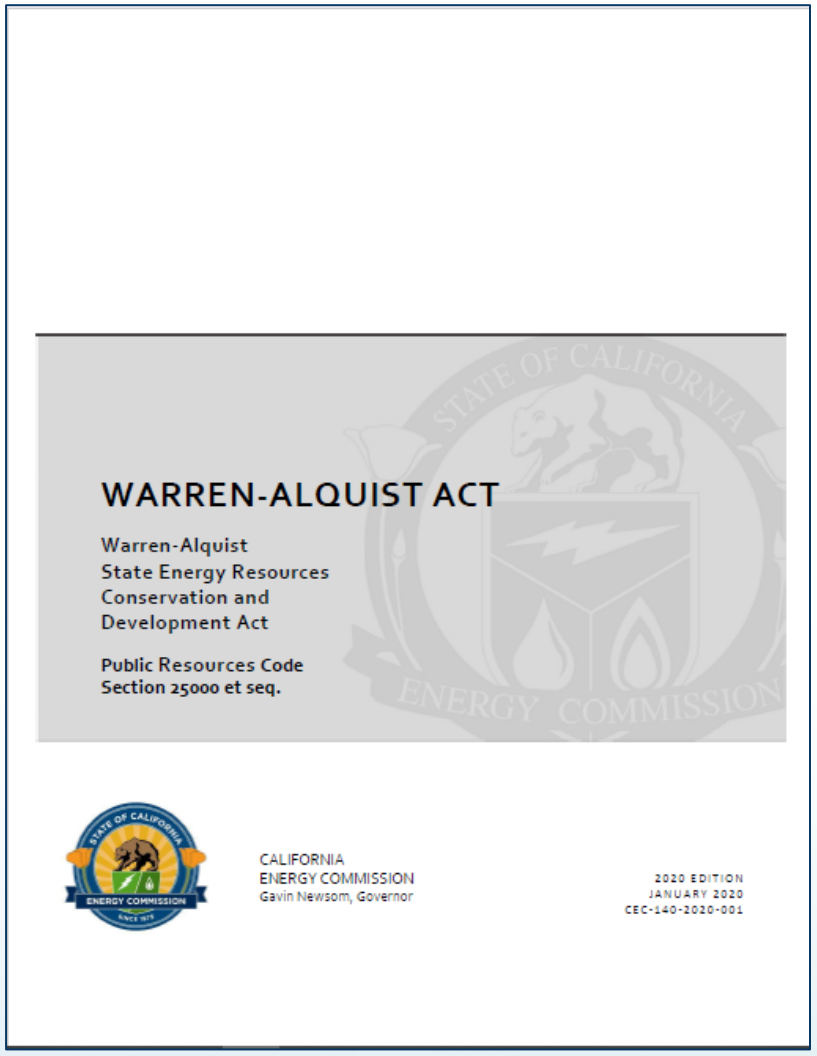
# 2022 Energy Code

## Solar PV, Solar Ready, Battery Storage Systems, Electric Ready – Multifamily

# Energy Code History

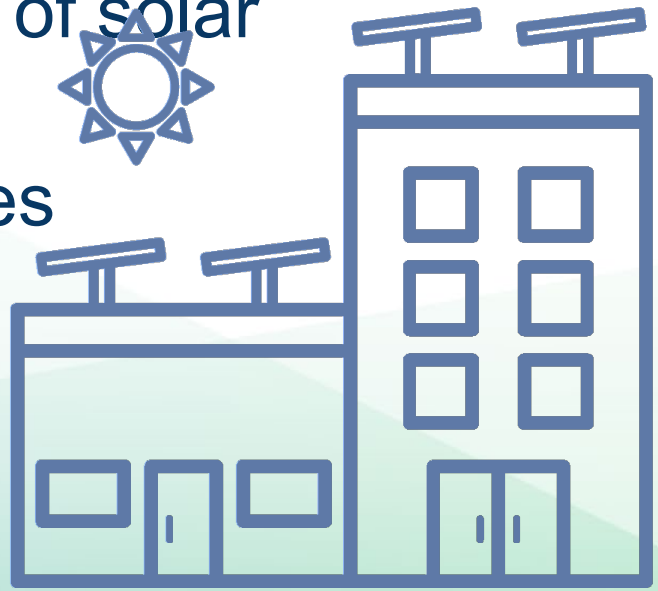



## The Warren-Alquist Act established the California Energy Commission in 1974

- Authority to develop and maintain Building Energy Efficiency Standards (Energy Code)
- Requires the CEC to update periodically, usually every three years
- Requires the Energy Code to be cost effective over the economic life of the building

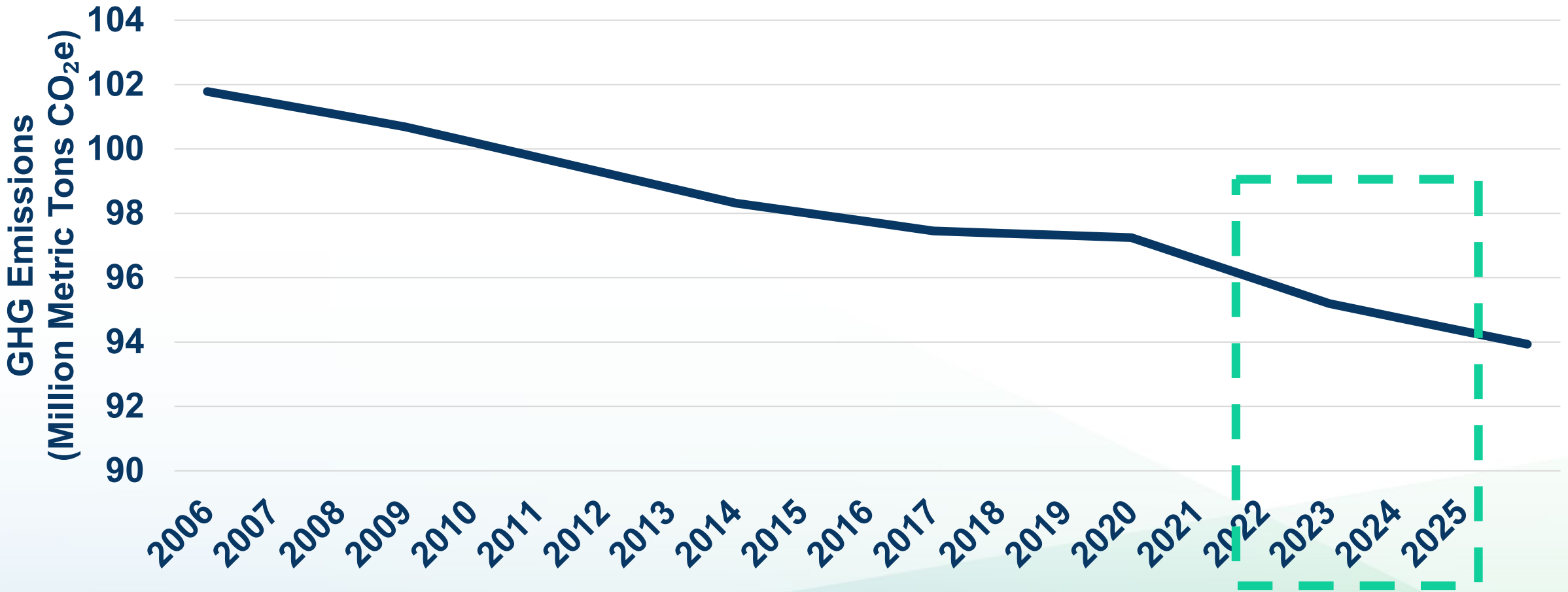
# 2022 Energy Code Goals

- Increase building energy efficiency cost-effectively
- Contribute to California's greenhouse gas (GHG) reduction goals
- Enable pathways for all-electric buildings
- Reduce residential building impacts on the electricity grid
- Promote demand flexibility and self-utilization of solar photovoltaic (solar PV)
- Provide tools for local government reach codes



