



Title 24, Parts 6 and 11
Local Energy Efficiency Ordinances

2019 Reach Codes: Options and Opportunities

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Codes and Standards Program

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2019 Reach Codes: A Selection of Potential Options and Opportunities

The California Codes and Standards program is working in partnership with the California Energy Commission (CEC), local governments, and many others toward achieving the state's Zero Net Energy (ZNE) and greenhouse gas reductions policy goals. As the state prepares to implement the 2019 Building Energy Efficiency (Title 24, Part 6) and CALGreen (Title 24, Part 11) Standards, the program team has identified many opportunities for jurisdictions to adopt local ordinances (reach codes) that exceed minimum state requirements. Any jurisdiction that chooses to implement more stringent standards now will reap the benefits of these policies early and gain valuable experience in advance of future changes.

The summary below provides high-level descriptions of several potential local ordinance options for both residential and nonresidential occupancies. All ordinances that require CEC approval must complete a detailed analysis documenting the cost-effectiveness of the requirements. Draft analysis has begun for a subset of the options, but others will require additional analysis to determine the applicable scope and requirements. The list below is not a comprehensive list; the intent is to provide a range of options for discussion with local stakeholders. Reach codes opportunities are sorted into the following categories:

- [Efficiency and/or Renewables](#),
- [Energy plus Water](#),
- [Process Loads](#),
- [Electric-Ready](#), and
- [Information Disclosure](#).

Efficiency and/or Renewables

Whole Building (mixed-fuel and all-electric)

Whole Building or Performance-based reach codes specify the minimum performance requirements for new construction projects but leave the individual measure and feature selection to the designer/builder. This method requires simulating the building performance using CEC-approved software and allows applicants the greatest flexibility to accommodate a wide variety of building designs. Specific performance and measure requirements are based on project scope, building type and type of energy systems in the design. A reach code may refer directly to the CALGreen voluntary tiers or may require higher or lower performance levels and different prerequisite measures.

Residential Whole Building: Performance Method

In 2019, there are three major changes to residential Title 24 requirements. All new single family and low-rise multifamily projects must:

- Install a PV system to offset the electricity use in the home;
- Meet two separate performance requirements. Show compliance with efficiency requirements first, then add renewables for overall compliance, and
- Document performance using the new Energy Design Rating (EDR) metric.



The EDR uses a 0-100 scale. The lower the EDR, the better the building performs, with zero representing a building that has zero net energy annual consumption. Projects must meet a minimum efficiency threshold prior to the addition of renewables. A project can exceed the minimum efficiency requirements to reduce the required PV system capacity, but may not do the opposite, which would compromise efficiency. This allows the proposed building to utilize more efficiency measures and less PV and still comply. Minimum code compliance scores typically range between 25-45 depending on the design and climate zone.

2019 CALGreen Tier 1 requires reducing the EDR score by approximately one half, with Tier 2 requiring an EDR equal to zero (or very close). Projects can reduce EDR scores using a combination of improved envelope, space and water heating efficiencies, battery storage and advanced battery controls. If a battery is present, mixed-fuel designs may slightly oversize the PV system above the estimated electrical load to optimize the system. All-electric designs may also increase the minimum PV system size required to meet the additional electricity load from electric appliances. The voluntary CALGreen Tiers also include recommendations for prerequisite measures:

- Roof Deck insulation, or ducts in conditioned space
- High Performance Walls
- Compact Hot Water Distribution with Drain Water Heat Recovery

Nonresidential and High-Rise Residential: Performance Method

2019 nonresidential compliance methodology retains the existing time dependent valuation (TDV) compliance metric. The baseline is expressed as a TDV-energy “budget” (maximum use) for each building, and the proposed building must use less than the budget to comply. Nonresidential CALGreen voluntary tiers are based on a percentage reduction in the modelled performance budget.

