

DECARBONIZATION POLICY

new construction

Zero Emissions New Construction *will require*



EFFICIENCY

+



ELECTRIFICATION

+



**RENEWABLE
ENERGY**

**Energy efficient
new construction**



meet latest model energy codes such as IECC 2021

No on-site fossil fuels



no fossil fuel-based systems for heating, cooking, etc.

**Generate/procure
carbon free
renewable energy**



ZERO Code Renewable Energy Standard

ZERO CODE™

A national and international building energy standard for new commercial, institutional, and mid- to high-rise residential buildings.



An **internationally applicable** building code standard for **zero carbon construction**

for new commercial, institutional, and mid- to high-rise residential buildings.





Addresses **emissions from new buildings** by:

- requiring all buildings to use of **carbon-free renewable energy**
- ensuring the addition of **new renewable energy** to electricity grids

How do you meet the ZERO Code?

1

Design an energy efficient building

- meet the latest model energy codes (e.g. IECC 2021)



2

Determine renewable energy requirements

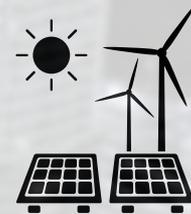
- prescriptive path: use ZERO Code default renewable energy table
- or
- performance path: complete an energy simulation



3

Generate/procure renewable energy

- generate either on-site renewable energy
- or
- procure off-site renewable energy



ZERO Code Off-Site Renewable Energy Procurement General Requirements

- 1 Legally binding contract.
- 2 Duration of not less than 15 years and shall survive transfer.
- 3 RECs and other environmental attributes shall be assigned to the building project for the duration of the contract.
- 4 Photovoltaic systems, solar thermal power plants, geothermal power plants, and/or wind turbines.
- 5 Located in the same ISO or RTO; or within integrated ISOs.
- 6 Transparent accounting that clearly assigns production to the ZNC building.

ZERO Code Off-Site Renewable Energy Procurement

Accepted Off-Site Procurement Methods

- 1 Direct Ownership (includes portfolios and campuses)
- 2 Community Renewables
- 3 Virtual Power Purchase Agreements (PPAs)
- 4 Renewable Energy Investment Fund (REIF)
- 5 Direct Access to Wholesale Markets (includes deals brokered by vertical utilities)
- 6 Green Retail Tariffs
- 7 Unbundled RECs

ZERO Code Off-Site Renewable Energy Procurement

Default Classes Of Off-Site Procurement Methods

Class One

- Community Renewables
- Renewable Energy Investment Fund (REIF)
- Virtual Power Purchase Agreements (PPAs)
- Direct Ownership (includes portfolios and campuses)

Class Two

- Green Retail Tariffs
- Direct Access to Wholesale Markets (includes deals brokered by vertical utilities)

Class Three

- Unbundled RECs

ZERO Code Off-Site Renewable Energy Procurement

Procurement Methods, Characteristics, and Discount Factors

CLASS	PROCUREMENT METHOD	CHARACTERISTICS	DISCOUNT FACTOR
1	<ul style="list-style-type: none">○ Virtual Power Purchase Agreements (PPAs)○ Direct Ownership (includes portfolios and campuses)○ Community Renewables (capacity acquisition)○ Renewable Energy Investment Fund (REIF)	<ul style="list-style-type: none">○ High probability of additionality○ Transaction involves capacity acquisition○ Generation sources are known	.75
2	<ul style="list-style-type: none">○ Community Renewables (subscription)○ Direct Access to Wholesale Markets○ Green Retail Tariffs	<ul style="list-style-type: none">○ Medium probability of additionality○ Customer purchasing green electricity not capacity	.55
3	<ul style="list-style-type: none">○ Unbundled RECs	<ul style="list-style-type: none">○ Low probability of additionality○ RECs are undervalued and misunderstood	.20

ZERO Code Off-Site Renewable Energy Procurement

Off-site renewable energy shall be determined with the following equation:

$$RE_{\text{offsite}} = \sum_{i=1}^n C_i \cdot RE_i = C_1 \cdot RE_1 + C_2 \cdot RE_2 + \dots + C_n \cdot RE_n$$