# Energy Code Environmental Benefit

## Reduced Statewide Emissions

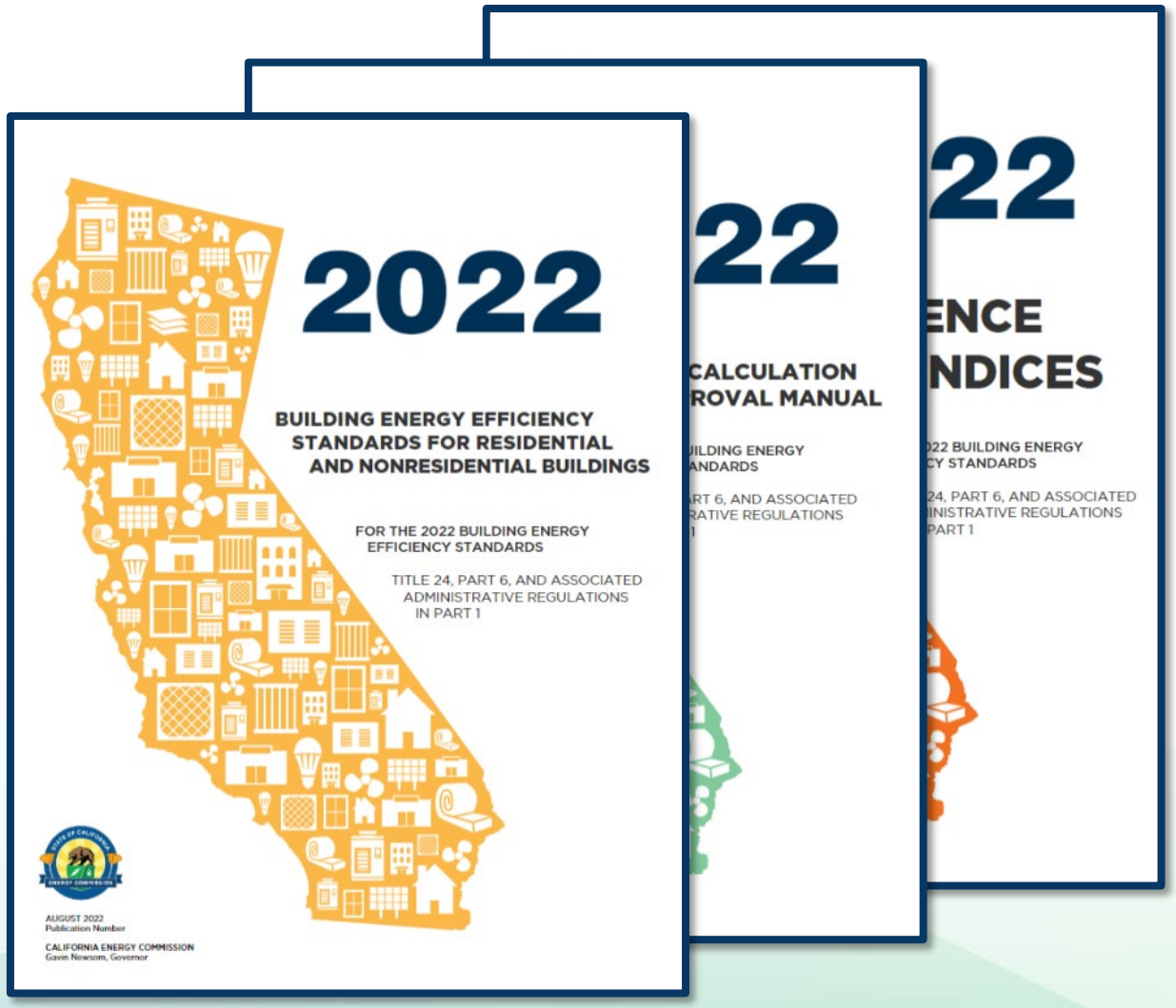



Source: CEC Impact Analysis 2005, 2008, 2013, 2016, 2019, 2022

# 2022 Energy Code

## Effective January 1, 2023

- Building permit applications submitted on or after Jan 1, 2023
- Must use 2022 tools
  - Software
  - Forms



# 2022 Documents Online

## 2022 Building Energy Efficiency Standards

The Building Energy Efficiency Standards (Energy Code) apply to newly constructed buildings, additions, and alterations. They are a vital pillar of California's climate action plan. The 2022 Energy Code will produce benefits to support the state's public health, climate, and clean energy goals.

The California Energy Commission (CEC) updates the Energy Code every three years. On August 11, 2021, the CEC adopted the 2022 Energy Code. In December, it was approved by the California Building Standards Commission for inclusion into the California Building Standards Code. The 2022 Energy Code encourages efficient electric heat pumps, establishes electric-ready requirements for new homes, expands solar photovoltaic and battery storage standards, strengthens ventilation standards, and more. Buildings whose permit applications are applied for on or after January 1, 2023, must comply with the 2022 Energy Code.

**2022 Energy Code for Residential and Nonresidential Buildings**

2022 ENERGY CODE

Expand All

Supporting Documents – Appendices, Compliance Manuals, and Forms

Software – Compliance Software, Manuals, and Tools

**BUILDING ENERGY EFFICIENCY STANDARDS - TITLE 24**

2025 Building Energy Efficiency Standards

**2022 Building Energy Efficiency Standards**

— Workshops, Notices, and Documents

2019 Building Energy Efficiency Standards

2016 Building Energy Efficiency Standards

Past Building Energy Efficiency Standards

Climate Zone tool, maps, and information supporting the California Energy Code

Online Resource Center

Solar Assessment Tools

**RELATED LINKS**

Workshops, Notices, and Documents

**CONTACT**

Building Energy Efficiency Standards - Title 24

Toll-free in California: 800-772-3300
Outside California: 916-654-5106

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Building Energy Efficiency Standards

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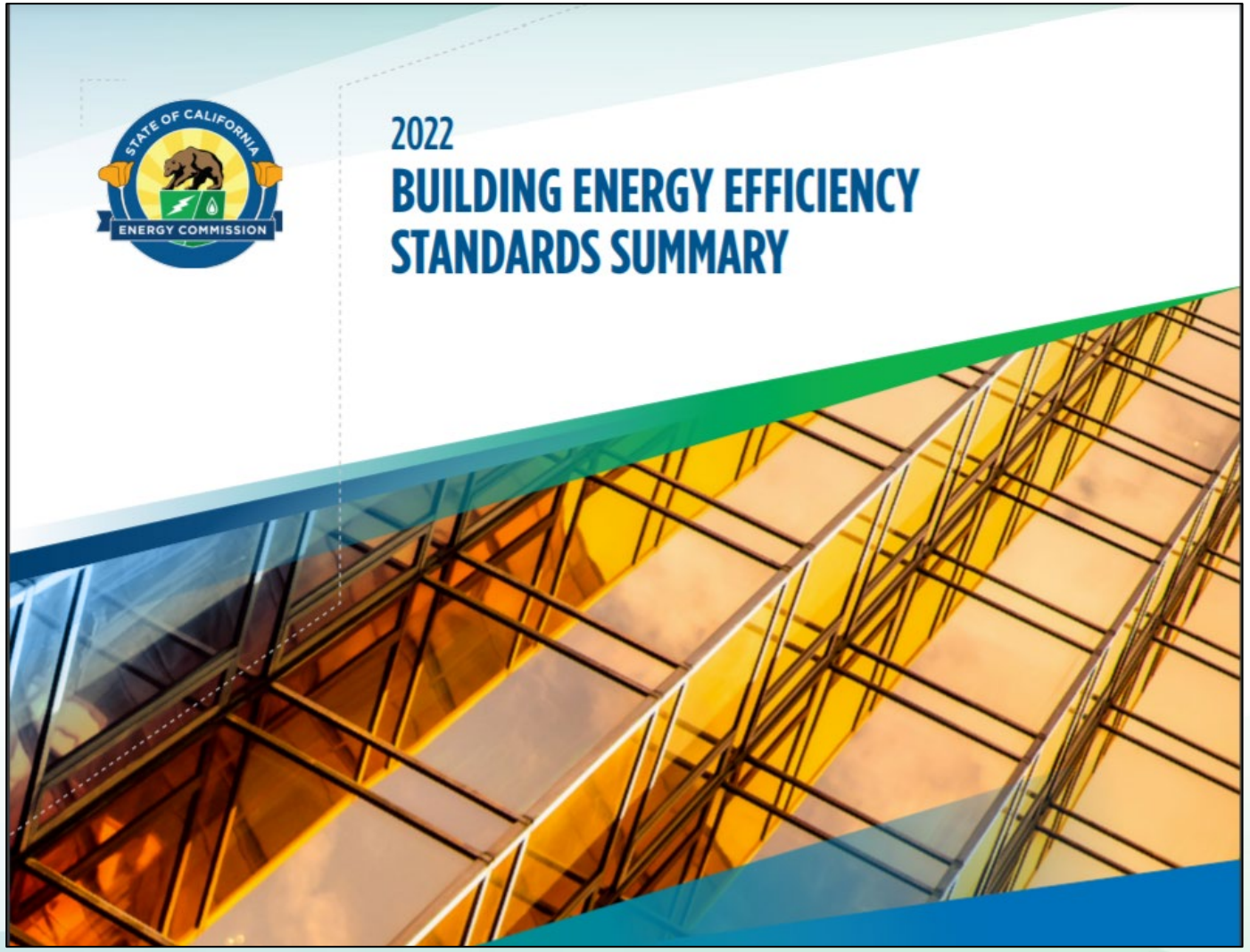
SUBSCRIBE

- Energy Code
- Reference Appendices
- Compliance Manuals
- Software
- Forms

# 2022 Energy Code Highlights

- Heat pump baselines
- Solar and battery storage
- Ventilation requirements
- Lighting
- Multifamily restructuring



