly constructed low-rise residential buildings.

The California Energy Commission (CEC) has confirmed that the solar PV system requirement does not apply to buildings that cannot meet the PV system structural requirements in the CBC and CRC due to high snow loads.

Site-specific conditions will determine whether a PV system can be installed safely to meet high snow loads. Building permit applicants must address the issues under their control to meet PV system high snow load structural requirements. These include the specific characteristics of the PV modules, method of installation, roof slope and design, and PV module location.

Steps that can be taken to meet high snow load structural requirements include the following:

- Use three-rail mounting or other installation practices to make PV modules resilient to high snow loads.
- Design roof slopes and PV module locations to maximize the roof slope and allow the PV system to qualify as unobstructed slippery surfaces.
- Modify roof designs, roof locations, or PV module mounting to avoid unnecessary snow accumulation or snow sliding off the roof to undesirable locations on the site.

Local enforcement agencies should ensure that practical approaches are taken to design homes that facilitate the installation of PV systems whenever possible.

1

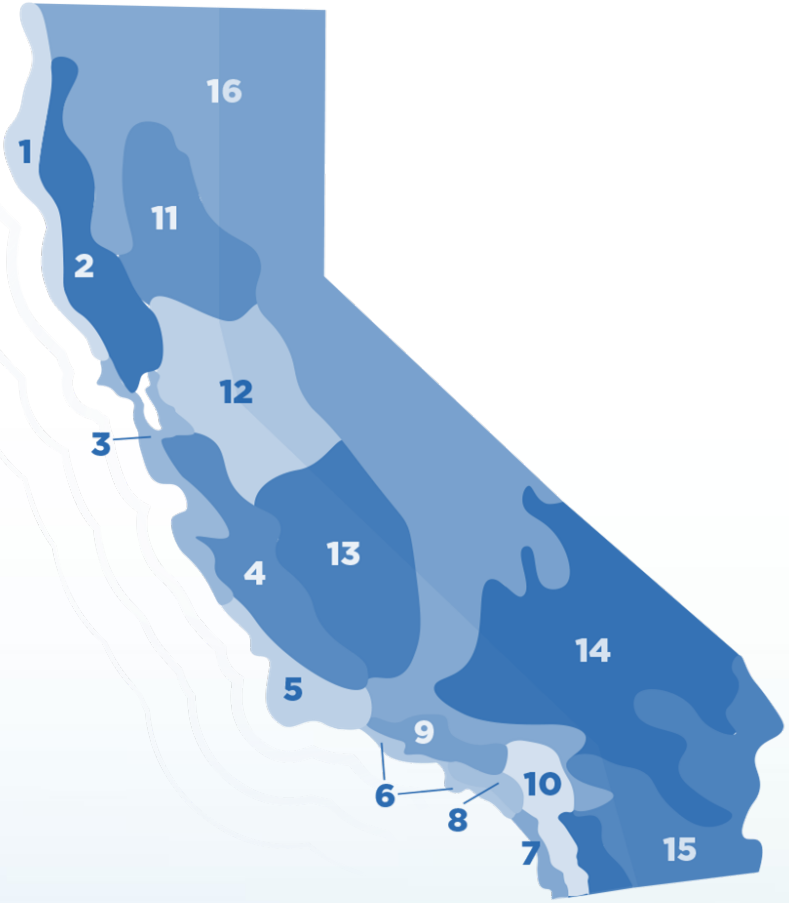
Stay Connected

Receive Energy Code updates

- Subscribe to Efficiency Division emails
  - Appliances
  - Blueprint
  - Building Standards
- Respond to confirmation email

Follow the California Energy Commission

Energy Code Hotline



Monday through Friday

8:00 a.m. to 12:00 p.m.

1:00 p.m. to 4:30 p.m.

