DOCKETED	
Docket Number:	24-BSTD-02
Project Title:	2025 CALGreen Rulemaking
TN #:	256432-1
Document Title:	2025 LSC Compliance Margins Proposal
Description:	Document relied upon for the proposed changes to the California Green Building Standards Code, Title 24, Part 11 (CALGreen) Appendices A4.2 & A5.2.
Filer:	Michael Shewmaker
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	5/16/2024 1:48:40 PM
Docketed Date:	5/16/2024

2025 LSC Compliance Margins Proposal

California Green Building Standards Code, Title 24, Part 11 (CALGreen), Appendix A4.2

Stephen Becker & Michael Shewmaker, Building Standards Development Unit

May 16, 2024

Measure Description

LSC Compliance Margin Proposal

The California Energy Commission is proposing to make the following changes to Appendix A4.2 of the California Green Building Code (Title 24, Part 11), also known as CALGreen:

- **A4.203.1 Energy Efficiency** – Update energy accounting methodology:
  - Energy Design Rating (EDR1) to Long-term System Cost (LSC)

- **Table A4.203.1.1: Recommended LSC Margins By Climate Zones** – Update performance compliance margins table
  - Revise performance compliance margins based on the proposed 2025 two heat pump baseline in Title 24, Part 6, plus:
    - Verified low-leakage ducts in conditioned space (VLLDCS) and/or
    - Compact hot water distribution (CDHW).

Source: 2025 Energy Code Accounting Report, available here: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=24-BSTD-01

Reasoning for Change to LSC

- In coordination with the CEC's proposed changes to the 2025 Energy Code (Title 24, Part 6), Part 11 will also be pivoting away from the old energy accounting methodologies of Energy Design Rating (EDR) and Time Dependent Valuation (TDV)

- Long-term System Cost (LSC) will be used as the primary energy accounting methodology.
  - Long-term System Cost is the CEC's projected present value of costs over a 30-year period for California's energy system.

Reasoning for Updating LSC Compliance Margin Table

- Offers local jurisdictions an option to enhance energy efficiency standards beyond the Energy Code (Title 24, Part 6).

- Increases energy efficiency of distribution systems within the building.
  - Verified low-leakage ducts in conditioned space in the climate zones where space heating or space cooling are the predominant energy end uses; and/or
  - Compact hot water distribution where water heating energy usage is prominent.

- Helps to reduce the wasteful, uneconomic, inefficient, or unnecessary consumption of energy consistent with the California Public Resources Code Section 25402.

Proposed Measure Description

- In climate zones 1-5, 11, 12, and 14-16, the LSC compliance margin is based on the proposed two heat pump baseline from Title 24, Part 6 (Energy Code), plus verified low-leakage ducts in conditioned space and compact hot water distribution.
  - Note: Climate Zone 15 is not cost-effective based on CEC methodology but has been included because local jurisdictions can consider additional savings beyond LSC savings in their cost-effective analysis.

- In climate zones 6-10 & 13, the LSC compliance margin is based on the proposed two heat pump baseline, plus compact hot water distribution.

Proposed Measure Description

- Verified Low-Leakage Ducts in Conditioned Space:
  - A visual inspection shall confirm the duct system location as specified by the Reference Appendices, RA3.1.4.1.3
  - Ducts shall be confirmed to have less than or equal to 25 cfm leakage to outside when measured as specified by Reference Appendices, RA3.1.4.3.4

- Compact Hot Water Distribution:
  - As specified in Reference Appendices, RA4.4.6

Energy Savings

Energy Savings Methodology

- The 2025 research version (RV) of the CBECC-Res compliance software was used to conduct the energy savings calculations and arrive at the proposed LSC compliance margins.

- CEC staff used the following single-family prototypes to perform the energy savings analysis:
  - 2,100-ft^2, one-story, 3-bedroom house with attached garage
  - 2,700-ft^2, two-story, 4-bedroom house with attached garage

- The CBECC-Res energy models were modified to include verified low-leakage ducts in conditioned space and/or compact hot water distribution.

Proposed LSC Compliance Margins

Climate Zone	LSC Compliance Margin
1	2.70
2	1.62
3	1.10
4	1.11
5	1.01
6	**0.24**
7	**0.24**
8	**0.21**
9	**0.20**
10	**0.18**
11	1.11
12	1.05
13	**0.23**
14	1.21
15	0.59
16	1.68

Compliance Packages:

Both compliance packages are based on a heat pump space heater and heat pump water heater, along with the following additional measures:

- CZs 1-5, 11, 12, 14-16:
  - Verified Low-Leakage Ducts in Conditioned Space (VLLDCS)
  - Compact Hot Water Distribution (CDHW)
- CZs 6-10 & 13 – **shown in bold**:
  - Compact Hot Water Distribution (CDHW)

First Year Savings

- To illustrate the savings potential of this proposal, the following slides display the first-year electricity and source energy savings based on our standard 2,100-ft^2 and 2,700-ft^2 single-family prototypes.
  - First Year Energy Savings are displayed in kWh/year.
  - First Year Source Energy Savings are displayed in kBtu/year.