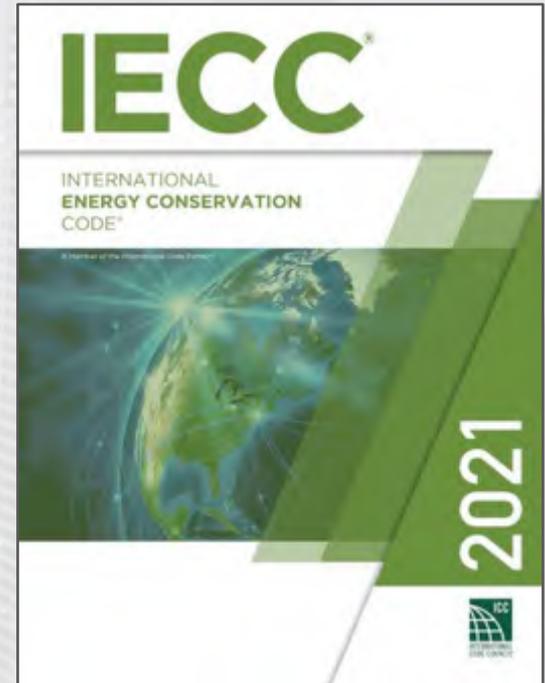
where

- **RE_{offsite}** == adjusted off-site renewable energy
- **RE_i** == annual energy production for each renewable energy class
- **C_i** == coefficients for each renewable energy class
- **C_n** == number of off-site renewable energy options

ZERO Code Renewable Energy Appendix

Key Points

- Optional for jurisdictions to adopt
- Sets a minimum renewable energy requirement based on energy simulations or default values
- Provides an incentive for buildings to be designed to be more energy efficiency than code requires
- Encourages on-site renewable energy when feasible
- Supports off-site renewable energy procurement when necessary
- Establishes a consistent framework that local governments can modify for their specific needs and conditions
- 2021 IECC energy efficiency requirements cannot be traded with renewable energy



ZERO Code Off-Site Renewable Energy Procurement Technical Support Document

Includes

- Overview of potential off-site procurement
- Comparison and classification methods
 - Comparison/classification criteria
 - Process for criteria weighting/prioritization

Outcomes

- Differential weighting assigned to different off-site renewable energy sources
- Flexible approach for each jurisdiction that adopts the ZERO Code

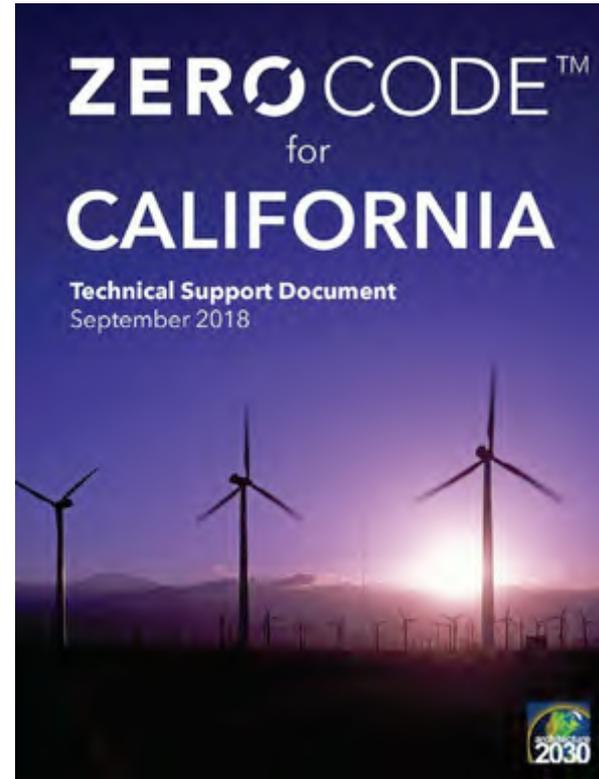
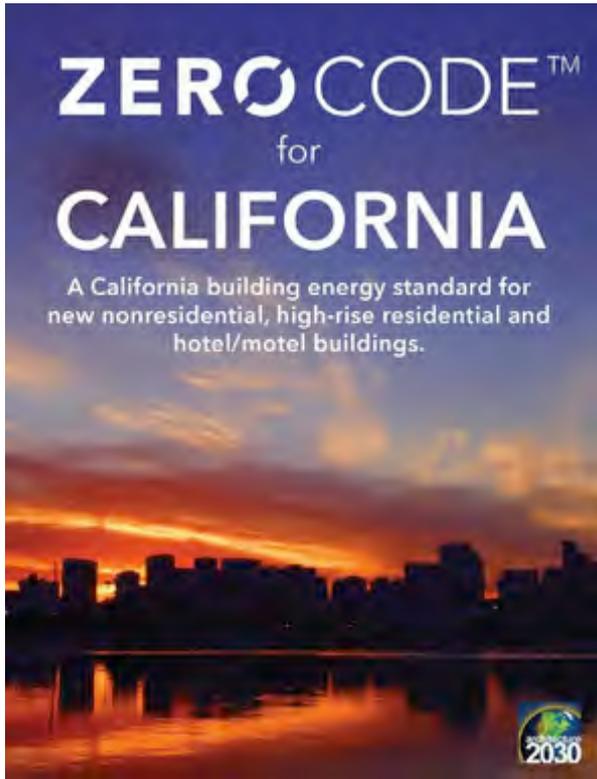


