LOW CARBON FUEL STANDARD
ANNUAL UPDATES TO LOOKUP TABLE PATHWAYS

2026 Carbon Intensity Values for California Average Grid Electricity Used as a Transportation Fuel in California and Electricity Supplied Under the Smart Charging or Smart Electrolysis Provision

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I. Summary

This document proposes the annual update to carbon intensity (CI) values for Lookup Table electricity pathways under the Low Carbon Fuel Standard (LCFS).

Section 95488.5(d) of the LCFS regulation[1] directs the Executive Officer to update the CI annually for these two Lookup Table pathways using the methodology described in Section II.F of the Lookup Table Pathways Technical Support Documentation.[2] Effective July 1, 2025, CA-GREET4.0 became the applicable version of the LCFS modeling tool and was therefore used in preparation of this pathway CI. Upon certification, the updated pathway CI values will be available for reporting fuel transactions that occur between January 1 and December 31, 2026.

The carbon intensity values for smart charging or smart electrolysis are determined using the California Average Grid Electricity CI and the normalized marginal emission rates for that period. The carbon intensity values calculated for California average grid electricity used as a transportation fuel in California, smart charging or smart electrolysis pathways in 2026 are shown in Tables 1 and 2 below.

[1] All citations to the LCFS Regulation are found in Title 17, California Code of Regulations (CCR), sections 95480-95503

[2] CA-GREET4.0 Technical Support Documentation for Lookup Table Pathways. August 12, 2024. California Air Resources Board. Accessed 2/2026. https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/ca-greet/lut_update_v08122024.pdf

Table 1. Proposed CI Values for 2026 Update to Electricity Lookup Table Pathways

Fuel Pathway Code	Fuel Pathway Description	CI (gCO_2e/MJ)
ELC000L00072026	California average grid electricity (subject to annual updates)	65.07
ELCT	Electricity supplied under the smart charging or smart electrolysis provision (subject to annual updates)	See Table 2

Table 2. Proposed CI Values (gCO_2e/MJ) for Smart Charging or Electrolysis in 2026

	Q1	Q2	Q3	Q4
12:01 AM – 1:00 AM	72.03	71.84	71.81	72.63
1:01 AM – 2:00 AM	72.03	71.85	71.76	72.03
2:01 AM – 3:00 AM	72.03	71.04	71.75	71.95
3:01 AM – 4:00 AM	72.03	72.00	71.75	71.94
4:01 AM – 5:00 AM	72.03	71.89	71.75	71.96
5:01 AM – 6:00 AM	72.12	72.42	71.75	74.16
6:01 AM – 7:00 AM	79.23	79.36	73.40	89.76
7:01 AM – 8:00 AM	83.75	57.89	72.61	87.42
8:01 AM – 9:00 AM	66.50	2.00	72.48	74.44
9:01 AM – 10:00 AM	47.95	1.44	6.20	30.23
10:01 AM – 11:00 AM	24.46	2.59	10.75	26.88
11:01 AM – 12:00 PM	24.46	41.41	18.21	29.93
12:01 PM – 1:00 PM	0.00	43.75	26.56	31.58
1:01 PM – 2:00 PM	0.00	45.06	37.71	33.57
2:01 PM – 3:00 PM	24.46	47.61	45.58	54.80
3:01 PM – 4:00 PM	47.58	51.35	79.85	60.79
4:01 PM – 5:00 PM	55.55	21.53	82.87	93.66
5:01 PM – 6:00 PM	85.26	25.81	97.32	118.07
6:01 PM – 7:00 PM	98.53	81.54	111.01	120.66
7:01 PM – 8:00 PM	95.91	115.62	123.36	113.08
8:01 PM – 9:00 PM	86.03	112.96	107.64	101.92
9:01 PM – 10:00 PM	75.28	88.77	89.55	88.50
10:01 PM – 11:00 PM	72.07	72.95	74.99	78.15
11:01 PM – 12:00 AM	72.03	71.99	72.28	73.56

These updates reflect changes in the carbon intensity of California grid electricity (Figure 1).[3] For more information about greenhouse gas (GHG) emissions for the electricity sector, please see the Annual Statewide GHG Inventory.[4]