# Energy Code Requirements

**Mandatory requirements**

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

**Prescriptive requirements**

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

# Compliance Approaches

**Prescriptive approach**

- Simple approach, no trade-offs
- Defines the standard building design
- 2022 heat pump baselines

**Performance approach**

- Most flexible approach, allows for trade-offs
- Must meet all mandatory requirements
- Requires the use of CEC-approved software
- Proposed building design meets or exceed standard building design

# 2022 Performance Metrics

New for 2022

## Energy performance calculations

- Nonresidential and multifamily
  - Hourly source energy
  - Time Dependent Valuation (TDV) Efficiency
  - TDV Total
    - Efficiency, solar PV + battery

## Heat pump baselines

- Requires heat pump for either space heating or water heating
  - Depends on climate zone and occupancy type
- Ability to go all-electric prescriptively
  - Must use heat pumps for both space heating and water heating

# Demonstrating Compliance

## Compliance forms confirm Energy Code is met

Updated for 2022

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

| Type of form | Single-family | Multifamily 3 or less habitable stories | Nonresidential Multifamily 4 or more habitable stories |
|---|---|---|---|
| **Certificate of compliance** | CF1R | LMCC | NRCC |
| **Certificate of installation** | CF2R | LMCI | NRCI |
| **Certificate of verification** | CF3R | LMCV | NRCV |
| **Certificate of acceptance** | - | - | NRCA |

# Forms Registration and Certification

## All Buildings § 10-103

Updated for 2022

**Multifamily buildings 3 or less habitable stories**

- When HERS verification is required all LMCC, LMCI, and LMCV forms must be registered with HERS provider data registry

**Multifamily buildings 4 or more habitable stories**

- NRCV must be registered with HERS provider when required

**All Multifamily buildings**

- When lighting or mechanical acceptance test is required all NRCC, NRCI, and NRCA forms must be recorded with ATTCP

# 2022 Compliance Software

**Performance approach must use approved compliance software versions**

- Single-family
  - CBECC-Res 2022.3.0
  - EnergyPro 9.2
  - Right-Energy 2022.2.0
- Nonresidential and multifamily
  - CBECC 2022.3.0
  - EnergyPro 9.2
  - IES 1.0

# Table 100.0-A, Multifamily

| | Mandatory | Prescriptive | Performance | Additions and Alterations |
|---|---|---|---|---|
| Solar PV | N/A | 170.2(f)&(g) | 170.1 | N/A |
| Battery | N/A | 170.2(h) | 170.1 | N/A |
| Solar Ready | 110.10<br>160.8* | N/A | N/A | 180.1(a) |
| Electric Ready | 160.9 | N/A | N/A | N/A |

- *§160.8 requires compliance with §110.10
- Battery requirements go together with PV requirements

# Solar Photovoltaic (Solar PV) Requirements

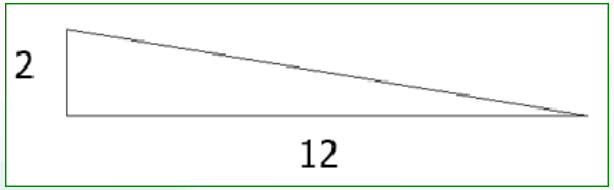
# SARA – §170.2(f)&(g)

- Solar Access Roof Area = all roof area capable of structurally supporting a solar PV system, including:
  - Covered parking areas, carports
  - Newly constructed structures on site compatible with supporting solar PV (Title 24, Part 2, §1511.9)

# SARA – Exclusions

- Any roof area with < 70% annual solar access
  - $Annual\ solar\ access = \frac{total\ annual\ insolation, minus\ shading}{total\ annual\ insolation, unshaded}$
  - Which shading is counted depends on habitable stories and roof slope (table below)
- Occupied roof areas (CBC § 503.1.4)
- Roof area unavailable due to other building code requirements

| Roof Angle | Low-Rise Multifamily (LRMF; up to 3 Habitable Stories) | High-Rise Multifamily (HRMF; 4 or more Habitable stories) |
|---|---|---|
| Steep | Only shading from existing permanent external obstructions | All obstructions |
| Low-sloped | All obstructions | All obstructions |



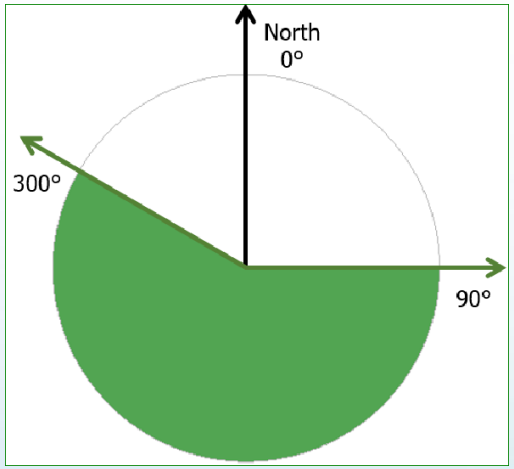
# Reference Joint Appendix JA11 – Solar Photovoltaic System Requirements

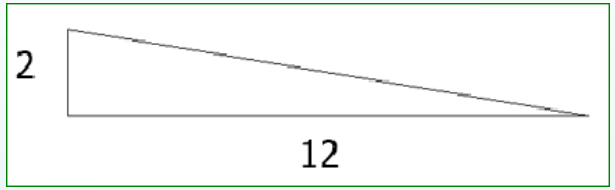
# JA11.2 – Orientation

Required azimuth (angle from true north, clockwise) depends on compliance approach and/or solar PV system tilt:

## Prescriptive Approach

- Determined by solar PV pitch:
  - > 2:12 (10°) – 90-300°, clockwise
  - < 2:12 – any azimuth range




## Performance Approach

- Determined by CA Flexible Installation (CFI) selection in software; solar PV at same tilt as roof, up to 7:12
  - CFI1 selected – 150-270°
  - CFI2 selected – 105-300°
  - If solar PV array meets neither, then input actual orientation

# JA11.3 – Shading

- Minimize shading from obstructions to meet prescriptive limit
  - Weighted average annual solar access by panel count ≥ 98%
- Obstructions north of array can be ignored
- Verify shading via certified solar access tool (JA11.4)

# JA11.4 – Solar Access Verification

- Use certified solar assessment tool to show that shading:
  - Meets prescriptive limit (JA11.3.1)
  - Matches LMCC or NRCC
  - Qualifies for exceptions in § 170.2(f)&(g)
- Tools must be certified to Executive Director to:
  - Calculate annual solar access %, inc. all known obstructions
  - Exclude horizon shading
  - Produce shade report (e.g. – address, panel count, orientation, annual solar access %)
  - Satellite/aerial image modeling must be comparable to onsite

# Solar Assessment Tools

The CEC has approved the use of the following solar assessment tools as specified in JA11.4:

- Aurora Solar Inc.
- Helioscope
- Scanifly
- IESVE
- Solar Pathfinder
- Solmetric Suneye
- Sunrun Lightmile

# JA11.5-11.6 – Monitoring and Interconnection

- Web-based portal and mobile device app that provides:
  - System kW rating
  - Number of modules with nominal W
  - kWh production, including running daily total, daily peak, and current system production
- Installed inverters tested per UL1741 and UL1741 Supplement A
  - System and components, including inverters, must meet Rule 21

# JA11.7-11.8 – Documentation

- Certificate of Installation certifies that JA11 met; must be available onsite
  - For low-rise multifamily, verified by AHJ and uploaded into CEC-approved registry
- Solar assessment report meeting one of the following:
  - Digital image must be created and dated after solar PV system installed
  - Include additional onsite pictures showing that install matches report

# §170.2(f) – Solar PV Size, Up to 3 Habitable Stories

- Newly constructed low-rise multifamily (LRMF) buildings must have ***new*** solar PV system/modules meeting JA11
- Minimum annual output = (whichever is smaller):
  - Calculated per Equation 170.2-C
  - Max. possible for building's SARA

# §170.2(f) – Solar PV Size, Up to 3 Habitable Stories (cont.)

Equation 170.2-C:

$$kW_{PV} = \left(\frac{CFA \times A}{1000}\right) + [N_{DU} \times B]$$

- $kW_{PV}$ = Solar PV size (kW)
- CFA = conditioned floor area ($ft^2$)
- $N_{DU}$ = number of dwelling units
- A = CFA adjustment from Table 170.2-T
- B = dwelling unit adjustment from Table 170.2-T

# Table 170.2-T

| 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 |

| Climate Zone | A – CFA | B – Dwelling Units |
|---|---|---|
| 9 | 0.613 | 1.36 |
| 10 | 0.627 | 1.41 |
| 11 | 0.836 | 1.44 |
| 12 | 0.613 | 1.40 |
| 13 | 0.894 | 1.51 |
| 14 | 0.741 | 1.26 |
| 15 | 1.56 | 1.47 |
| 16 | 0.59 | 1.22 |