ZERO Code Off-Site Renewable Energy Procurement

Technical Support Document: Comparison and Classification Criteria

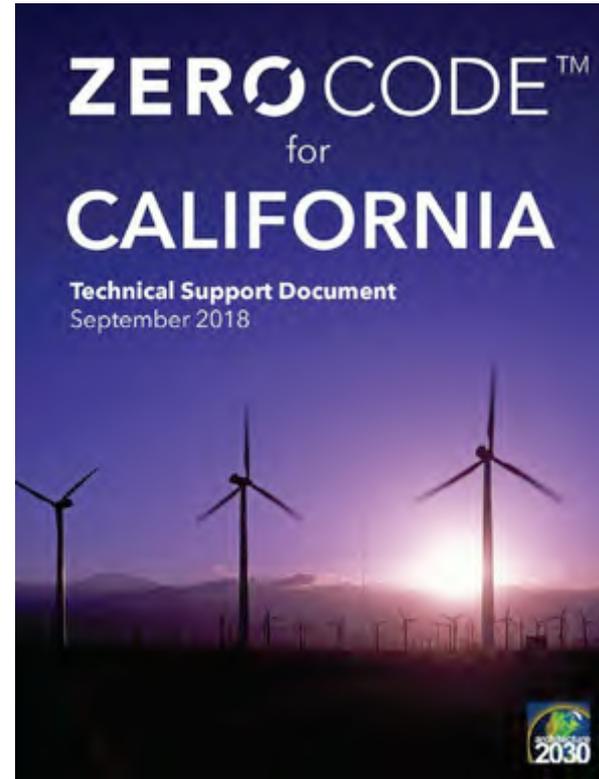
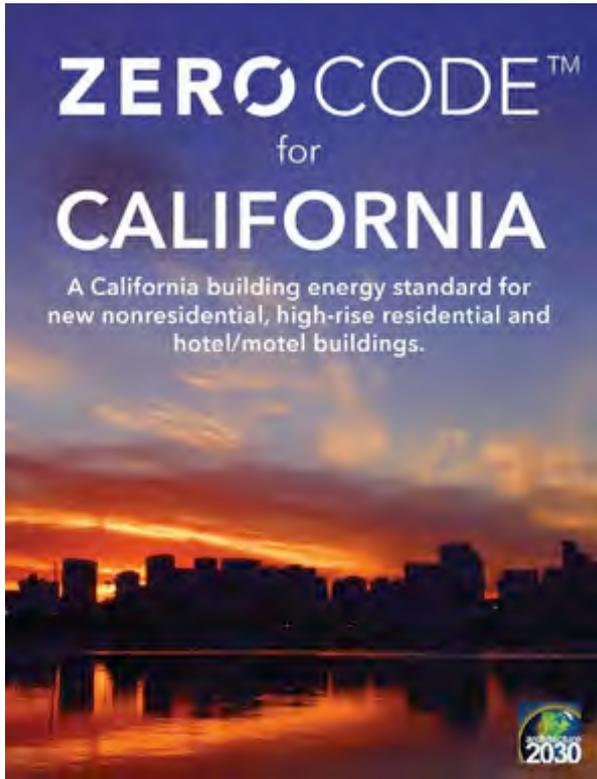
- Additionality
- Long-Term Commitment (Durability)
- Assignment to Building
- Grid Management Capability
- Environmental Impact
- Inspirational/Educational Value
- Incremental Acquisition
- Permanent Financing