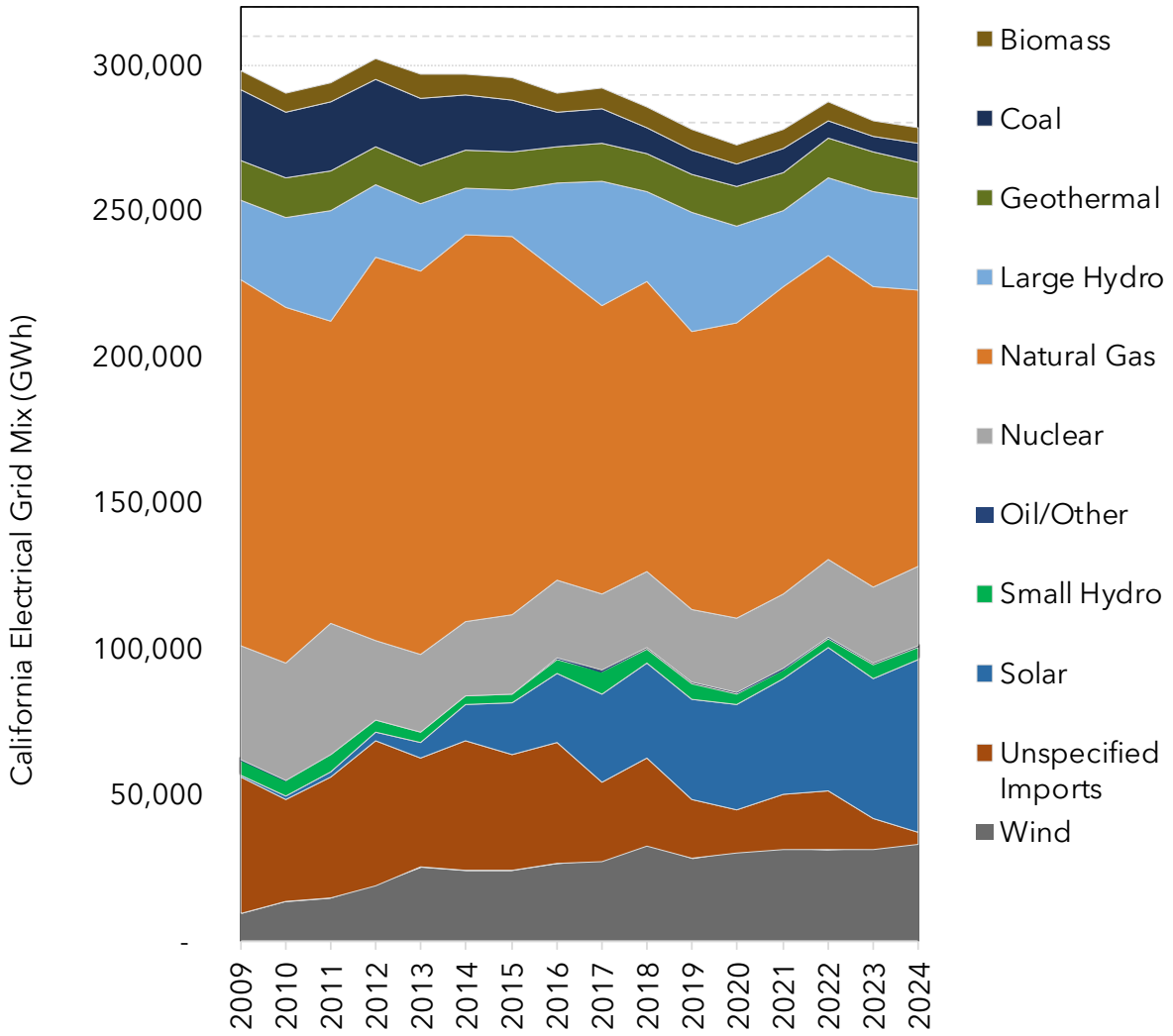

Figure 1. Total System Electric Mix in California in Gigawatt Hours (GWh)

[3] Total System Electric Generation, 2011-2024. California Energy Commission. Accessed 2/2026. https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-electrical-energy-generation

[4] Current California GHG Emission Inventory Data. https://ww2.arb.ca.gov/ghg-inventory-data

II. Pathway Details, Assumptions, and Calculations

1. California Grid Electricity Mix

Pursuant to the CA-GREET4.0 Technical Support Documentation for Lookup Table Pathways (August 12, 2024), the "Power Generation" stage of the California average grid electricity pathway is modeled in CA-GREET4.0 using the Total System Electric Generation dataset provided by the California Energy Commission (CEC).