First Year Energy Savings

Climate Zone	2100 ft² Prototype Electricity Savings (kWh/yr)	2700 ft² Prototype Electricity Savings (kWh/yr)
1	891	781
2	538	535
3	358	358
4	374	380
5	357	356
6	92	125
7	87	124
8	86	119
9	84	112
10	79	110
11	393	420
12	341	371
13	101	122
14	445	463
15	370	303
16	522	503

First Year Source Energy Savings

Climate Zone	2100 ft^2 Prototype Source Energy Savings (kBtu/yr)	2700 ft^2 Prototype Source Energy Savings (kBtu/yr)
1	372	394
2	339	367
3	326	356
4	309	341
5	326	356
6	279	312
7	277	308
8	270	302
9	272	302
10	265	296
11	288	319
12	302	335
13	263	291
14	287	315
15	227	249
16	335	365

Cost and Cost Effectiveness

Incremental Cost

- **Incremental Cost** – includes incremental equipment, replacement, and maintenance costs over the 30-year analysis.

- **Present Value** – when converting future costs to present value ($PV), a 3% discount rate (d) is used in the following equation, where n is the year the cost is incurred:

$$Present\ Value\ of\ Future\ Cost = Future\ Cost \times \left[\frac{1}{1+d}\right]^{n}$$

Proposed Incremental Cost

Verified low-leakage ducts in conditioned space (VLLDCS)

- First Cost: $1,300
- Lifetime: 30-years
- Replacement/Maintenance: $0

Compact Hot Water Distribution

- First Cost: $100-200
- Lifetime: 30-years
- Replacement/Maintenance: $0

Cost-Effectiveness

- **Cost Benefits** – include LSC savings over the 30-year analysis period.

- **Benefit to Cost Ratio (B/C Ratio):**
  - Calculated by dividing the cost benefits realized over 30-years by the total incremental cost.
  - Determines if measure is cost-effective – B/C ratios greater than or equal to 1 are assumed to be cost-effective in terms of LSC.

Key Takeaways

The proposed LSC compliance margins in Table A4.203.1.1 are based on the following packages:

- Title 24, Part 6 Dual-Heat Pump Baseline (HPWH + HPSH) + VLLDCS and CDHW in CZs 1-5, 11, 12, & 14-16
- Title 24, Part 6 Dual-Heat Pump Baseline + CDHW in CZs 6-10 & 13

The proposed compliance packages show:

- First year energy savings ranging from 79 to 891 kWh
- First year source energy savings ranging from 249 to 394 kBtu
- Cost-effective in terms of LSC in all climate zones except CZ 15

Benefit-to-Cost (B/C) Ratios

Climate Zone	2100 ft² Prototype Lifetime Savings (PV$)	2100 ft² Prototype B/C Ratio	2700 ft² Prototype Lifetime Savings (PV$)	2700 ft² Prototype B/C Ratio
1	$4,487	3.0	$3,951	2.6
2	$2,607	1.7	$2,452	1.6
3	$1,784	1.2	$1,641	1.1
4	$1,742	1.2	$1,729	1.2
5	$1,633	1.1	$1,535	1.0
6	**$329**	**1.7**	**$423**	**2.1**
7	**$302**	**1.5**	**$441**	**2.2**
8	**$274**	**1.4**	**$388**	**1.9**
9	**$261**	**1.3**	**$370**	**1.9**
10	**$233**	**1.2**	**$318**	**1.6**
11	$1,688	1.1	$1,799	1.2
12	$1,619	1.1	$1,676	1.1
13	**$329**	**1.7**	**$388**	**1.9**
14	$1,880	1.3	$1,905	1.3
15	$1,029	0.7	$811	0.5
16	$2,717	1.8	$2,540	1.7

NOTE: Climate zones where only compact hot water distribution is proposed is shown in **bold**.

How/Where to Submit Comments

- Please submit your comments and questions to the docket (24-BSTD-02) by 5:00pm on Monday, July 1, 2024.

- Comments can be submitted directly here: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=24-BSTD-02

OR

- Comments can also be emailed to the Docket Unit at: docket@energy.ca.gov
  - Please include docket number: 24-BSTD-02, and “2025 CALGreen” in the subject line.

Public Advisor's Assistance

- The CEC's Office of the Public Advisor, Energy Equity, and Tribal Affairs assists the public with participation in CEC proceedings.
- To request assistance, interpreting services, or reasonable modifications and accommodations, please call (916)-957-7910, or email publicadvisor@energy.ca.gov
  - Please reach out as soon as possible, but at least five (5) days in advance.
- The CEC will work diligently to meet all requests based on availability.

Thank You!