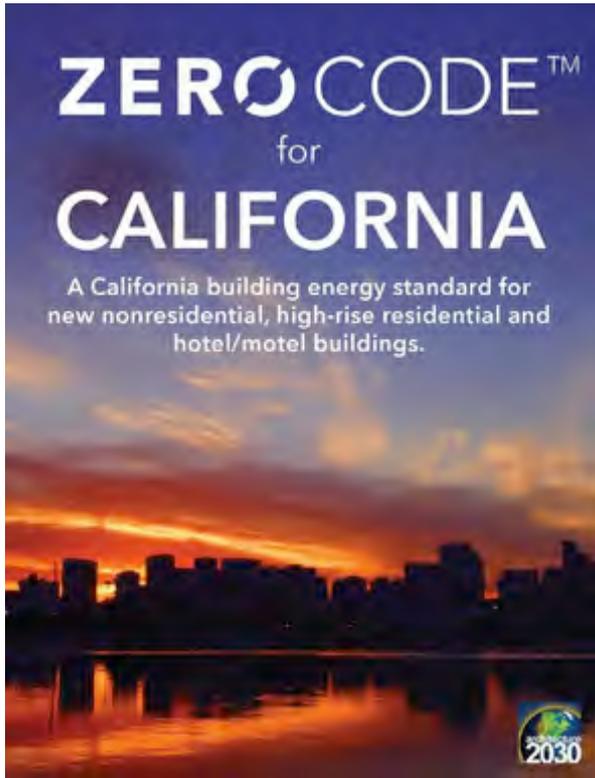
**Published October 2018
in advance of the Global Climate Action Summit**





**Applies to commercial, institutional, hotels/ motels,
and high-rise residential**





November 20, 2017

population and building stock, all while achieving relatively
 nita energy levels in part through strong building efficiency
 rt of many of California's climate accomplishments, and must
 at our long term decarbonization commitments.

ia will host the first Global Climate Action Summit. September
 is to bring together states, cities, businesses, investors, and
 ge—collectively “non-state actors”—to assess global progress
 take new commitments to ambition and action in line with what
 ous climate change. One of the five key areas of focus for the
 and communities. As we build momentum for accelerated
 it, I welcome your work on a Zero Net Carbon (ZNC) building
 cared with and adopted by our partners at the national and

important role in helping to combat climate change and curtail
 ough improvements in the built environment and energy
 o work with you going forward, including for successful

STATE OF CALIFORNIA – NATURAL RESOURCES AGENCY
 CALIFORNIA ENERGY COMMISSION
 Commissioner: James Rogovin, Ph.D.
 1700 Main Street, 4th Floor
 Sacramento, CA 95833
 www.energy.ca.gov

October 27, 2017

Ed Mazria, CEO
 Architecture 2030
 907 Cerrillos Road
 Santa Fe, NM 87505

Re: California Zero Net Carbon Cities Initiative

Dear Mr. Mazria:

The Energy Commission supports California cities' actions to reduce dramatically the greenhouse gas emissions of their built environment. Cities provide essential leadership and implementation experience from which the rest of California can learn.

The Energy Commission welcomes the opportunity to work with you to ensure that your Zero Net Carbon (ZNC) building initiative and code standard dovetails well with California's Building Energy Efficiency Standards (BEES). In particular, our collaboration will aim to ensure that local building ordinances intending to utilize a ZNC metric will meet or exceed the minimum levels of energy efficiency required by law within BEES, as verified by the Energy Commission.

It is the Commission's desire to encourage cities' work in this arena while avoiding the potential for conflict with the statewide building code, recognizing that there are multiple potential approaches to creating a functional relationship between ZNC and the BEES.

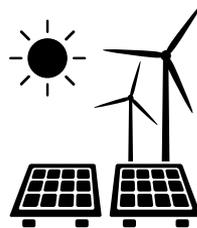
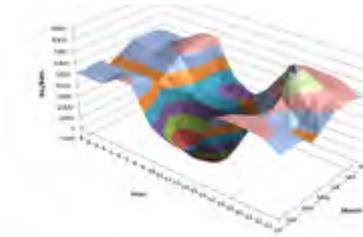
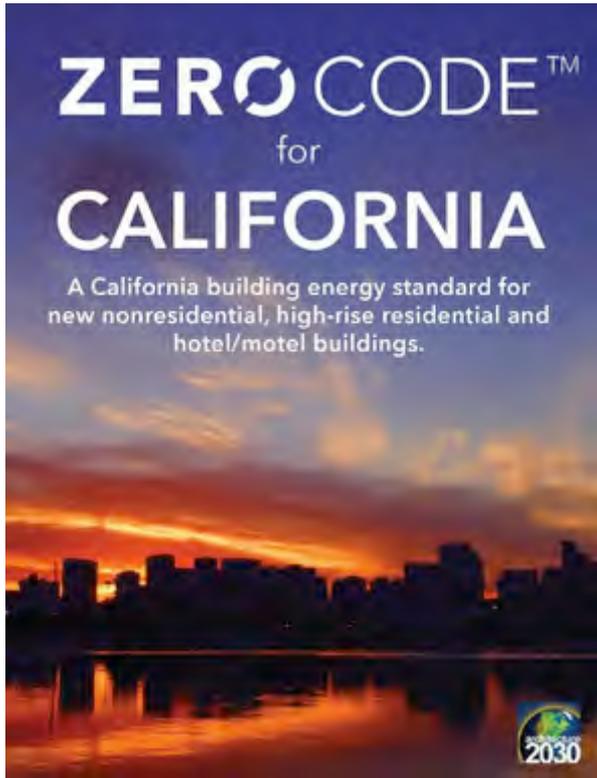
Please take this letter as our commitment to work with you to identify and implement the most sensible approach to meet both state requirements and local needs as California's cities redouble their efforts to promote the creation of sustainable, low-emission buildings.