The "Feedstock Production" stage is modeled using the U.S. average mix from the U.S. EPA Emissions & Generation Resource Integrated Database (eGRID). Only the "Power Generation" stage of the life cycle is updated using the CEC Total System Electric Generation data for the 2024 reporting year. [5] The CEC's California Power Mix for 2023 and 2024 data years are compared in Table 3.

Table 3. California Power Mix for Data Years 2023 and 2024

	2023 CEC		2024 CEC	
	% Mix	**GWh**	**% Mix**	**GWh**
Residual oil	0.1%	242	0.1%	255
Natural Gas	40.2%	113,147	35.5%	98,706
Coal	1.8%	4,981	2.2%	6,162
Nuclear	9.3%	26,271	9.9%	27,613
Biomass	2.1%	5,790	1.9%	5,394
Hydro	13.5%	37,875	12.6%	35,020
Geothermal	4.8%	13,567	4.6%	12,803
Wind	11.2%	31,399	11.9%	33,102
Solar	17.0%	47,869	21.3%	59,283
Total	**100.0%**	**281,141**	**100.0%**	**278,338**

As described in the CA-GREET4.0 Technical Support Documentation for Lookup Table Pathways, to harmonize resources reported by CEC with those in CA-GREET4.0, the "Other Petroleum Sources" category from CEC's mix was treated as "Residual Oil", while the "Unspecified Sources of Power" category was assumed to be from "Natural Gas" in CA-GREET4.0.

Table 4 details the updated contribution of each power resource in energy input, emission factor to calculate an average CI for electricity, which will be used for reporting in 2026 after completion of a public comment period.

[5] 2024 California Total System Electric Generation data from California Energy Commission (CEC). Accessed 2/2026. https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2024-total-system-electric-generation

Table 4. 2024 California Average Grid Electricity CI for 2026 Reporting [6]

	Electricity Resource Mix	**Energy Inputs, Btu Feedstock /MMBtu Electricity**	**Feedstock Production, gCO_2e/MMBtu Electricity**	**Electricity Generation, gCO_2e/MMBtu Electricity**
Residual Oil	0.1%	2,982	38	255
Natural Gas	35.5%	811,356	10,895	48,360
Coal	2.2%	69,001	361	6,923
Nuclear	9.9%	106,102	149	0
Biomass	1.9%	91,219	233	124
Hydro	12.6%	134,565	0	0
Geothermal	4.6%	49,197	0	1,312
Wind	11.9%	127,195	0	0
Solar PV	21.3%	227,795	0	0
Total	**100%**	**1,619,413**	**11,677**	**56,973**
2024 CA Average Grid CI, gCO_2e/MJ			**11.07**	**54.00**
			65.07	

The resulting average CI for California grid electricity for use in 2026 reporting is **65.07 gCO_2e/MJ**, a decrease from the previous CI of 70.05 gCO_2e/MJ certified for use in 2025 reporting.

2. California Grid Electricity CI for Smart Charging or Smart Electrolysis

2.1. Smart Charging or Smart Electrolysis CI Values

The CI values for smart charging or smart electrolysis provisions are calculated based on the marginal emission rates determined using the Avoided Cost Calculator developed by the California Public Utilities Commission.[7] A set of algorithmically neutral CI values are determined for each hour of the day, for the four quarters of the year, to represent the average marginal emission rates for EV charging or electrolytic hydrogen production that takes place during these times. Shifting EV charging or electrolysis could result in additional emission reductions as compared to Average Grid Electricity CI during the periods when the marginal emission reductions are low.

[6] Values may not sum to the total due to rounding.

[7] Energy and Environmental Economics, Inc. Avoided Cost Calculator, May 2018. Incorporated by reference into the LCFS Regulation, section 95481(a). Accessed 2/2026. Available from the California Public Utilities Commission website at: https://www.ethree.com/public_proceedings/energy-efficiency-calculator/

2.2. Normalized Average Marginal Emission Rates

For calculation of marginal emission rates in the Avoided Cost Calculator, natural gas is assumed to be the marginal fuel for electricity generation in California in all hours and the hourly emissions rate of the marginal generator is calculated based on the day-ahead market price curve. Higher market prices enable lower-efficiency (i.e., less economical) generators to operate, resulting in corresponding, increased rates of emissions at the margin.