- Sizes PV per:
  - Climate zone
  - Conditioned floor area
  - Number of dwelling units

# §170.2(f) Exceptions

1. Steep-sloped roofs – SARA excludes roof areas with azimuth 90-300°. No solar PV if SARA < 80 $ft^2$, contiguous
2. No solar PV if minimum < 1.8 $kW_{dc}$
3. No solar PV if AHJ determines solar PV system cannot meet ASCE Standard 7-16, Chapter 7, Snow Loads

# §170.2(f) Exceptions (cont.)

4. For buildings approved before January 1, 2020, with mandatory conditions for approval:
    a. Shading from roof designs and configurations for steep-sloped roofs, which are required by mandatory conditions for approval, must be considered for annual solar access calculation
    b. Roof areas not allowed by mandatory conditions for approval to have solar PV, must not be considered in determining SARA
5. Solar PV system sizes determined per Equation 170.2-C may be reduced by 25% if installed with battery ≥ 7.5 kWh, meeting JA12

# §170.2(g) – Solar PV Sizing, > 3 Habitable Stories

- Newly constructed high-rise multifamily (HRMF) buildings where ≥ 80% of total floor area made up of any combination of building types listed in Table 170.2-U
- Requires new solar PV meeting JA11
- Minimum output = (whichever is smaller):
  - Equation 170.2-D
    - For mixed use buildings that contain building types in Table 170.2-U, the total solar PV capacity = sum for each value per Equation 170.2-D, for each building type including its support areas
  - Solar Access Roof Area (SARA) x 14W/ft$^2$

# §170.2(g) – Solar PV Sizing, > 3 Habitable Stories (cont.)

Equation 170.2-D:

$$kW_{PV} = \frac{CFA \times A}{1000}$$

- $kW_{PV}$ = Solar PV size (kW)
- CFA = conditioned floor area ($ft^2$)
- A = Capacity factor adjustment from Table 170.2-U

# Table 170.2-U

| Building Type | Factor A – Minimum PV Capacity (W/ft² of conditioned floor area) Climate Zones 1, 3, 5, 16 | *Factor A – Minimum PV Capacity (W/ft² of conditioned floor area)* Climate Zones 2, 4, 6-14 | Factor A – Minimum PV Capacity (W/ft² of conditioned floor area) Climate Zone 15 |
|---|---|---|---|
| Grocery | 2.62 | 2.91 | 3.53 |
| High-Rise Multifamily | 1.82 | 2.21 | 2.77 |
| Office, Financial Institutions, Unleased Tenant Space | 2.59 | 3.13 | 3.80 |
| Retail | 2.62 | 2.91 | 3.53 |
| School | 1.27 | 1.63 | 2.46 |
| Warehouse | 0.39 | 0.44 | 0.58 |
| Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater | 0.39 | 0.44 | 0.58 |

- Building types are defined in §100.1
- Capacity factor (A) depends on building type and climate zone

# §170.2(g) Exceptions

No solar PV system required if/in:

1. SARA < 3% of CFA
2. Minimum solar PV < 4 $kW_{dc}$
3. SARA < 80 $ft^2$, contiguous
4. AHJ determines solar PV system cannot meet ASCE Std. 7-16, Ch. 7, Snow Loads
5. Multi-tenant buildings in areas where load serving entity provides neither Virtual Net Metering (VNEM) nor community solar program

# HRMF Solar PV Sizing Example

Example: 350k sq ft multitenant building in Climate Zone (CZ) 12; 276k sq ft high-rise multifamily (HRMF), 18.5k sq ft retail, 5.5k sq ft office space, 50k sq ft unconditioned storage; 24k sq ft of SARA

**SARA Method:**

Total available Solar Access Roof Areas (SARA) x 14 W/ft²

$$24{,}000\ sqft\ \times 14W = 336\ kW$$

# HRMF Solar PV Sizing Example (cont.)

**Equation Method:** $$kW_{PV} = \frac{CFA \times A}{1000}$$

- Retail: $\left(\frac{18{,}500}{1000}\right) x\ 2.91 = 53.84\ kW$
- Office: $\left(\frac{5{,}500}{1000}\right) x\ 3.13 = 17.22\ kW$
- HRMF: $\left(\frac{276{,}000}{1000}\right) x\ 2.21 = 609.96\ kW$
- Total = 681.02 kW

SARA Method = 336 kW,  Equation Method = 681.02 kW

**Required solar PV size is 336 kW** (use the lesser kW of the two methods)

# Solar Ready Requirements

# §110.10(a)2&3 – Scope

- Mandatory but only triggers if solar PV doesn't apply
- Must meet §110.10(b)-(d):
  - LRMFs
  - HRMFs, up to 10 habitable stories

# §110.10(b)1B – Min. Solar Zone Area

- Solar zone must meet access, pathway, smoke ventilation, and spacing requirements in Title 24, Part 9 or any local ordinance
- Solar zone area requirements:
  - No dimensions < 5 ft
  - ≥ 80 $ft^2$, if total roof area ≤ 10,000 $ft^2$
    ≥ 160 $ft^2$, if total roof area > 10,000 $ft^2$
- Total area ≥ 15% of total roof area, minus skylights. Applies to entire building, including mixed occupancy
  - Located on roof or overhang, another structure up to 250-ft. away from building, or covered parking installed with building project

# §110.10(b)1B Exceptions; Eliminate Solar Zone

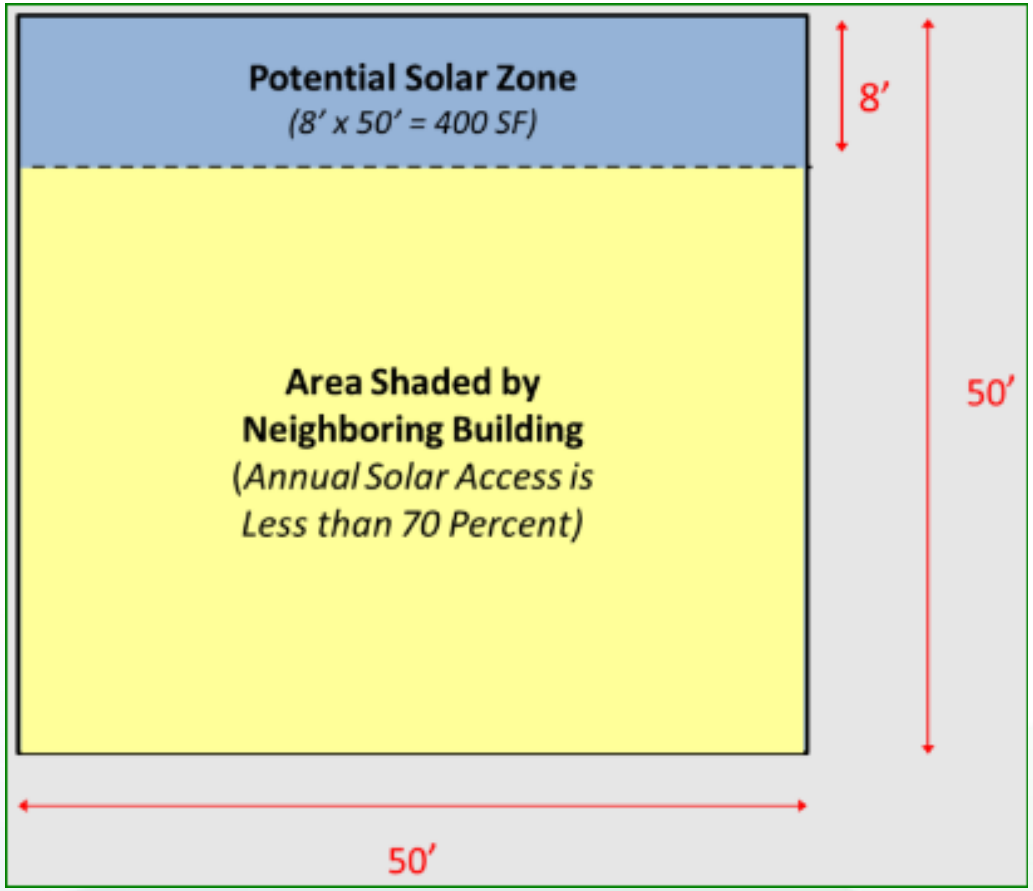
| Exception | Requirements |
|---|---|
| 1 | HRMF with solar PV system, nameplate DC power rating (Standard Test Conditions) of ≥ 1 W/ft$^2$ of roof area. |
| 2 | HRMF with solar water-heating meeting §150.1(c)8C |
| 4 | All dwelling unit thermostats are demand responsive (DR) controls meeting §110.12(a) before occupancy granted, and for each dwelling unit, one of the following:<br>○ ENERGY STAR dishwasher and either ENERGY STAR refrigerator or whole-house fan with electronic motor<br>○ DR home automation for appliances and lighting<br>○ Discharge from clothes washer and bathing fixtures irrigate landscape<br>○ Rainwater catchment uses rainwater flowing from ≥ 65% of the available roof area.<br>• Meet Title 24, Pt. 11, § A4.106.8.2 |
| 5 | Roof designed and approved for vehicular traffic, parking or heliport |