Sincerely,

 J. Andrew McAllister, Ph.D.
 Commissioner

**With support from Office of Governor Edmund G. Brown Jr.
 and the California Energy Commission**



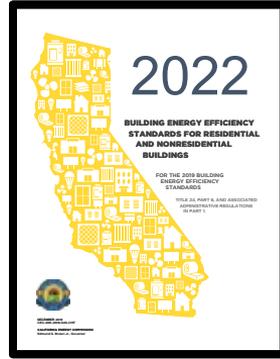
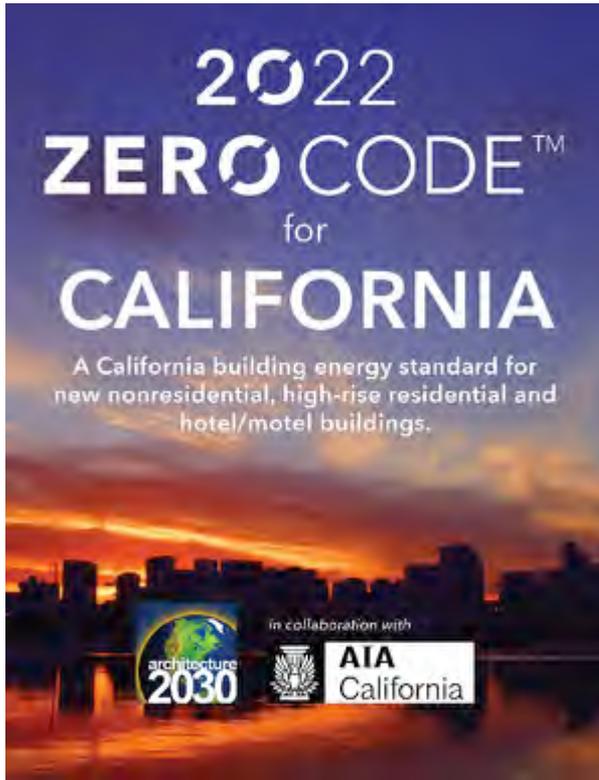


2019 CA BEES
(base energy efficiency)

**TIME-DEPENDANT
SOURCE ENERGY**
(replaced TDV)

RENEWABLE ENERGY
(on-site or off-site)



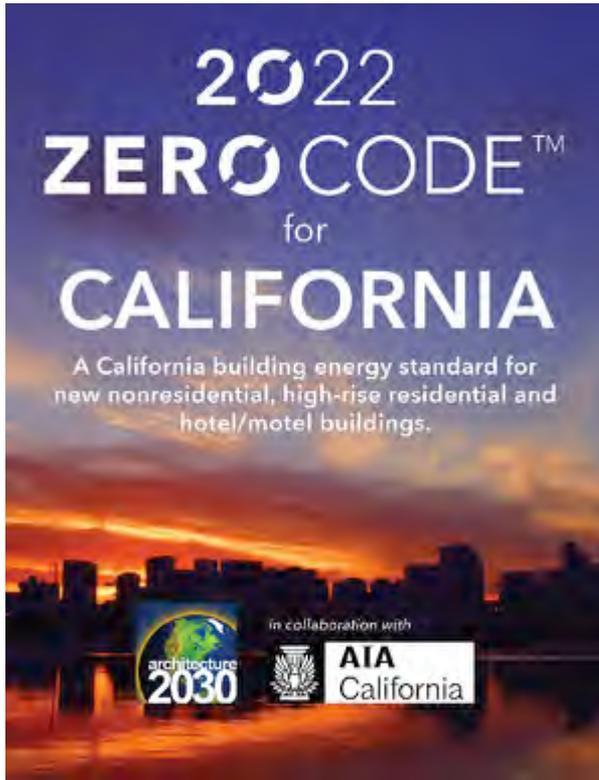


2022 CA BEES
(base energy efficiency)

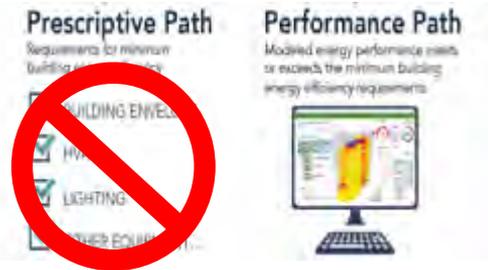
RENEWABLE ENERGY
FOR THE ENERGY
(in place of TDM) (TDM)ent)

