

Local governments may adopt amendments to the California Building Code (Title 24) to require enhanced energy performance in newly constructed single-family homes. These reach codes may either be codified as local amendments to the California Energy Code (Title 24, Part 6) or jurisdictions may adopt from the voluntary energy efficiency section of CALGreen (the California Green Building Code, Title 24, Part 11).

Amendments to the California Energy Code could require all new single family homes to meet a specific energy performance margin and could include requirements for additional solar PV capacity (see model ordinance). Adoption of CALGreen Section A4.203.1 would require homes to meet a different energy performance margin and install at least two prerequisite measures from a prescribed list of ten measures.

The California Codes and Standards 2022 Cost-effectiveness Study: Single Family New Construction (the Study) supports findings of cost-effectiveness for the performance requirements of both of these approaches (see Table 1 below). Both mechanisms are similar in that they require a building to exceed the performance of a minimally compliant building by a specific value – the compliance margin. And both mechanisms favor electrification because heat pumps significantly improve the compliance margin.

### SUMMARY POINTS

- Both CALGreen and the Study use existing compliance metrics and can be easily codified and incorporated into existing permitting processes and compliance documentation.
- Both have performance margins that can be achieved cost-effectively.
- The Study supports findings of cost-effectiveness that exceed CALGreen specifications.
- The Study supports different performance margins for all-electric and mixed-fuel buildings. CALGreen has one performance margin (per climate zone) for all fuel-types (although CALGreen could be amended to apply only to mixed-fuel buildings).
- The Study supports different performance margins for homes and ADUs. Under CALGreen, ADUs would either be subject to the same requirements or exempted.
- The Study offers jurisdictions more opportunities to customize the performance margins to achieve specific objectives, such as maximizing GHG reductions and maintaining minimum energy efficiency requirements for all fuel-types.

### Understanding Compliance Metrics

The 2022 State Energy Code established three compliance metrics for single family homes; the design must satisfy all three. All are computed in the State-approved compliance software and are reported in the compliance documents. The metrics are expressed as Energy Design Ratings (EDRs), an abstract scale wherein lower values represent lower energy consumption. There are three different EDR metrics in the State Energy Code.

- **Energy Design Rating 1 (EDR1)** represents total Source Energy, and is a proxy for GHG emissions
- **Efficiency Energy Design Rating 2 (EDR2-eff)** represents TDV Energy, excluding self-generation but including battery storage
- **Total Energy Design Rating EDR2 (EDR2-total)** represents TDV Energy, including both self-generation and battery storage

*CALGreen is based on Source Energy, EDR1. The Study is focused on the Efficiency metric, EDR2-eff (the Study also reports margins for EDR1 and EDR2-total).*

### SITE, SOURCE AND TDV ENERGY

- **SITE ENERGY** is energy delivered to a building, as measured by a customer meter. It is not used as a state compliance metric.
- **SOURCE ENERGY** is delivered energy plus the energy that is used in its generation and that which is lost during transmission, distribution, and storage.
- **TIME DEPENDENT VALUATION (TDV) ENERGY** is a quantification of delivered energy based on its relative societal cost rather than its static embodied energy content. TDV is a version of Source Energy, in that it accounts for source fuel and line losses, but unlike Source Energy, it varies with supply and demand and accounts for externalities. It is therefore useful as a metric to allocate resources based on economic efficiency.

### MAINTAINING BASIC EFFICIENCY MEASURES

A potential unintended consequence of using the CALGreen EDR1 metric is that it may be possible for an all-electric building to comply without installing some basic energy efficiency measures, which are otherwise part of the prescriptive State Energy Code. For example, a design that swaps out a gas space heater with an electric heat pump may obtain a significant compliance credit that could be applied to reduce standard efficiency measures, such as exterior wall insulation. The Study supports EDR2-eff compliance values that can compensate for this windfall (see the All-Electric Prescriptive case in the Study), thus maintaining minimum levels of energy efficiency.

### REQUIRING ADDITIONAL SOLAR PV

The Efficiency metric used in the Study does not offer credit for additional solar PV (it does, however, account for battery storage). To require additional PV (the State code already requires PV to offset the majority of electricity usage), it would need to be specified as a mandated measure. Additional solar PV may be used in practice to satisfy some or all of the CALGreen requirements.

### SAMPLE REACH CODE TEXT

#### ENERGY CODE AMENDMENT (SEE MODEL ORDINANCE)



The Efficiency Energy Design Rating (EDR2-eff) for the Proposed Design Building shall be at least X points less than the Efficiency Energy Design Rating (EDR2-eff) for the Standard Design Building if the Proposed Building is an All-Electric Building and Y points less if it is a Mixed-Fuel Building.

#### CALGREEN REQUIREMENT (TITLE 24, PART 11)



A4.203.1. Hourly Source Energy Design Ratings (EDR1): EDR1 ratings for the building's Proposed Design shall be computed by Compliance Software certified by the Energy Commission as specified in Title 24, Part 6, Section 100.1 and 150.1(b), and shall reduce the EDR1 required in the Compliance Software for minimum performance-based compliance with the California Energy Code by the compliance margin specified in Table A4.203.1.1.

**TABLE 1: CALGREEN COMPLIANCE MARGINS AND COST-EFFECTIVE COMPLIANCE MARGINS**

Climate Zone & Utility	EDR1 (Source Energy) Compliance Margins (%)		
	CALGreen Margin Table A4.203.1.1	Maximum Cost-Effective Margins from the Study	
	All Sizes	Single Family Home	ADU
01 PGE	4.3	39.8	21.7
02 PGE	4.4	17.5	15.8
03 PGE	6.0	12.5	3.9
04 CPAU	5.8	11.6	8.7
04 PGE	5.8	11.6	3.7
05 PGE	5.8	10.1	7.1
05 PGE/SCG	5.8	10.1	7.1
06 SCE/SCG	3.5	7.1	5.3
07 SDGE	2.9	21.6	5.1
08 SCE/SCG	2.1	4.4	4.9
09 SCE/SCG	3.6	5.9	6.0
10 SCE/SCG	6.5	7.1	7.1
10 SDGE	6.5	20.1	7.1
11 PGE	4.3	14.3	13.0
12 PGE	4.4	14.2	12.6
12 SMUD/PGE	4.4	14.2	12.6
13 PGE	4.9	11.0	4.4
14 SCE/SCG	5.8	22.9	5.7
14 SDGE	5.8	22.9	5.7
15 SCE/SCG	1.8	2.7	4.0
16 PGE	4.3	35.8	22.4