# §110.10(b)1B Exceptions; Reduce Solar Zone

| Exception | Requirements | Min. Solar Zone ($ft^2$) |
|---|---|---|
| 3 | 50% of potential solar zone (Designated solar zone) < 250 $ft^2$ | Designated solar zone (see example) |

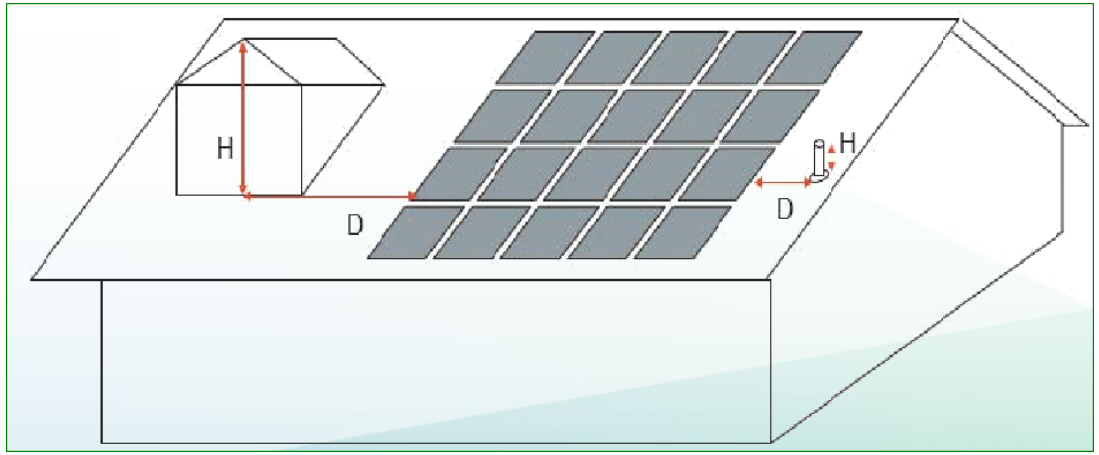
# §110.10(b)1B Exception 3, Example

- 2,500 $ft^2$ roof; if fully unshaded, min. solar zone = 250 $ft^2$
- 2,100 $ft^2$ shaded by neighboring building (annual solar access < 70%); potential solar zone = 400 $ft^2$
  - Per Exc. 3, designated solar zone = 400 $ft^2$ x 50% = 200 $ft^2$ < 250 $ft^2$
  - ***Thus, min. solar zone is 200 $ft^2$***



# §110.10(b)2-4

- All solar zones on steep-sloped roofs must have azimuth 90-300°
- Shading
  - No obstructions in solar zone
  - Roof-based obstructions & building portions over solar zone must be at least 2x height away from solar zone
  - EXCEPTION: Any obstructions or building parts north of solar zone
- Roof dead loads and live loads must be clearly marked on construction documents



# §110.10(c)-(d) – Documentation

- Construction documents must indicate:
  - Reserved location for inverters and metering equipment
  - Reserved pathway for conduit from solar zone to electrical service connection
  - If central water heating used – pathway for plumbing from solar zone to water-heating system
- Occupant gets construction documents or information from §110.10(b)-(c)

# §180.1(a) – Additions

- §180.1(a) – additions must meet §§ 110.0-110.12 […]
  - Exception to §180.1(a)1 – additions that increase roof area by 2,000 sq ft or less from §160.8 (§110.10)

# Battery Storage Systems Requirements

# §170.2(h) – Battery Requirements

- Newly constructed HRMFs requiring solar PV also require battery meeting JA12
- Minimum rated energy and power capacities calculated per Equations 170.2-E & -F
  - For mixed use buildings that contain building types in Table 170.2-V, the battery capacity = sum of each value per Equations 170.2-E & -F for each building type, including its support areas

# Equations 170.2-E & -F

## 170.2-E – Rated Energy Capacity

$$kWh_{batt} = \frac{kW_{PVdc}\ x\ B}{D^{0.5}}$$

- $kW_{PVdc}$ = Solar PV required per §170.2(g) ($kW_{dc}$)
- B = Battery energy capacity factor per Table 170.2-V
- D = Rated round-trip efficiency of battery

## 170.2-F– Rated Power Capacity

$$kW_{batt} = kWPVdc\ x\ C$$

- $kW_{PVdc}$ = Solar PV required per §170.2(g) ($kW_{dc}$)
- C = Battery power capacity factor per Table 170.2-V

# Table 170.2-V

TABLE *170.2-V – Battery Storage Capacity Factors*

| | **Factor B – Energy Capacity** | **Factor C – Power Capacity** |
|---|---|---|
| **Storage-to-PV Ratio** | **Wh/W** | **W/W** |
| Grocery | 1.03 | 0.26 |
| High-Rise Multifamily | 1.03 | 0.26 |
| Office, Financial Institutions, Unleased Tenant Space | 1.68 | 0.42 |
| Retail | 1.03 | 0.26 |
| School | 1.87 | 0.46 |
| Warehouse | 0.93 | 0.23 |
| Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater | 0.93 | 0.23 |

# §170.2(h) Exceptions

- No battery required if:
  - Installed solar PV size < 15% of size per Equation 170.2-D (see example)
  - Battery storage system requirement < 10 kWh rated capacity

# §170.2(h) Exception 1 Example

- HRMF in CZ-12; 20k ft$^2$ CFA; 620 ft$^2$ SARA. Is battery required?
  - Required minimum solar PV capacity = Equation 170.2-D or SARA, whichever is smaller:
    - Eqn. 170.2-D: $\frac{CFA\ x\ A}{1000} = \frac{20{,}000\ x\ 2.91}{1000} = 58.2\ kWdc$
    - SARA: $SARA\ x \frac{14W}{ft^2} = 620\ x\ 14 = 8.68\ kWdc$
  - $58.2\ kWdc\ x\ 15\% = 8.73\ kWdc$; if 8.73 kWdc or less is installed, ***battery storage is not required***

# §170.1(b) – Performance Standards

- Proposed Design Efficiency and Total TDVs and source energy ≤ Standard Design energy budget
  - Baseline based on prescriptive requirements
- Budgets in TDV
  - CEC-approved community-shared solar and/or battery system providing dedicated benefits to permitted building may offset required solar/battery TDV
- Field verification required when performance above prescriptive requirements needed for individual dwelling unit compliance

# JA12.2 – Battery Safety and System Performance Requirements

- Battery storage systems must be certified to CEC as meeting:
  - ***Safety*** – tested per UL1973 and UL9540. Inverters tested per UL1741 and UL1741 Supplement A.
  - ***Minimum System Performance*** (see table below)

| | Prescriptive | Performance |
|---|---|---|
| Usable capacity ≥ 5 kWh | X | X |
| Single charge-discharge cycle AC to AC (round-trip) efficiency ≥ 80% | X | |
| • Energy capacity retention of 70% of nameplate capacity after 4,000 cycles covered by warranty; or<br>• 70% of nameplate capacity under 10-year warranty | X | X |

# JA12.2 – Control Requirements

- Battery must:
  - At inspection, be installed for approved control strategy
  - Be able to remotely switch control strategies
  - Be able to remotely change charge and discharge periods
  - Prioritize electrical load of dwelling unit(s)
  - Use approved control strategy; backup mode if power interrupted
  - Do system check within 10 calendar days before summer and winter TOU schedules

# JA12.2 – Control Strategies

| Strategy | Charge | Discharge | Notes |
|---|---|---|---|
| Basic (JA12.2.3.1) | Solar PV production > onsite load | Solar PV production < onsite load | |
| Time-of-Use (TOU) (JA12.2.3.2) | Solar PV only | Highest-priced TOU hours | • Schedule factory preprogrammed, updated remotely, or programmed at install<br>• At minimum, able to program 3 separate seasonal TOU schedules |
| Advanced Demand Flex. (JA12.2.3.3) | [Basic or TOU control] | [Basic or TOU control] | • Control meets §110.12(a)<br>• Can change charging/discharging periods per local utility signal |

# JA12.2 – Control Strategies (cont.)

| Strategy | Charge | Discharge | Notes |
|---|---|---|---|
| Separate Battery Storage Systems (JA12.2.3.4) | Lowest-priced TOU hours | Highest-priced TOU hours | • Battery separate from onsite solar PV (e.g., using community solar PV)<br>• Battery meets §110.12(a), and able to change charging/discharging periods per local utility signal |
| Alternative Control Approved by the Executive Director (JA12.2.3.5) | N/A | N/A | • Executive Director approved<br>• Must have equal or greater benefits to approved strategies<br>• Clear and easily-implemented algorithms for incorporation into compliance software |