RENEWABLE ENERGY
FOR SITE-PURCHASED
EQUIPMENT





**EXCEEDING
CODE MINIMUM
(Optional)**



**Prescriptive
compliance path
is not available**



Achieving **Zero Emissions New Construction**



EFFICIENCY

+



ELECTRIFICATION

+



RENEWABLE ENERGY

**Energy efficient
new construction**



upcoming 2022 California
Building Energy Standards
(BEES)

No on-site fossil fuels



no fossil fuel-based systems
for heating, cooking, etc.

**Generate/procure
carbon free
renewable energy**



minimum on-site
renewable energy
+
off-site renewable
energy procurement





Minimum On-Site Renewable Energy

Minimum On-Site Renewable Energy

Building projects shall contain on-site photovoltaic systems as required by the California 2022 BEES, but with a rated capacity of not less than **2.0 W/ft² multiplied by the horizontal projection of the gross roof area** over conditioned spaces. For the purposes of this section, the building roof area may exclude the following:

- a. **Shaded areas**, defined as roof area where direct-beam sunlight is blocked by structures or natural objects for more than 1500 annual hours between 8 a.m. and 4 p.m.
- b. **Green roofs** and areas of vegetated terrace.
- c. Areas designated for **public occupancy**. Parking areas shall not qualify for this exclusion.



Example

- $10,000 \text{ ft}^2 \text{ roof area} \times 2 \text{ W/ft}^2 = 20,000 \text{ W}$
- $20,000 \text{ W} / 300 \text{ W/panel} = 67 \text{ panels}$
- $17 \text{ ft}^2/\text{panel} \times 67 \text{ panels} = 1,139 \text{ ft}^2 \text{ of collector area (11\% of roof area)}$

Exempt roof area:

- Shaded areas
- Rooftop terraces
- Vegetated areas



Net Electricity



**Electricity
Consumption**

less



**On-Site Renewable
Energy Production**

An aerial photograph of a city skyline, likely San Francisco, featuring numerous skyscrapers and a prominent dome in the lower-left. The image is overlaid with a semi-transparent dark blue circle in the upper-right quadrant, which contains the text. The text is in a bold, white, sans-serif font.

Off-Site Renewable Energy

Community Solar, Green Pricing and Utility Contracts

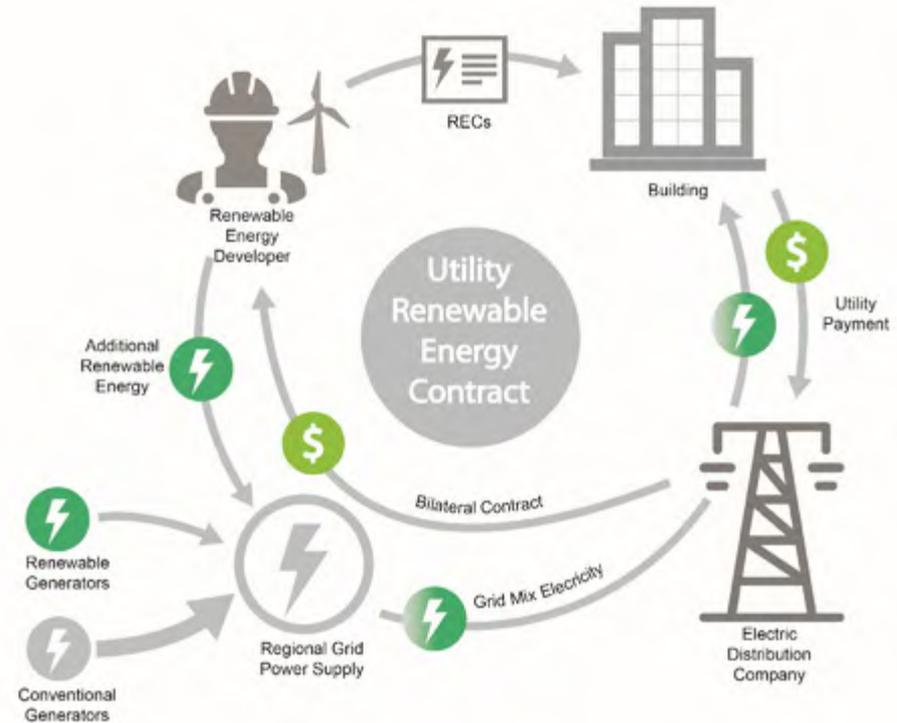
Purchase net electricity from one of these programs

