



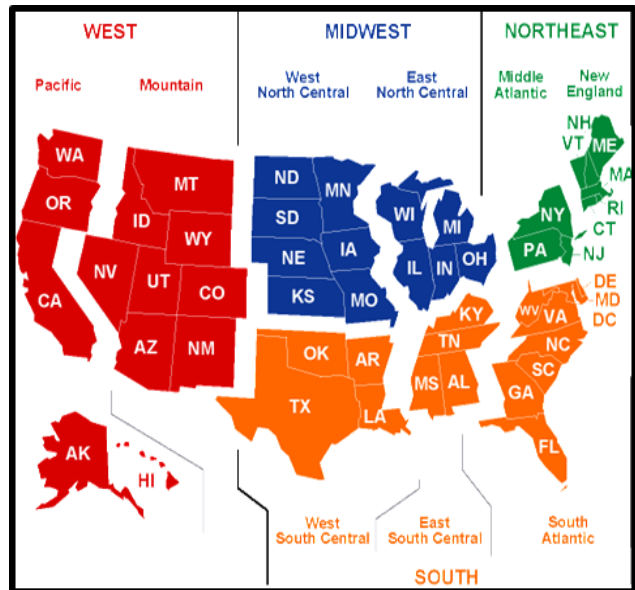
California’s Declining Reliance on Coal – Overview

Reductions in the use of coal-fired electricity generation have played a key role in California’s efforts to decrease greenhouse gas emissions attributable to the electrical sector. This update highlights some of the more important actions taken by California to reduce reliance on coal-fired electrical generation owned or under long-term contract to a California load serving entity (LSE). Heading the list is California’s Emissions Performance Standard (EPS), established in 2006, which limits long-term investments in baseload generation with high-carbon dioxide (CO₂) emissions, primarily coal-fired generation.

Figure 1 shows that as of 2016, California used less in-state coal-fired electricity generation than most other states. Coal continues to be a predominant source of energy throughout the United States with some exceptions such as California, Washington, Oregon, Idaho, and the Northeastern states.

Figure 1: In-State Coal Generation for Calendar Year 2015 – 2016 (GWh)

Census Division and State (GWh)	2015	2016
New England	3,882	2,562
Middle Atlantic	68,776	57,538
East North Central	313,779	274,771
West North Central	197,842	183,347
South Atlantic	242,400	238,128
East South Central	151,017	137,683
West South Central	183,326	176,209
Mountain	181,645	160,973
Pacific Contiguous	7,727	6,819
California	298	319
Oregon	2,377	1,898
Washington	5,052	4,602
Pacific Noncontiguous	2,005	2,060
U.S. Total	1,352,398	1,240,089



Source: U.S. Energy Information, <https://www.eia.gov/electricity/monthly/archive/february2017.pdf> and U.S Census Regions and Divisions Map, <https://www.eia.gov/consumption/commercial/maps.php>

California’s in-state coal-fired generation during both 2015 and 2016 was roughly 0.2 percent of the state’s electric load.¹ Of the 48 states that use coal for generation, 15 obtained at least 50 percent of their electricity from coal generation. (Only Rhode Island and Vermont have no in-

¹ In-state coal generation increased slightly in 2016, as the Argus Cogeneration Plant (Argus Cogen Plant), the only operating in-state power plant in the state, generated slightly more than in 2015.



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state coal-fired generation.) Nonetheless, the nation’s coal-fired generation has been dropping. Between 2007 and 2016, coal-fired generation fell about 18 percent.

California’s Emission Performance Standard

Senate Bill 1368 (Perata, Chapter 598, Statutes of 2006) established the EPS for California LSEs. The EPS applies to baseload generation owned by or under long-term contract to any California LSE. The EPS defines baseload power plants as facilities that run at least 60 percent of the time. The standard is a maximum emissions rate of 1,100 pounds of carbon dioxide per megawatt-hour (MWh), and “long-term” means five or more years. The EPS also includes restrictions on capital investments that increase generating capacity or extend the life of the power plant.