# JA12.3 & 12.4 – Interconnection & Enforcement

- Battery and associated components, including inverters, must meet Rule 21 and Net Energy Metering (NEM) rules adopted by CPUC
- AHJ must verify all LMCIs and NRCIs
  - Battery model must be certified to CEC as qualified for credit
  - Battery using approved control strategy; programmed control strategy at final inspection and commissioning must match LMCC or NRCC

# Electric Ready Requirements

# §160.9(a)-(c)1 – Electric Ready, Individual Dwelling Units

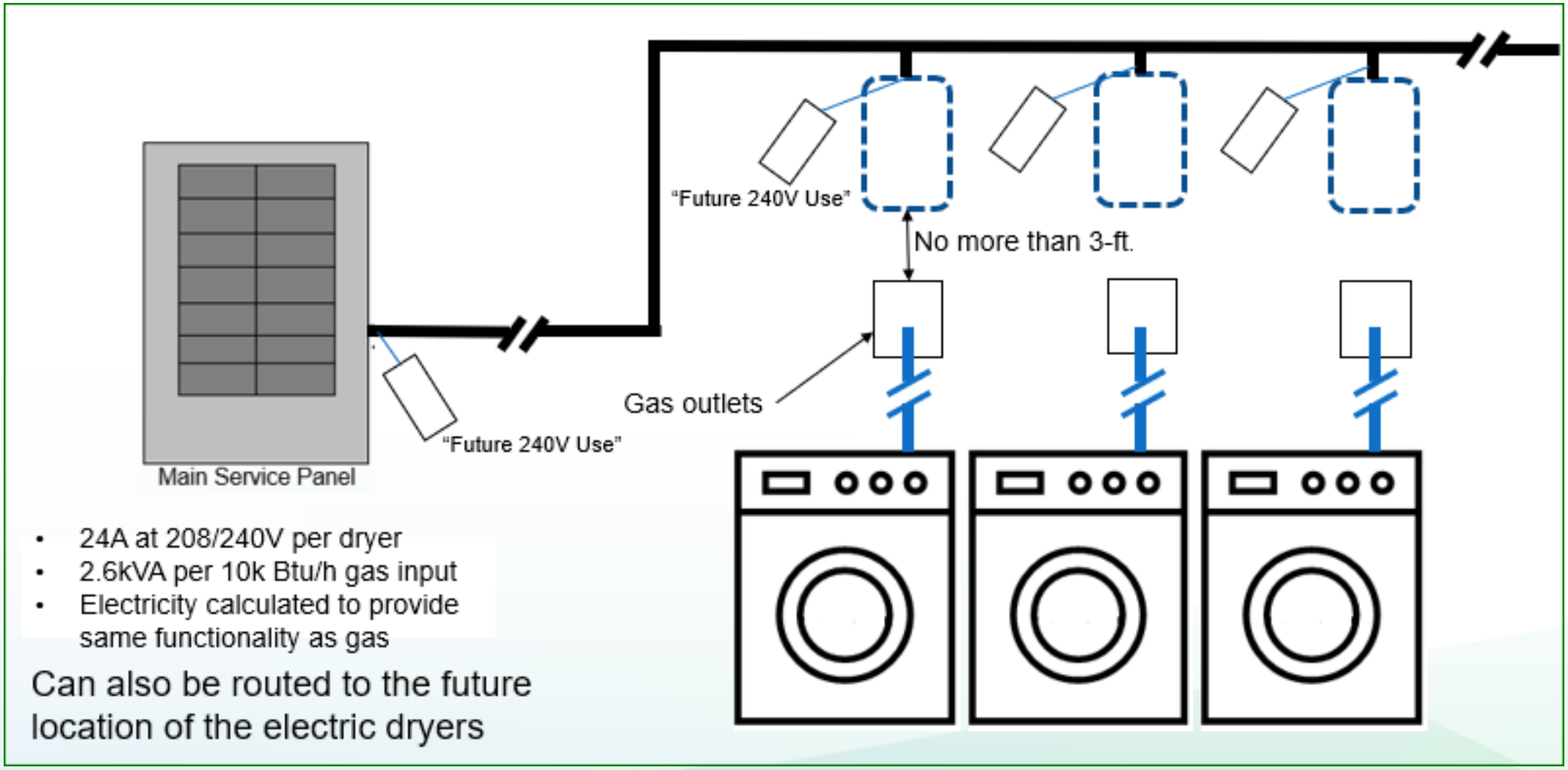
- If gas/propane furnace, cooktop, or clothes dryer connections used:
  - Dedicated unobstructed 240V branch circuit wiring installed within 3 ft. of appliance
    - Conductors:
      - Furnaces, dryers: 30A
      - Cooktops: 50A
    - Blank cover marked “240V ready”
  - Main panel space reserved for double pole circuit breaker, permanently marked “For Future 240V use”

# §160.9(c)2 – Electric Dryer Ready, Common Areas

Dryer locations with gas/propane plumbing in common areas:

- Conductors/raceway between main panel and location up to 3 ft. from each gas outlet, or location designated for future electric dryers
  - Both ends labelled “Future 240V Use”
  - Equipment sized for future electricity requirements, at service voltage, where building conductors connect to utility distribution
  - Capacity must be one of:
    - 24A at 208/240V per dryer
    - 2.6 kVA per 10k Btu/h of rated gas input/pipe capacity
    - Electricity to provide same functionality as gas equipment, calculated and documented by responsible person

# §160.9(c)2 Example



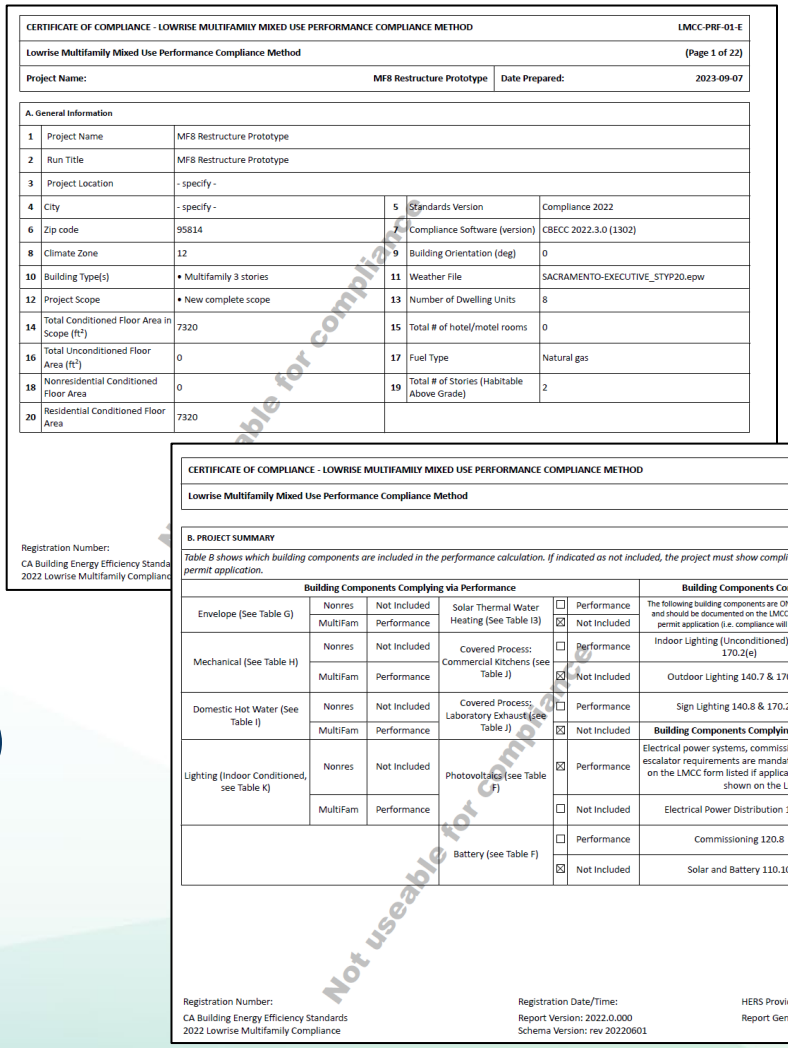

- 24A at 208/240V per dryer
- 2.6kVA per 10k Btu/h gas input
- Electricity calculated to provide same functionality as gas

Can also be routed to the future location of the electric dryers

# Plan Review & Field Inspection

# Plan Review

- Verify the following match plan and meet JA11:
  - Solar PV system size ($kW_{dc}$)
  - Modules and array type
  - Azimuth and array angle
  - Tilt
  - Inverter efficiency
  - Annual solar access
- LMCC-SAB-E and NRCC-SRA-E (Solar Ready) triggered if solar PV system is not required
- Newly constructed buildings are electric ready if certain gas appliances are installed