This relationship holds for a reasonable range of prices but breaks down when prices are extremely high or low. For this reason, the avoided cost methodology bounds the maximum and minimum emissions rates based on the range of gas turbine technology heat rates. Additionally, if the implied heat rate is calculated to be at or below zero, it is then assumed that the system is in a period of over generation and therefore the marginal emission rate is correspondingly zero as well.

The Avoided Cost Calculator estimates marginal emission rates for utilities in Northern and Southern California, which are based on the normalized hourly day-ahead heat rate profiles for California Independent System Operator (CAISO) NP-15 and SP-15 regions. Statewide average marginal emission rates for 2026, are calculated based on the load profile of large load serving entities (LSE) in the two geographical areas, Pacific Gas and Electric (PG&E) in Northern California and Southern California Edison (SCE) and San Diego Gas and Electric (SDG&E) in Southern California.

Based on the CAISO OASIS data [8] for all three utilities from January 1, 2024 through December 31, 2024, approximately 44% of the annual average hourly load is served in Northern California and 56% is served in Southern California (includes SCE and SDG&E), as shown in Table 5.

Table 5. LSE Average Hourly Load and Share of Total Load in California for 2024

Load-Serving Entity	Average Hourly Load (MW)	% of Load
PG&E	11,255	44.4%
SCE	11,920	47.0%
SDG&E	2,179	8.6%
Total	**25,354**	**100%**

The statewide average marginal emission rates for California Grid Average Electricity are normalized to the annual average California Grid emissions rate over the year for each hourly window for the four quarters of the year, as shown in Table 6.

[8] CAISO Demand Forecast – Actual. Accessed 2/2026. http://oasis.caiso.com/mrioasis/logon.do

Table 6. Normalized Marginal Emission Rates for California Grid Electricity for 2026

	Q1	Q2	Q3	Q4
12:01 AM – 1:00 AM	1.1070	1.1041	1.1035	1.1162
1:01 AM – 2:00 AM	1.1070	1.1041	1.1028	1.1070
2:01 AM – 3:00 AM	1.1070	1.0918	1.1026	1.1057
3:01 AM – 4:00 AM	1.1070	1.1066	1.1026	1.1055
4:01 AM – 5:00 AM	1.1070	1.1048	1.1026	1.1058
5:01 AM – 6:00 AM	1.1083	1.1130	1.1026	1.1397
6:01 AM – 7:00 AM	1.2176	1.2197	1.1280	1.3794
7:01 AM – 8:00 AM	1.2871	0.8897	1.1159	1.3435
8:01 AM – 9:00 AM	1.0220	0.0308	1.1139	1.1441
9:01 AM – 10:00 AM	0.7369	0.0221	0.0952	0.4647
10:01 AM – 11:00 AM	0.3758	0.0398	0.1652	0.4131
11:01 AM – 12:00 PM	0.3758	0.6364	0.2798	0.4600
12:01 PM – 1:00 PM	0.0000	0.6724	0.4081	0.4853
1:01 PM – 2:00 PM	0.0000	0.6925	0.5796	0.5158
2:01 PM – 3:00 PM	0.3758	0.7317	0.7005	0.8421
3:01 PM – 4:00 PM	0.7312	0.7891	1.2271	0.9343
4:01 PM – 5:00 PM	0.8536	0.3309	1.2735	1.4394
5:01 PM – 6:00 PM	1.3103	0.3966	1.4956	1.8145
6:01 PM – 7:00 PM	1.5142	1.2532	1.7060	1.8543
7:01 PM – 8:00 PM	1.4740	1.7768	1.8958	1.7378
8:01 PM – 9:00 PM	1.3221	1.7359	1.6541	1.5663
9:01 PM – 10:00 PM	1.1569	1.3643	1.3763	1.3600
10:01 PM – 11:00 PM	1.1075	1.1212	1.1524	1.2010
11:01 PM – 12:00 AM	1.1070	1.1063	1.1108	1.1304

APPENDIX:
Carbon Intensity Calculations in Table 4

Table A.1 provides emission factors, combustion technologies, and energy conversion efficiencies derived from CA-GREET4.0 for calculations in Table 4.