Progress in Reducing California’s Use of Coal-Fired Generation

The EPS has been a driving force behind California’s utilities ending, or planning to end, affiliations (contracts and/or ownership) with coal-fired generation resources, especially with large out-of-state coal-fired power plants. Coal-fired generation for California fell about 75 percent from 50,011 gigawatt-hour (GWh) in 2007 (when the Energy Commission began to implement EPS) to 12,007 GWh in 2016. **Figure 2** shows that coal-fired generation’s annual share of all types of generation to serve California electricity demand declined from about 17 percent in 2007, to about 8 percent from 2009 through 2013, about 6 percent in 2014 and 2015, and to about 4 percent in 2016. **Figure 3** shows that the share is expected to drop to about 3 percent by 2019 and to almost zero by the end of 2025.

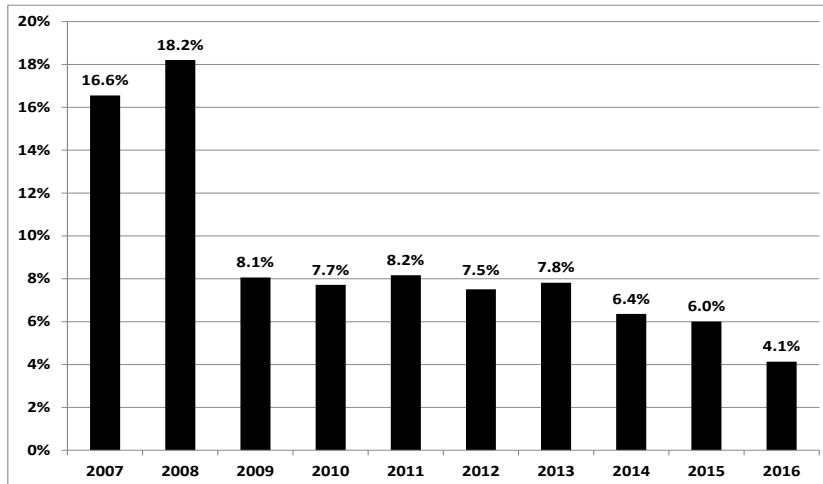
Coal plant, unit, capacity, and generation data, shown in **Table 1**, also demonstrate reduced reliance on coal-fired generation.² For instance, in 2001, coal-fired generation was 12 percent of all generation used in California and by 2016 it was only 4 percent. All out-of-state coal-fired generation that is either owned or that has long-term contracts with California LSEs is located in Oregon, Utah, or New Mexico. The Intermountain Power Project (IPP) in Utah is the only out-of-state coal-fired power plant that is within a California balancing authority, by virtue of its direct connection with the Los Angeles Department of Water and Power (LADWP) system.³ Generation from Boardman in Oregon and San Juan Units 3 and 4 in New Mexico comes into California via the western bulk transmission system.

² Some electric generation, including some generation at refineries, comes from plants that are fueled with petroleum coke, which is reported in a separate category.

³ A *balancing authority* maintains the electricity balance between supply and demand within its region by controlling the generation and transmission of electricity throughout its own region, and between neighboring balancing authorities. *California balancing authority* refers to a balancing authority located primarily in California with more than 50 percent of its end-use electric load physically located within the political boundaries of California.