**CERTIFICATE OF COMPLIANCE - LOWRISE MULTIFAMILY MIXED USE PERFORMANCE COMPLIANCE METHOD** — LMCC-PRF-01-E

**Lowrise Multifamily Mixed Use Performance Compliance Method** — (Page 1 of 22)

| Project Name: | MF8 Restructure Prototype | Date Prepared: | 2023-09-07 |
|---|---|---|---|

**A. General Information**

| | | | | | |
|---|---|---|---|---|---|
| 1 | Project Name | MF8 Restructure Prototype | | | |
| 2 | Run Title | MF8 Restructure Prototype | | | |
| 3 | Project Location | - specify - | | | |
| 4 | City | - specify - | 5 | Standards Version | Compliance 2022 |
| 6 | Zip code | 95814 | 7 | Compliance Software (version) | CBECC 2022.3.0 (1302) |
| 8 | Climate Zone | 12 | 9 | Building Orientation (deg) | 0 |
| 10 | Building Type(s) | • Multifamily 3 stories | 11 | Weather File | SACRAMENTO-EXECUTIVE_STYP20.epw |
| 12 | Project Scope | • New complete scope | 13 | Number of Dwelling Units | 8 |
| 14 | Total Conditioned Floor Area in Scope ($ft^2$) | 7320 | 15 | Total # of hotel/motel rooms | 0 |
| 16 | Total Unconditioned Floor Area ($ft^2$) | 0 | 17 | Fuel Type | Natural gas |
| 18 | Nonresidential Conditioned Floor Area | 0 | 19 | Total # of Stories (Habitable Above Grade) | 2 |
| 20 | Residential Conditioned Floor Area | 7320 | | | |

Registration Number:
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2022 Lowrise Multifamily Compliand

**CERTIFICATE OF COMPLIANCE - LOWRISE MULTIFAMILY MIXED USE PERFORMANCE COMPLIANCE METHOD** — LMCC-PRF-01-E

**Lowrise Multifamily Mixed Use Performance Compliance Method** — (Page 2 of 22)

**B. PROJECT SUMMARY**

*Table B shows which building components are included in the performance calculation. If indicated as not included, the project must show compliance prescriptively if within the permit application.*

| Building Components Complying via Performance | | | | | | Building Components Complying Prescriptively | |
|---|---|---|---|---|---|---|---|
| Envelope (See Table G) | Nonres | Not Included | Solar Thermal Water Heating (See Table I3) | ☐ | Performance | The following building components are ONLY eligible for prescriptive compliance and should be documented on the LMCC form listed if within the scope of the permit application (i.e. compliance will not be shown on the LMCC-PRF-E). | |
| | MultiFam | Performance | | ☒ | Not Included | | |
| Mechanical (See Table H) | Nonres | Not Included | Covered Process: Commercial Kitchens (see Table J) | ☐ | Performance | Indoor Lighting (Unconditioned) 140.6 & 170.2(e) | LMCC-LTI-01E is required |
| | MultiFam | Performance | | ☒ | Not Included | Outdoor Lighting 140.7 & 170.2(e) | LMCC-LTO-01E is required |
| Domestic Hot Water (See Table I) | Nonres | Not Included | Covered Process: Laboratory Exhaust (see Table J) | ☐ | Performance | Sign Lighting 140.8 & 170.2(e) | LMCC-LTS-01E is required |
| | MultiFam | Performance | | ☒ | Not Included | **Building Components Complying with Mandatory Measures** | |
| Lighting (Indoor Conditioned, see Table K) | Nonres | Not Included | Photovoltaics (see Table F) | ☒ | Performance | Electrical power systems, commissioning, solar ready, elevator and escalator requirements are mandatory and should be documented on the LMCC form listed if applicable (i.e. compliance will not be shown on the LMCC-PRF-E.) | |
| | MultiFam | Performance | | ☐ | Not Included | Electrical Power Distribution 110.11 | LMCC-ELC-01E is required |
| | | | Battery (see Table F) | ☐ | Performance | Commissioning 120.8 | LMCC-CXR-01E is required |
| | | | | ☒ | Not Included | Solar and Battery 110.10 | LMCC-SAB-01E is required |

Registration Number:
CA Building Energy Efficiency Standards
2022 Lowrise Multifamily Compliance

Registration Date/Time:
Report Version: 2022.0.000
Schema Version: rev 20220601

HERS Provider:
Report Generated: 2023-09-07 15:16:20

# LMCC-PRF-01-E Sample Form

| CERTIFICATE OF COMPLIANCE - LOWRISE MULTIFAMILY MIXED USE PERFORMANCE COMPLIANCE METHOD | LMCC-PRF-01-E |
|---|---|
| **Lowrise Multifamily Mixed Use Performance Compliance Method** | **(Page 10 of 22)** |

**E1. HERS VERIFICATION SUMMARY**

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry.

Building-level Verifications:
- Quality insulation installation (QII)
- Indoor air quality ventilation
- Kitchen range hood

Cooling System Verifications:
- Minimum Airflow
- Verified Refrigerant Charge
- Fan Efficacy Watts/CFM

Heating System Verifications:
- -- None --

HVAC Distribution System Verifications:
- Duct leakage testing
- Ducts located entirely in conditioned space confirmed by duct leakage testing

Domestic Hot Water System Verifications:
- -- None --

**F1. REQUIRED PV SYSTEMS**

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DC System Size (kWdc) | Exception[1] | Module Type | Array Type | Power Electronics | CFI | Azimuth (deg) | Tilt Input | Array Angle (deg) | Tilt: (x in 12) | Inverter Eff. (%) | Annual Solar Access (%) |
| 15.7 | n/a | Standard (14-17%) | Fixed | none | true | 150-270 | N/A | N/A | <=7:12 | 96 | 98 |

[1]*See Table D1 for any PV exceptions used.*

# Field Inspection

Field inspector verifies:

- Building and product information are in accordance with the approved plans, specifications, and energy compliance documentation
- No shading from permanent natural and man-made obstructions
- No shading from roof penetrations
- Rooftop solar PV system meets the Fire Code requirements

2022 Energy Code forms

- **Low-rise multifamily (≤ 3 habitable stories)**
  - Certificate of Compliance
    - LMCC-PRF-01-E Performance Approach
    - LMCC-SAB-E Solar and Battery
    - LMCC-ELC-01-E Electric Ready
  - Certificate of Installation
    - LMCI-SAB-E Solar and Battery
    - LMCI-ELC-01-E Electric Ready
- **High-rise multifamily (> 3 habitable stories)**
  - High-rise Multifamily Certificate of Compliance
    - NRCC-PRF-01-E Performance Approach
    - NRCC-SAB-E Solar and Battery
    - NRCC-ELC-E Electric Ready
  - High-rise Multifamily Certificate of Installation
    - NRCI-SAB-E Solar and Battery
    - NRCI-ELC-E Electric Ready

# Resources

# Online Resource Center

www.energy.ca.gov/orc

- **Handouts**
- Fact sheets
- Guides
- **Tools**
- Checklists
- Blueprint newsletter
- **Training**
- Presentations
- Videos
- **Links**
- Internal resources
- External resources

# Blueprint Newsletter

- Energy Code quarterly newsletter
- Updates
- Clarifications
- Frequently asked questions

Issue 138 | April - June 2022

BLUEPRINT

CALIFORNIA ENERGY COMMISSION

*EFFICIENCY DIVISION*

## IN THIS ISSUE

- 2022 Energy Code: Multifamily Summary
- 2022 Energy Code: Compliance Software
- 2019 Energy Code: HERS Verifications
- Q&A
  - Solar PV for Multifamily Buildings
  - Multifamily Water Heating
  - Multifamily Common Use Areas

For additional help with the Energy Code see Energy Code Ace's **online offerings** of trainings, tools, and resources.