Nonresidential CALGreen Tier requirements are as follows:

Tier 1/Tier 2:

- 1)-Buildings that include indoor lighting **or** mechanical systems, but **not both** must achieve a 5/10 percent reduction to the energy budget baseline
- 2)-Buildings that **include both** indoor lighting and mechanical systems, must achieve a 10/15 percent reduction, and
- 3)-High Rise Residential and Hotel/Motel buildings must achieve a 5/10 percent reduction.

In addition: One/Two of the following measures is/are required:

- 1) Reduce outdoor lighting by 10%, with color rendition requirements
- 2) Install Solar Water Heating saving at least 15% in restaurants \geq 8,000 sq. ft: (exceptions apply for high efficiency gas over 95% or solar access limitations)
- 3) Warehouse Dock Seals or Dock Shelters adjacent to conditioned spaces
- 4) Daylighting controls
- 5) Exhaust Heat Recovery



Solar PV

Nonresidential PV Systems

The Building Energy Standards do not require or provide a compliance credit for installation of photovoltaic systems on nonresidential occupancies. To maximize savings and performance, packages that include both efficiency measures (such as those described above) and a PV system may result in cost-effective reach code options for various building types. In addition, installing a PV system on a minimally-compliant building appears to be cost-effective across most nonresidential occupancies.

- The initial analysis underway is examining a range of PV system sizes, alone and in combination with efficiency measures, for calculating the minimum PV system size required. The analysis includes a broad range of system sizes, from: 15 DC Watts per square foot of solar zone (no less than 15% of roof), scaled up to a system that occupies approximately 50% of the roof area.

Depending on the specific site characteristics, in many cases, a system sized somewhere in between the two range limits will prove the most cost-effective design solution.

Single Measures

In addition to the whole building or performance path, reach codes may be structured to focus on a single measure, such as cool roofs or outdoor lighting. Single measure reach codes typically require projects to document Building Energy Standards compliance without including the measure. This structure ensures the measure is not used to meet minimum compliance, and that the reach code results in the intended energy savings.

Residential Retrofits

One of the greatest challenges to improving the efficiency of buildings in California is addressing those that are already built. The Codes and Standards Statewide Program completed an “Existing Building Efficiency Upgrade Cost-Effectiveness Study” for the 2016 Standards, and plans to update it for 2019.

The analysis documents the feasibility and cost effectiveness of several measures for single family and low-rise multifamily residential occupancies by climate zone and vintage. The analysis results show significant opportunities to consider cost effective measures when undergoing a significant retrofit, or at other trigger events. Inland cooling climates and very cold climates (CZ 10-16 for single-family and CZ 9-16 for multi-family) show consistent cost effectiveness for all vintages. In coastal or transitional (moderate) climates, cost effective applications exist for older vintages but are not universal for all cases.

A cost effectiveness study is required, and is planned for 2019.

Cool Roofs

Cool roofs can bring many benefits, including reduced energy use, air pollution, and greenhouse gas emissions, as well as improved human health and comfort. In addition, there are typically no additional installation costs for cool roof products. In order to ensure projects exceed the code requirements with the cool roof, an ordinance would need to prohibit applicants from using the cool roofs credit to meet the energy code. Benefits of exceeding minimum requirements are substantial in cooling-dominated climate zones (6-16) and can be cost effective in moderate climate zones (2-5) as well.



Previous analysis found cost-effective levels for the Solar Reflectance (SR) and Thermal Emittance (TE) requirements similar to those in CALGreen, displayed in the table below.

All Building Types, All Climate Zones	≤ 2:12 (low-slope)		> 2:12 (steep-slope)	
	Solar Reflectance	Thermal Emittance	Solar Reflectance	Thermal Emittance
Minimum	≥ 0.63	≥ 0.75	≥ 0.20	≥ 0.75
TIER 1	≥ 0.68	≥ 0.85	≥ 0.28	≥ 0.85
TIER 2	≥ 0.70	≥ 0.85	≥ 0.34	≥ 0.85

Rental Property

Existing Rental Property (Date-Certain Upgrades)

Reach codes have been implemented in jurisdictions, such as Boulder, CO, to require existing rental housing to be upgraded to improve energy efficiency performance by certain time-based deadlines. Time based triggers ensure an ordinance will eventually impact all rental housing, rather than triggering requirements upon title transfer. Such an ordinance can be designed to enhance tenant comfort, support Climate Action Plans, and energy savings goals.