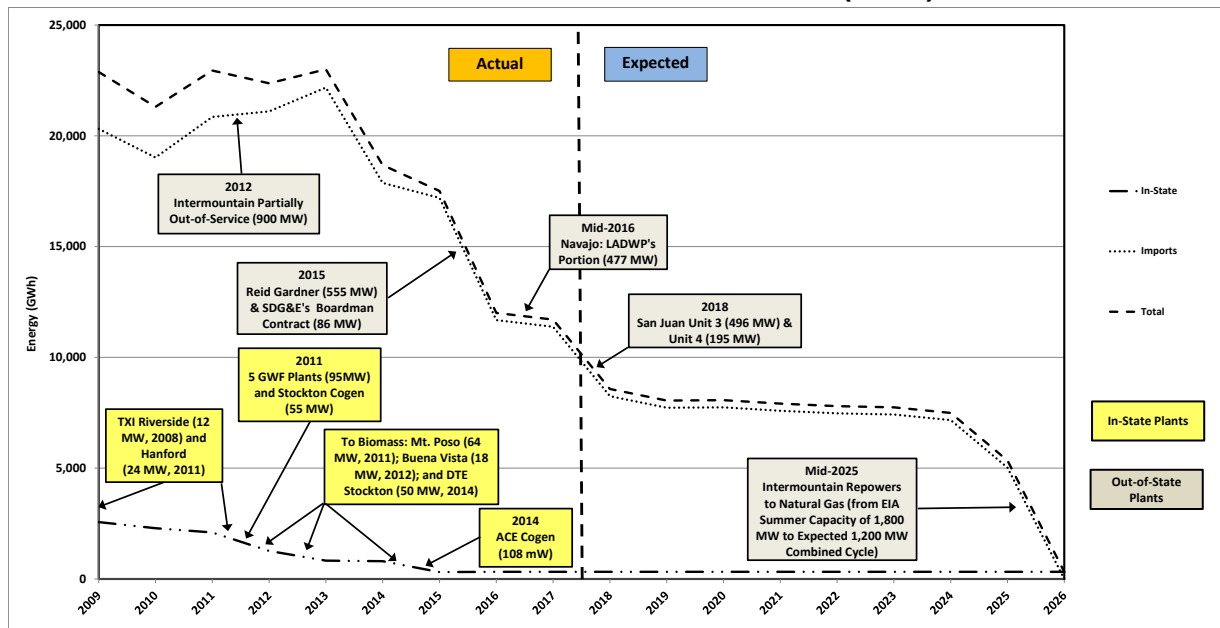


Figure 2: Annual Coal-Fired Generation as a Portion of Total Generation for California



Source: California Energy Commission, Energy Almanac, *Total System Power*, http://www.energy.ca.gov/almanac/electricity_data/total_system_power.html.

Figure 3: Actual and Expected Reductions of Energy by Coal-Fired Plants Used to Serve California 2009-2026 (GWh)



Sources: 1) Electricity Supply Forms (S-1 and S-2) submitted by LSEs for the California Energy Commission's *Integrated Energy Policy Reports (IEPR)*, http://www.energy.ca.gov/almanac/electricity_data/ (under Utility Plans 2017 and Utility Capacity and Supply Plans for 2011 – 2015); and 2) M-S-R Resolution No. 2015-02, <http://msrpower.org/Portals/0/Public%20Documents/M-S-R%20Public%20Power%20Agency%20Commission%20Agendas/MSRPPACommissionMeeting-July222015.pdf>.



**Table 1: Coal-Fired Generation Either Contracted or Owned by a California Load-Serving Entity for Select Years
(2017 – 2026 Generation Estimated in GWh)**

	Year	# of Coal-Fired Plants	# of Coal-Fired Units	Total Plant Capacity (MW)	Plant Capacity Contracted or Owned by a California LSE (MW)	Generation for California (GWh)
Reported	2009	22	26	4,625	2,718	22,877
	2011	20	24	4,578	2,795	22,946
	2012	17	21	4,441	2,877	22,369
	2013	10	14	4,272	2,895	22,999
	2014	8	12	3,246	2,675	18,679
	2015	5	9	3,062	2,679	17,508
	2016	5	9	3,062	2,679	12,007
Estimated	2017	4	8	2,585	2,193	11,703
	2019	2	5	1,839	1,773	8,053
	2025	2	5	1,839	585	5,342
	2026	1	3	63	63	324

Sources: Numbers of plants, units and total plant capacities are from the California Energy Commission’s Energy Almanac and U.S. Energy Information Agency EIA-860 data. Contracted or owned plant capacities from 2009 through 2016, and estimated capacities and generation 2017 through 2026 are from the Energy Almanac Utility Plans. Generation from 2009 through 2016 is from the Energy Almanac, Total System Power. The Energy Almanac is available at http://www.energy.ca.gov/almanac/electricity_data/ and the EIA-860 data is available at <https://www.eia.gov/electricity/data/eia860/>.