Table A.1. Emission Factors, Combustion Technology Shares and Energy Conversion Efficiencies for Grid Electricity Used as Transportation Fuel in California

	Electricity Generation Emissions, gCO_2e/kWh	**Technology Share**	**Electricity Generation Efficiency**
Residual Oil			
Boiler	858	81.7%	34.0%
Internal Combustion Engine	838	12.4%	34.7%
Gas Turbine	1362	5.8%	21.4%
Weighted Average	*885*		*32.91%*
Natural Gas			
Boiler	655	4.0%	31.1%
Simple-cycle Gas Turbine	590	10.7%	34.3%
Combined-cycle Gas Turbine	402	83.7%	50.4%
Internal Combustion Engine	563	1.6%	41.3%
Weighted Average	*435*		*46.75%*
Coal			
Boiler	998	100.0%	34.3%
IGCC	880	0.0%	39.0%
Weighted Average	*998*		34.3%
Biomass			
Boiler	20	100.0%	22.7%
Nuclear	0		
Hydro	0		
Geothermal	0		
Wind	0		
Solar PV	0		

The following calculations serve as demonstrations based on truncated values included in the tables of this document to enhance visualization. However, since the results are from the tables of this document that are calculated using non-truncated values, slight variations may occur.

1) Calculation of Contribution to Emissions from Residual Oil

Residual oil (RO) fired power plants use three combustion technologies: boiler, internal combustion engine, and gas turbine. The combustion technology shares and their energy conversion efficiencies were calculated from CA-GREET4.0.

For each MMBtu of California grid electricity delivered, the RO fuel input is:

$$1{,}000{,}000 \text{ Btu Grid Electricity} \times \frac{1 \text{ Btu RO}}{0.3291 \text{ Btu Grid Electricity}} \times \frac{0.1\%}{(1 - 6.5\%)} = 2{,}982 \text{ Btu RO}$$

where:

Electricity resources mix share of residual oil = 0.1% (Table 3)
Weighted average RO electricity generation efficiency = 32.91% (Table A.1)
Loss in electricity transmission = 6.5% (CA-GREET4.0)

The contribution of RO to the feedstock production CI in Table 4 is:

$$\frac{2{,}982 \text{ Btu RO}}{\text{MMBtu Grid Electricity}} \times \frac{12{,}779 \text{ gCO}_2\text{e}}{\text{MMBtu RO}} = \frac{38 \text{ gCO}_2\text{e}}{\text{MMBtu Grid Electricity}}$$

where:

Upstream EF of RO use in power plant = 12,779 gCO_2e/MMBtu RO (CI value of the "Petroleum" tab in CA-GREET4.0, Upstream and downstream of RO).

The contribution of RO to the electricity generation CI in Table 4 is:

$$\frac{885 \text{ gCO}_2\text{e}}{\text{kWh}} \times \frac{293.07 \text{ kWh}}{\text{MMBtu}} \times \frac{0.1\%}{1 - 6.5\%} = \frac{255 \text{ gCO}_2\text{e}}{\text{MMBtu Grid Electricity}}$$

where:

Electricity generation emission factor = 885 gCO_2e/kWh (Weighted average emissions factor of each RO combustion type, calculated using values in 'EF' and 'Electric' tabs of CA-GREET4.0)

2) Calculation of Contribution to Emissions from Natural Gas

Natural gas (NG) fired power plants use one of four combustion technologies: boiler, simple-cycle gas turbine, combined-cycle gas turbine and internal combustion engine. The combustion technology shares, and their energy conversion efficiencies were calculated using data from CA-GREET4.0.

For each MMBtu of California grid electricity delivered, the NG fuel input is:

$$1{,}000{,}000 \text{ Btu Grid Electricity} \times \frac{1 \text{ Btu NG}}{0.4675 \text{ Btu Grid Electricity}} \times \frac{35.5\%}{(1 - 6.5\%)} = 811{,}356 \text{ Btu NG}$$

where:

Weighted average generation efficiency = 0.4675 (Table A.1)
Resources mix share of NG-derived electricity = 35.5% (Table 3)
Loss in electricity transmission = 6.5% (CA-GREET4.0)

The contribution of NG to the feedstock production CI in Table 4 is:

$$\frac{811{,}356 \text{ Btu NG}}{\text{MMBtu Grid Electricity}} \times \frac{13{,}428 \text{ gCO}_2\text{e}}{\text{MMBtu NG}} = \frac{10{,}895 \text{ gCO}_2\text{e}}{\text{MMBtu Grid Electricity}}$$

where:

Upstream EF of NG used in power plant = 13,513 gCO_2e/MMBtu NG (CI value of the "Natural Gas for Electricity Generation" in the NG tab of CA-GREET4.0)

The contribution of NG to the electricity generation CI in Table 4 is:

$$\frac{435 \text{ gCO}_2\text{e}}{\text{kWh}} \times \frac{293.07 \text{ kWh}}{\text{MMBtu}} \times \frac{35.5\%}{1 - 6.5\%} = \frac{48{,}360 \text{gCO}_2\text{e}}{\text{MMBtu Grid Electricity}}$$

where:

Electricity generation emission factor = 435 gCO_2e/kWh (Weighted average emissions factor of each NG combustion type, calculated using values in 'EF' and 'Electric' tabs of CA-GREET4.0)
Note: 293.07 kWh/MMBtu is unit conversion from kWh to MMBtu

3) Calculation of Contribution to Emissions from Coal

Coal fired power plants use two combustion technologies: boiler and integrated gasification combined cycle (IGCC). The combustion technology shares, and their energy conversion efficiencies were calculated using CA-GREET4.0.

For each MMBtu of California grid electricity delivered, the coal fuel input is:

$$1{,}000{,}000 \text{ Btu Grid Electricity} \times \frac{1 \text{ Btu Coal}}{0.343 \text{ Btu Grid Electricity}} \times \frac{2.2\%}{(1 - 6.5\%)} = 69{,}001 \text{ Btu Coal}$$

where:

Weighted average generation efficiency = 0.345 (Table A.1)
Electricity resources mix share of Coal = 2.2% (Table 3)
Loss in electricity transmission = 6.5% (CA-GREET4.0)

The contribution of coal to the feedstock production CI in Table 4 is:

$$\frac{69{,}001 \text{ Btu Coal}}{\text{MMBtu Grid Electricity}} \times \frac{5{,}233 \text{ gCO}_2\text{e}}{\text{MMBtu Coal}} = \frac{361 \text{ gCO}_2\text{e}}{\text{MMBtu Grid Electricity}}$$

where:

Upstream EF of coal use in power plant = 5,233 gCO_2e/MMBtu Coal (CI value of the "Coal" tab in CA-GREET4.0)

The contribution of coal to the electricity generation CI in Table 4 is:

$$\frac{998 \text{ gCO}_2\text{e}}{\text{kWh}} \times \frac{293.07 \text{ kWh}}{\text{MMBtu}} \times \frac{2.2\%}{1 - 6.5\%} = \frac{6{,}923 \text{ gCO}_2\text{e}}{\text{MMBtu Grid Electricity}}$$

where:

Electricity generation emission factor = 998 gCO_2e/kWh (Weighted average emissions factor of each coal combustion type, calculated using values in 'EF' and 'Electric' tabs of CA-GREET4.0)

4) Calculation of Contribution to Emissions from Nuclear

CA-GREET 4.0 model assumes electricity from nuclear is generated in the light water reactor and uranium is U-235. Emissions are from feedstock production (uranium mining and transport); no emissions are modeled for electricity generation.

For each MMBtu of California grid electricity delivered, the nuclear emissions are:

$$1{,}000{,}000 \text{ Btu Grid Electricity} \times \frac{1 \text{ Btu Nuclear}}{1 \text{ Btu Grid Electricity}} \times \frac{9.9\%}{(1 - 6.5\%)} = 106{,}102 \text{ Btu Nuclear}$$

The contribution of nuclear to the feedstock production CI is:

$$\frac{106{,}102 \text{ Btu Nuclear}}{\text{MMBtu Electricity}} \times \frac{33{,}115 \text{ gCO}_2\text{e}}{6{,}926 \text{ kWh}} \times \frac{293.07 \text{ kWh}}{\text{MMBtu}} = \frac{149 \text{ gCO}_2\text{e}}{\text{MMBtu Grid Electricity}}$$

where:

Resources mix share of nuclear-derived electricity = 9.9% (Table 3)
Loss in electricity transmission = 6.5% (CA-GREET4.0)
Conversion factor = 6,926 kWh/g U-235 (CA-GREET4.0)
Uranium EF = 33,115 gCO_2e/g U-235 (CA-GREET4.0)