Call

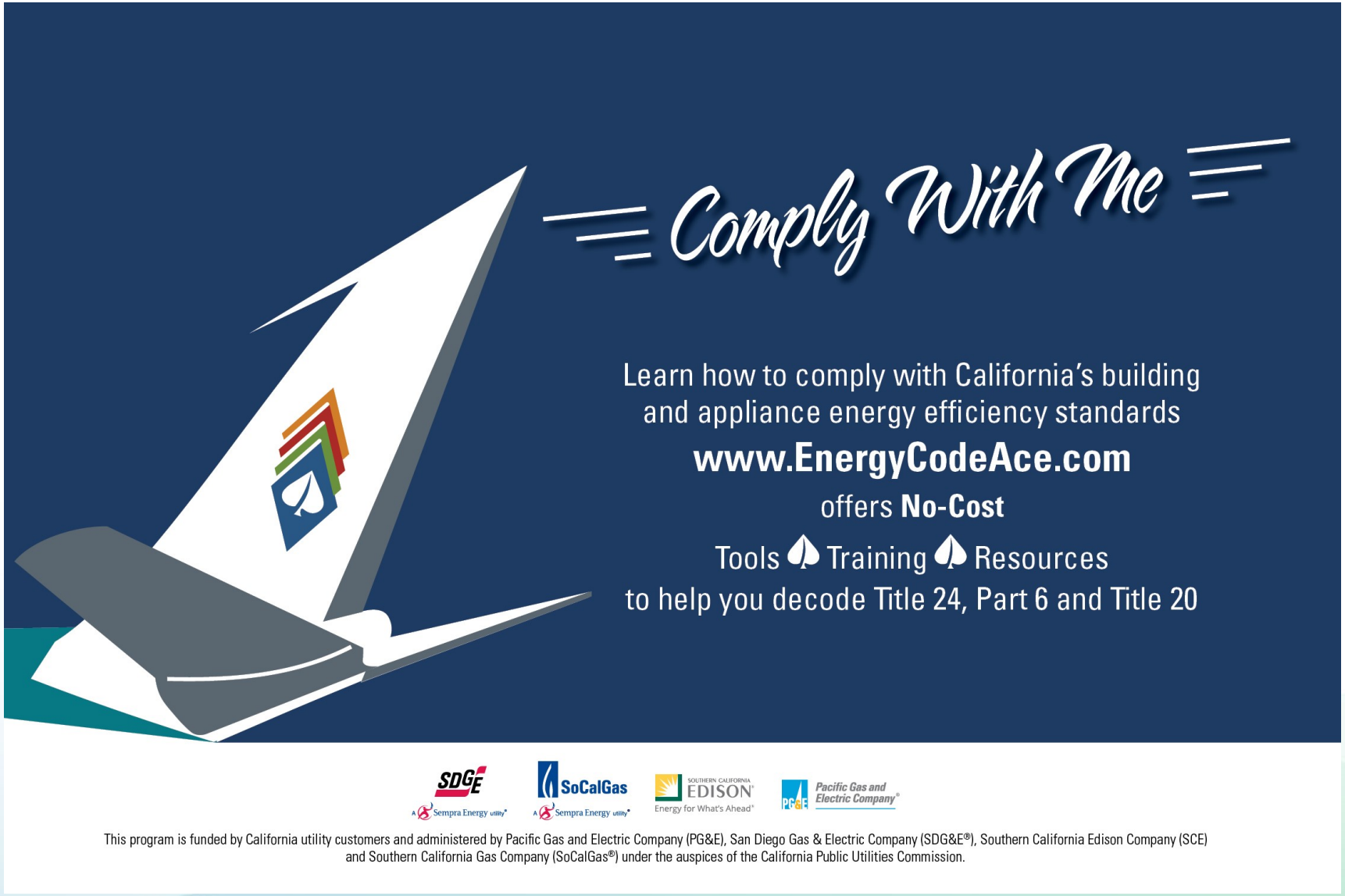
800-772-3300 in CA

916-654-5106 outside CA

Email

Title24@energy.ca.gov

Energy Code Ace



Thank you