Note: Total System Power is a source of data for Tables 1 and 2. Total System Power data before 2009 is not included because import data in previous years used simple splits between generation from the Pacific Northwest and Pacific Southwest that overstated imports from the northwest and understated imports from the southwest.

Since 2007, 11 in-state coal-fired plants retired (370 MW) and three converted to biomass fuel (132 MW). With the retirement of the 108 MW ACE Cogeneration plant in 2014, the last remaining coal-fired power plant in California is the 63 MW Argus Cogen plant.⁴ Both plants are located in Trona, San Bernardino County.

⁴ The Argus Plant is comprised of both the Argus Cogeneration Plant (Argus Cogen Plant) and the Argus Cogeneration Expansion Plant (ACE Cogen Plant). The Argus Cogen Plant consists of a 7.5 MW unit that is used for blackstart and runs on natural gas. Two additional 27.5 MW units both run primarily on coal, with natural gas as a secondary fuel. Natural gas accounts for only 2.2 percent of the fuel used for both units. The ACE Cogen Plant is an existing but retired and non-operable coal-fired power plant that ceased operations in October 2014. In October 2016 an equipment failure at the ACE facility lead to the use of its on-site diesel generator to maintain the retired facility’s equipment. On November 8, 2017, the Energy Commission approved an order to separate the ACE facility from the landfill portion of the project and to allow for continued use of its on-site diesel generator.



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In addition, California’s affiliations with seven out-of-state plants totaling 2,635 MW ended between 2012 and 2016. Energy Commission staff is expecting three more affiliations with out-of-state plants will end by December 30, 2025, totaling 2,226 MW.

In 2009, 22,877 GWh of coal-fired generation accounted for about 7.7 percent of electricity generation for California. By 2016, coal-fired generation’s share had dropped to about 4 percent, or 12,007 GWh. **Table 2** also shows that total statewide electricity load served by imported coal-fired generation declined about 48 percent from 2009 to 2016.

Table 2: In-State and Imported Coal-Fired Generation With First Point of Connection to a California Balancing Authority (Gigawatt-Hours)

Year	Total Generation to Serve California Loads	Coal-Fired Generation		
		In-State	Imported	Total
2009	298,310	2,565	20,312	22,877
		0.9%	6.8%	7.7%
2010	290,518	2,290	19,019	21,309
		0.8%	6.5%	7.3%
2011	293,652	2,096	20,850	22,946
		0.7%	7.1%	7.8%
2012	301,966	1,263	21,106	22,369
		0.4%	7.0%	7.4%
2013	296,628	824	22,175	22,999
		0.3%	7.5%	7.8%
2014	297,062	802	17,877	18,679
		0.3%	6.0%	6.3%
2015	295,405	311	17,197	17,508
		0.1%	5.8%	5.9%
2016	290,567	324	11,683	12,007
		0.1%	4.0%	4.1%

Sources: California Energy Commission, California Electricity Data, Facts, & Statistics, Data, Facts, & Statistics, Total Electric Generation (2016) and Total System Power (prior to 2009 through 2015).