A cost effectiveness study is required. Depending on the ordinance structure and requirements, one may be able to use the Residential Retrofit study (described above) to directly support the cost-effectiveness of the requirements.

Cool Roofs

Re-roofing projects can be good opportunities to install cool roofs. Refer to the specifications in the table above for additional information.

A cost effectiveness study is required.

Energy Plus Water Efficiency

Hot Water Distribution

Multifamily Central Systems Retrofit

For a domestic hot water system retrofit, require installation of automatic demand controls for central domestic hot water systems with a recirculation system. (For new construction with central domestic hot water systems, automatic demand control is the prescriptive requirement and the basis of the Standard Budget when using the Performance Method of compliance. If demand control isn't installed in new construction, the project must compensate for the additional energy use with other energy savings measures.)

A cost-effectiveness study is required.



Indoor Water

Nonresidential and Multifamily or Single Family New Construction

Require compliance with voluntary measures of CALGreen. There are two options:

- Dual plumb to support alternative water supply: Dual plumb building for recycled water/ gray water and potable water.
- Provide alternative water supply: Plumb indoor water use for non-potable water supply (, i.e. recycled water) for water closets, urinal, and other allowed uses.

Outdoor Water

Potable Water Elimination—Nonresidential and Multifamily or Single Family New Construction

Provide alternative water supply for landscaping if available. Plumb outdoor water use for non-potable water supply (rainwater, graywater, water treated for irrigation by a water district, or recycled water) for irrigation.

Process Loads (Equipment)

Commercial Kitchens

New Construction and Retrofit

Adopt voluntary measures of CALGreen (as updated for 2019 when available), which address cubed ice makers, food steamers, food waste disposers, dishwashers and commercial pre-rinse spray valves. Commercial kitchen water use is primarily associated with dishwashing.

A cost-effectiveness study is not required for water-savings measures, but any requirements impacting kitchen exhaust, ventilation, refrigeration or other equipment included in the scope of Part 6 will require a cost-effectiveness study. A justification must be filed with the Building Standards Commission.

Elevators

Adopt voluntary measures of 2019 CALGreen (when available):

Require regenerative drive system which feeds power to the grid when in motion. Depending on the specific requirements, a cost-effectiveness study may be required.

Escalators

Adopt voluntary measures of 2019 CALGreen (when available):

Require escalators to use Variable Voltage, Variable Frequency (VVVF) motors that are fully regenerative when the escalator is in motion. Depending on the specific requirements, a cost-effectiveness study may be required.



Electric-Ready

240 V Pre-wiring

Residential New Construction—Carbon-Free Building Preparations

To accommodate carbon-free electrical equipment, pre-wired 240 Volt circuits for cooking stoves, clothes dryer, and HVAC may be needed. Electric-ready requirements for water heating are included in the 2019 Standards, Section 150.0(n).

Panel Upgrade

Residential New Construction—Carbon-Free Building Preparations

If main electrical panel design capacity does not allow for current or eventual electrification of space, water, cooking, and laundry end uses, it may be necessary to upsize the panel. Current practice for new single family occupancies may likely allow for adequate capacity, but multifamily occupancies may be more constrained.

EV Readiness

Nonresidential and Hotels/Motels New Construction

CALGreen mandates a minimum number of parking spaces in new nonresidential buildings and hotels/motels be ZEV-ready with voluntary tiers set at approximately 8% and 10%. Projects with less than 10 spaces are exempt.

There are proposals to increase the required number of spaces for 2019, however, as of November 2018, the new code has not been adopted as by the Building Standards Commission as of .

Note: The table below refers to 2016 CALGreen values.