Procurement Method	Description
Community Solar	A program, often offered in partnership with the local utility or community choice aggregator, whereby a large solar system is installed at a common location within a community and property owners subscribe to the program so that renewable energy production is assigned to their property.
Green Pricing	A special electric tariff offered by the local utility, community choice aggregator or other electricity supplier that delivers 100% renewable energy to the property.
Utility Renewable Energy Contract	A special bilateral tariff negotiated with the local utility, community choice aggregator or other electricity supplier that delivers 100% renewable energy to the property.

Community Solar, Green Pricing and Utility Contracts

- Community Solar
- Green Pricing
- Utility Renewable Energy Contracts

Buy net electricity from a 100% renewable energy program



Qualifying Off-Site Programs

Type	Organization	Program
CCA	CleanPowerSF	Super Green
CCA	East Bay Community Energy	Renewable 100
CCA	Lancaster Choice Energy	LCE Smart Choice
CCA	Marin Clean Energy	MCE Deep Green
CCA	Marin Clean Energy	MCE Local Solar
CCA	Monterey Bay Community Power	MBprime
CCA	Peninsula Clean Energy	ECO100
CCA	Silicon Valley Clean Energy	Green Prime
CCA	Sonoma Clean Power	SCP Evergreen
Direct Access	3 Phases	3PR 100 Renewables Product
IOU	PG&E	100% Solar Choice
IOU	SCE	SCE Green Rate 100% Option
IOU	SDG&E	EcoChoice
Muni	Anaheim	Green Power Program
Muni	Healdsburg	Green Rate
Muni	LADWP	2018 Green Power
Muni	Palo Alto	Palo Alto Green
Muni	Pasadena	PWP Green
Muni	SMUD	Greenenergy Partner Plus
Muni	SMUD	Greenenergy Partner
Muni	SMUD	SolarShares
Muni?	Pacific Power	Blue Sky
Muni?	Rancho Mirage Energy Authority	REMA Renewable Choice
Muni?	Redwood Coast Energy Authority	REpower+
Muni?	San Jacinto Power	SJP Pure Green
Muni?	Solana Beach	SEA Green
Muni?	Valley Clean Energy	Ultra Green



Self-Owned, vPPAs and REIFs

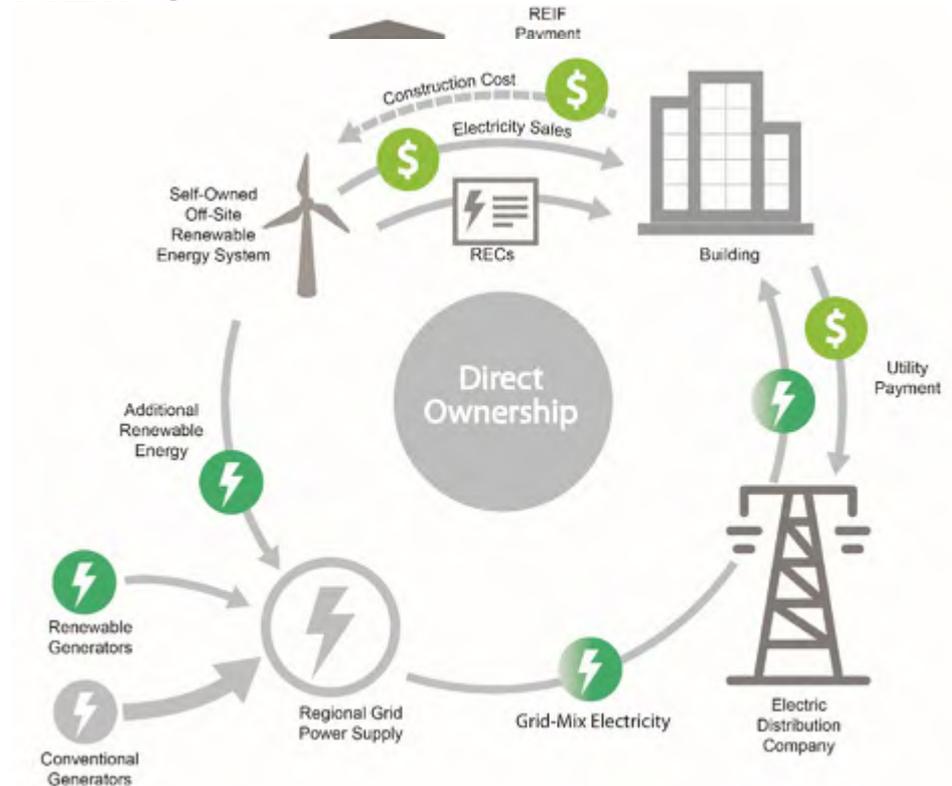
Procurement Method	Description
Self-Owned Off-site	A renewable energy system that is installed on separate property from the building but under the same ownership or control.
Virtual Power Purchase Agreement	This option is available to large, credit-worthy building owners. The buyer guarantees a minimum price to the renewable energy developer for the electricity sold by a new solar or wind farm so that the renewable energy developer can establish financial feasibility and secure funding.
Renewable Energy Investment Fund (REIF)	A program by local government or other entity to buy 100% renewable energy on behalf of a group of customers who pay into or subscribe to the program.