http://www.energy.ca.gov/almanac/electricity_data/

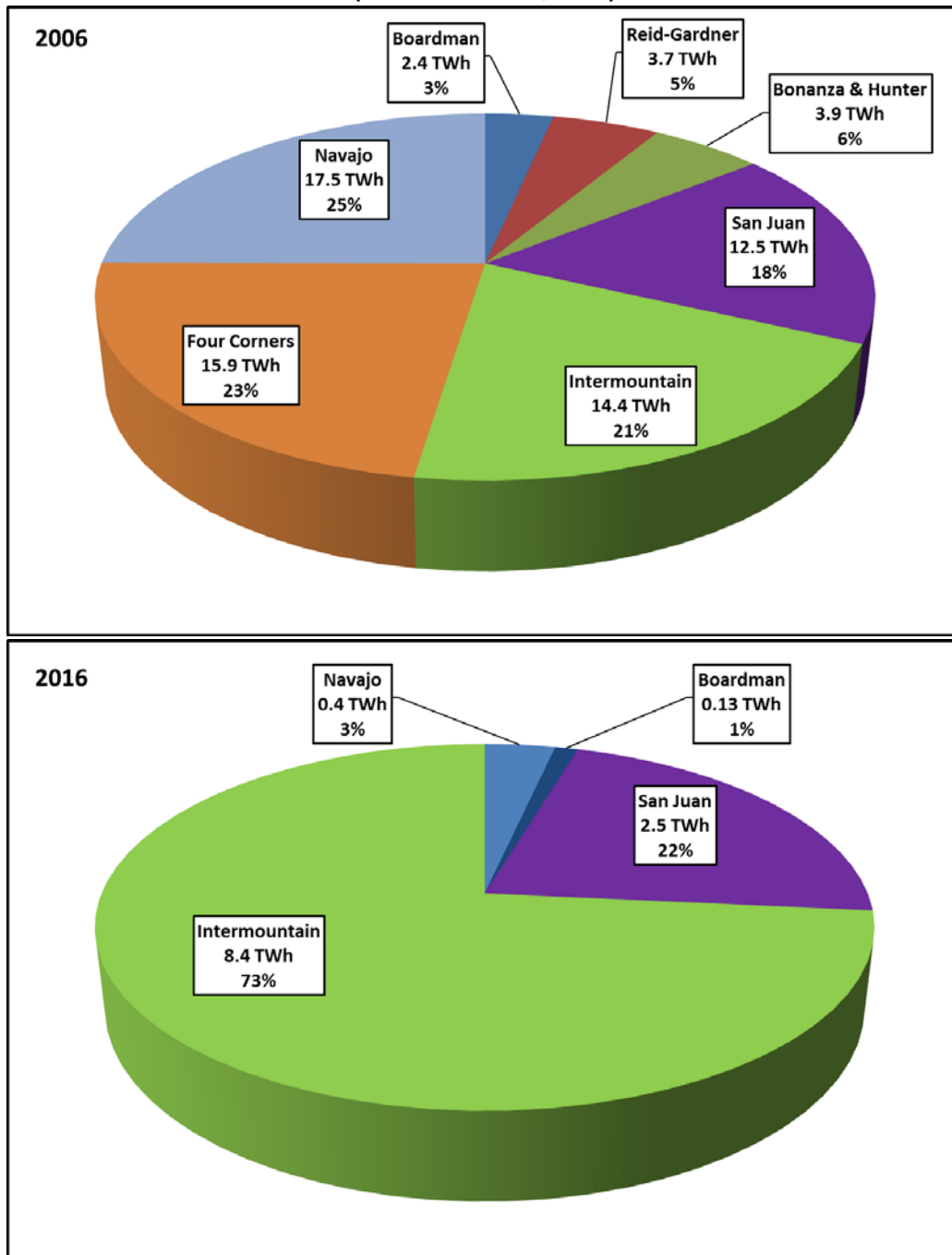
Note: Total may not equal in-state plus imported due to rounding. Also, see note on Table 1.

Differences in generation between **Tables 1** and **2** are due to differences in reporting sources. **Table 1** data are reported in utility filings under biennial Integrated Energy Policy Report requirements. **Table 2** data are power plant owners/operators reporting under Quarterly Fuel and Energy Report requirements. Metering, losses, and other reasons may also contribute to differences.



Figure 4 shows plant shares of imports for both 2006 and 2016. By 2016, the number of out-of-state coal-fired power plants decreased from seven to four.