## 2022 Energy Code: Multifamily Summary

The 2022 Building Energy Efficiency Standards (Energy Code) reorganizes low-rise (three or fewer habitable stories) and high-rise (four or more habitable stories) multifamily buildings into one building type, updates the multifamily buildings definition in § 100.1, and moves all requirements for multifamily buildings to §§ 160.0-180.4. This and other significant changes include:

*Mandatory Requirements*

- Updates minimum efficiencies for HVAC equipment; adds minimum efficiency requirements for dedicated outdoor air systems (DOAS), heat pump, and heat recovery chiller packages. § 110.2
- Changes demand responsive lighting controls trigger to 4,000 watts or more; adds requirements for controlled receptacles. §§ 110.12, 160.5(b)4E
- Unifies envelope insulation, vapor retarder, and fenestration requirements. § 160.1
- For dwelling units
  - Adds requirements for central fan integrated ventilation systems requiring a motorized controlled damper, damper controls, and variable ventilation. § 160.2(b)2Aii
  - Requires vented kitchen range hoods ventilation rates or capture efficiencies based on conditioned floor area and fuel type per Tables 160.2-E, F, G. § 160.2(b)2Avic2
  - Requires a HERS-verified maximum fan efficacy of 1.0 Watts per cfm for heat recovery ventilation (HRV) and energy recovery ventilation (ERV) systems. § 160.2(b)2Biii
  - Adds mechanical acceptance testing requirements. § 160.3(d)2
  - Adds electric-ready requirements when gas equipment is installed for space heating, cooking, and clothes dryers. § 160.9(a-c)

1

# Stay Connected

## Receive Energy Code updates

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

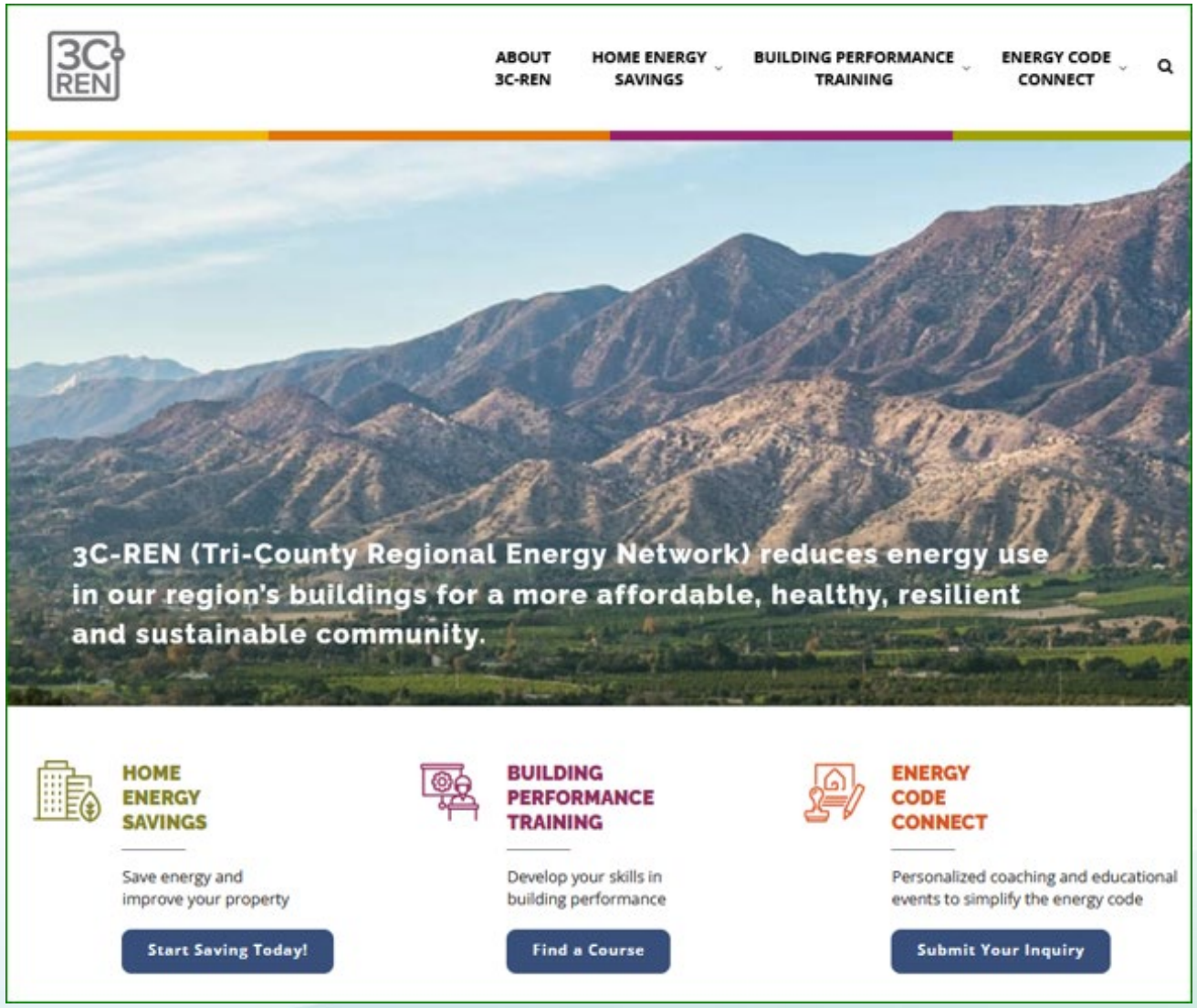
## Follow the California Energy Commission

# 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

# 3C-REN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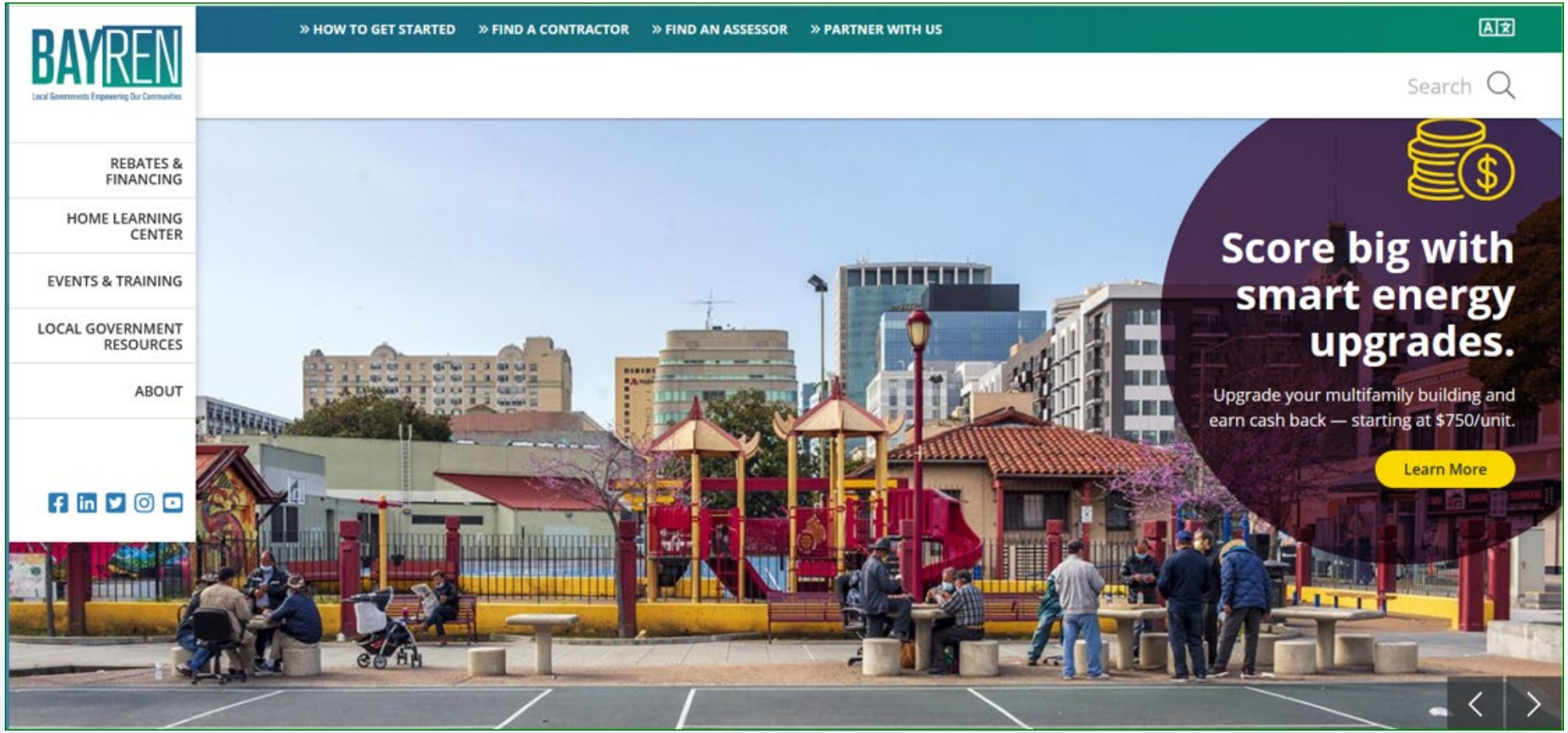
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# Other Available Resources –
## Inland Regional Energy Network (I-REN)

iren.gov
info@iren.gov

## Codes and Standards

### Training and Education Program

- Free ICC-approved training sessions for 2022 Energy Code (Title 24, Part 6) requirements → www.iren.gov/161/CS-Trainings
- Requested training courses can also be scheduled

### C&S Technical Support Program

Request Free Technical Assistance from Local Code Experts—Reach Code Development, Permit Guides, Etc. → www.iren.gov/162/CS-Technical-Support

### Ask a Code Mentor an Energy Code Question

Submit queries online and receive a personalized response addressed by energy code experts within two business days! → www.iren.gov/162/CS-Technical-Support

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# Thank you