Self-Owned, vPPAs and REIFs

- Direct Ownership
- Virtual Power Purchase Agreements
- Investment Fund (REIF)

Purchase requirement (net electricity) determined through either energy simulations or prescriptive table



Prescriptive Renewable Energy Requirement (Table 6.4)



Climate Zone	Office	Retail	School	Restaurant	Hotel	Warehouse	Residential
1	38	35	39	186	31	26	29
2	41	37	36	177	29	20	30
3	38	33	33	177	26	19	27
4	40	35	34	175	27	18	29
5	39	32	33	179	26	18	27
6	39	33	31	174	25	14	28
7	38	32	30	168	24	13	27
8	40	35	32	174	26	14	28
9	41	37	33	171	27	15	29
10	42	38	34	175	28	15	30
11	44	42	39	183	32	22	33
12	42	39	38	175	30	21	31
13	44	41	39	182	32	20	32
14	45	42	39	184	32	21	32
15	46	44	38	192	32	14	34
16	46	45	45	187	36	31	35




(Building Area x 42) – On-site PV Production

Minimum Requirements for Off-Site Procurement

- Durability: 20 year contract or commitment
- RECs must come with the deal
- Renewable energy generators shall be:
 - photovoltaic systems,
 - solar thermal power plants,
 - geothermal power plants,
 - eligible hydro,
 - wind turbines or
 - other technologies recognized for credit by the California renewable portfolio standards
- Generators must be located in the region



Wrapup



Summary of Key Points

- Hourly source energy (HSE) is the metric for evaluating building energy efficiency and on-site renewable energy
- The latest (future) version of the California Building Energy Efficiency Standards is referenced
- On-site combustion is prohibited
- All buildings must have minimum on-site PV capacity
- Off-site procurement is not discounted
- An option is provided for local jurisdictions that want to require beyond-code energy efficiency



Goals are Compatible

**Eliminate on-site
combustion**

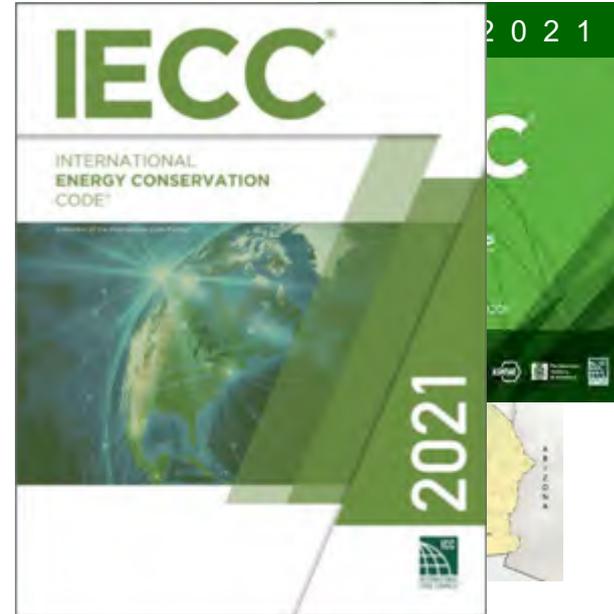


**Assure 100%
clean electricity**



ZERO Code Derivatives

- Special California Version
 - First version October 2018
 - 2022 Version Proposed for CalGreen
- Standard 189.1-2020
- IECC 2021 Renewable Energy Appendix

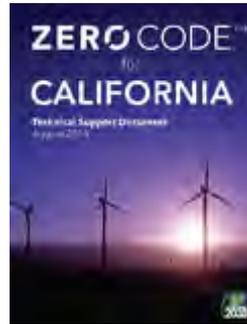


Documents (visit zero-code.org)

National



California



I-Codes