5) Calculation of Contribution to Emissions from Biomass

For each MMBtu of California grid electricity delivered, the biomass fuel input is:

$$1{,}000{,}000 \text{ Btu Grid Electricity} \times \frac{1 \text{ Btu Biomass}}{0.227 \text{ Btu Grid Electricity}} \times \frac{1.9\%}{(1 - 6.5\%)} = 91{,}219 \text{ Btu Biomass}$$

where:

Weighted average generation efficiency = 0.227 (Table A.1)
Resources mix share of biomass-derived electricity = 1.9% (Table 3)
Loss in electricity transmission = 6.5% (CA-GREET4.0)

The contribution of biomass to the feedstock production CI in Table 4 is:

$$\frac{91{,}219 \text{ Btu Biomass}}{\text{MMBtu Grid Electricity}} \times \frac{2{,}559 \text{ gCO}_2\text{e}}{\text{MMBtu Biomass}} = \frac{233 \text{ gCO}_2\text{e}}{\text{MMBtu Grid Electricity}}$$

where:

Upstream EF of biomass use in power plant = 2,559 gCO_2e/MMBtu Biomass ("EtOH" tab in CA-GREET4.0, "Forest Residue" section).

The contribution of biomass to the electricity generation CI in Table 4 is:

$$\frac{20\ gCO_2e}{kWh} \times \frac{293.07\ kWh}{MMBtu} \times \frac{1.9\%}{1 - 6.5\%} = \frac{124\ gCO_2e}{MMBtu\ Grid\ Electricity}$$

where:

Electricity generation emission factor = 20 gCO_2e/kWh ("Electric" tab of CA-GREET4.0)

6) Energy Contribution of Hydro

For each MMBtu of California grid electricity delivered, the hydro input is:

$$1{,}000{,}000\ Btu\ Grid\ Electricity \times \frac{1\ Btu\ Hydro}{1\ Btu\ Grid\ Electricity} \times \frac{12.6\%}{(1 - 6.5\%)} = 134{,}565\ Btu\ Hydro$$

where:

Resources mix share of hydro = 12.6% (Table 3)
Loss in electricity transmission = 6.5% (CA-GREET4.0)

Hydro power is not evaluated as having feedstock production or electricity generation emissions.

7) Calculation of Contribution to Emissions from Geothermal

For each MMBtu of California grid electricity delivered, the geothermal input is:

$$1{,}000{,}000\ Btu\ Grid\ Electricity \times \frac{1\ Btu\ Geothermal}{1\ Btu\ Grid\ Electricity} \times \frac{4.6\%}{(1 - 6.5\%)} = 49{,}197\ Btu\ Geothermal$$

where:

Resources mix share of geothermal = 4.6% (Table 3)
Loss in electricity transmission = 6.5% (CA-GREET4.0)

Geothermal is not evaluated as having feedstock production emissions. The contribution of geothermal to the electricity generation CI in Table 4 is:

$$\frac{49{,}197 \text{ Btu Geothermal}}{\text{MMBtu Grid Electricity}} \times \frac{26{,}669 \text{ gCO}_2\text{e}}{\text{MMBtu Geothermal}} = \frac{1{,}312 \text{ gCO}_2\text{e}}{\text{MMBtu Grid Electricity}}$$

where:

Upstream EF of geothermal use in power plant = 26,669 gCO_2/MMBtu (CA-GREET4.0)

8) Energy Contribution of Wind Turbine

For each MMBtu of California grid electricity delivered, the wind power input is:

$$1{,}000{,}000 \text{ Btu Grid Electricity} \times \frac{1 \text{ Btu Wind}}{1 \text{ Btu Grid Electricity}} \times \frac{11.9\%}{(1 - 6.5\%)} = 127{,}195 \text{ Btu Wind}$$

where:

Resources mix share of wind = 11.9% (Table 3)
Loss in electricity transmission = 6.5% (CA-GREET4.0)

Wind power is not evaluated as having feedstock production or electricity generation emissions.

9) Energy Contribution of Solar Photovoltaics

For each MMBtu of California grid electricity delivered, the solar power input is:

$$1{,}000{,}000 \text{ Btu Grid Electricity} \times \frac{1 \text{ Btu Solar}}{1 \text{ Btu Grid Electricity}} \times \frac{21.3\%}{(1 - 6.5\%)} = 227{,}795 \text{ Btu Solar}$$

where:

Resources mix share of solar = 21.3% (Table 3)
Loss in electricity transmission = 6.5% (CA-GREET4.0)

Solar power is not evaluated as having feedstock production or electricity generation emissions.