2016 CALGreen Electric Vehicle Charging Readiness			
Total Number of Parking Spaces	Number of Required Spaces for EV	Tier 1	Tier 2
0-9	0	0	1
10-25	1	2	2
26-50	2	3	4
51-75	4	5	6
76-100	5	7	9
101-150	7	10	12
151-200	10	14	17
201 and over	6% of total	8% of total	10% of total



EV Charging

Multifamily New Construction

2019 proposed CALGreen Code includes mandatory provisions for electric vehicle (EV) charging infrastructure to support future installation of charging stations. All new multifamily buildings must install EV charging infrastructure that is “EV capable in 10 percent of parking spaces.” (EV capable means: Install raceway electrical conduit and adequate panel capacity for a dedicated branch circuit and charging station.) The proposed minimums for the 2019 CALGreen voluntary tiers are as follows:

Tier 1: 15 percent EV capable

Tier 2: 20 percent EV capable and the complete installation of at least one charging station (not just the conduit and panel capacity).

Information Disclosure

Audits

Audits at Time of Retrofit or Time of Sale

In addition to identifying opportunities for improvement, scoring the energy efficiency of homes can help establish the value of efficiency and renewable energy improvements. California HERS II ratings (HERS) or Federal Home Energy Scores (HES) can be used to qualify for Energy Efficient Mortgages. The Home Energy Score system tends to result in a less expensive (and less detailed) analysis than the HERS II system. The value of energy efficiency and challenge of the inefficient housing stock appears to require a new paradigm that adds utility costs (energy and water) to the traditional “PITI” (principal, interest, taxes and insurance). Energy audit requirements can facilitate this shift.

Benchmarking

Benchmarking at Time of Sale, Time of Lease Renewal, or Date Certain Requirements

As with residential buildings, meeting building sector climate and energy goals must address the major challenge of improving existing nonresidential structures.

Benchmarking for full energy use transparency using scores can start the process of identifying opportunities to improve existing efficiency and facility operations. According to AB 802, disclosable buildings larger than 50,000 square feet with no residential utility accounts must report required information using Energy Star Portfolio Manager to the CEC by June 1, 2018. By June 1, 2019, disclosable buildings with 17 or more residential utility accounts must also report usage information. The ENERGY STAR score is a metric from 1 to 100 that demonstrates a building’s energy efficiency compared to similar buildings. A score of 50 indicates the national average energy performance.

Reach code considerations may include accelerating the pace for buildings with residential accounts or reducing size requirements.



2019 Potential Reach Codes Opportunities

Scope / Measure		C/E Study Required?	Timing of Reach Code			Project Types				
			At Construction / Entitlement		Other Trigger (Time of Sale, Date-Certain...)	Single Family	Multifamily			Non-Residential
			New	Addition / Remodel / Renovation	Existing Building		Low-Rise (<3)	Mid-Rise	High-Rise (4+)	
Efficiency and/or Renewables	Whole Building (mixed-fuel and all-electric)	Yes	X		X	X	X	X	X	
	Solar PV	Yes	X	X	X		X	X	X	
	Single Measures	Yes	X	X	X	X	X	X	X	
	Rental Property	Yes		X	X		X	X	X	
Energy Plus Water Efficiency	Hot Water Distribution	Yes	X	X		X	X	X	X	Some
	Indoor Water	No	X	X	X	X	X	X	X	X
	Outdoor Water	No	X	X	X	X	X	X	X	X
Process Loads (Equipment)	Commercial Kitchens	Maybe	X	X						X
	Elevators	Maybe	X	X				X	X	X
	Escalators	Maybe	X	X						X
Electric-Ready	240 V Pre-wiring	No	X	X		X	X	X	X	
	Panel Upgrade	No	X	X		X	X	X	X	X
	EV Readiness	No	X	X		X	X	X	X	X
	EV Charging	No	X	X		X	X	X	X	X
Information Disclosure	Audits	No		X	X	X	X	X	X	X
	Benchmarking	No		X	X		X	X	X	X

NOTE: Items shown in bold indicate types of reach codes that one or more jurisdictions adopted during the 2016 Code Cycle.