Figure 4: Coal Energy Direct Imports in 2006 and 2016 (Terawatt-Hours, TWh)



Source: U.S. Energy Information Agency, EIA-623



Actions Expected to Further Reduce California's Use of Coal-Fired Generation

The largest coal-fired generation resource serving California is IPP in Utah. Six publicly owned utilities (Anaheim, Burbank, Glendale, Pasadena, Riverside, and LADWP) expect to replace IPP with a natural gas-fired, combined-cycle plant and to continue purchasing power from mid-2027 through mid-2077. The new plant would consist of two combined-cycle units, each 600 MW for a total of 1,200 MW. If the new plant becomes commercially operational by mid-2025, coal-fired generation from the current plant would cease two years earlier than the current contract expiration date. Momentum for converting coal-fired to natural gas-fired generation has been building in recent years, driven primarily by reductions in the price of natural gas, as well as environmental regulations.

In late-2015, M-S-R (Modesto Irrigation District, Silicon Valley Power, and Redding Electric) informed the Energy Commission that it will exit its ownership in San Juan Unit 4 by January 1, 2018. Staff expects that Anaheim will exit by 2018 as well, but has been unable to confirm. Three small LSEs (Azusa, Banning, and Colton) could end their affiliations with San Juan Unit 3 in New Mexico early. If so, this would reduce annual energy provided to these cities by 522 GWh per year. Also, if Anaheim ends its affiliation with San Juan Unit 4, another reduction of 345 GWh per year would take place.

Current expectations are for a 4 percent decrease from 2016 through 2026, when essentially all specified coal-fired generation used to serve California loads ends. This is several years earlier than anticipated in previous Tracking Progress updates because utilities have accelerated ending their ownership of, or contracts for, coal-fired power generation. California's emission reduction policies, such as California's EPS and Cap and Trade program, are a major impetus behind these changes.

Table 3 provides information on the out-of-state plants that are either owned by, or under long-term contract to a California LSE. Staff expects that by 2019, IPP will be the only operational out-of-state coal-fired power plant that has a long-term contract with a California LSE and no out-of-state coal-fired power plants will be owned by a California LSE. **Table 4** provides information on the retirements of in-state coal-fired power plants over the last decade, and last remaining in-state plant, Argus Cogeneration.



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Table 3: Status of Out-of-State Coal-Fired Generation

Plant Name	State	Nameplate Capacity	Utility and Capacity Under Contract or Owned		Status
Operational					
Boardman	Oregon	460 MW	Turlock, 55 MW		Turlock Irrigation District's contract expires 2018. Portland General Electric, the owner, is expected to retire the plant by the end of 2020.
Intermountain Power Project (IPP)	Utah	1,775 MW	Anaheim 236 MW, Burbank 75 MW; Glendale 35 MW; LADWP 1,198 MW; Pasadena 94 MW; Riverside 137 MW		In late 2016, the Energy Commission approved EPS compliance filings by LADWP, Glendale, Pasadena, Burbank, and Riverside to replace the existing IPP coal-fired contract with a contract for a new 1,200 MW natural gas-fired combined-cycle power plant by July 1, 2025. This would be almost two years before the current contract ends. Anaheim will not participate in the replacement project.
San Juan Units 3 and 4	New Mexico	Unit 3, 496 MW Unit 4, 507 MW	1,003 MW total		Unit 3 is expected to retire the end of 2017. M-S-R owns 28.8 percent of Unit 4 but will exit by 2018. Although Anaheim's contract for Unit 4 expires in 2022, it too is expected to exit by 2018.
Affiliation(s) Ended					
Navajo	Arizona	2,250 MW	LADWP, 477 MW		LADWP sold its contract share to the Salt River Project in June 2016.
Boardman	Oregon	460 MW	SDG&E, 86 MW		SDG&E's contract expired 2013.
Four Corners Units 4 and 5	New Mexico	2,040 MW total: Unit 4, 745 MW Unit 5, 745 MW	SCE, 720 MW		Arizona Public Service purchased SCE's ownership in Units 4 and 5 in 2013 and closed Units 1, 2, and 3.
Retired					
Deseret Bonanza & Hunter	Utah	Bonanza, 500 MW Hunter, 1,472 MW	Riverside, 52 MW		Riverside's affiliation ended in 2010.
Mohave	Nevada	1,636 MW 2 x 818 MW	SCE, 916 MW LADWP, 164 MW		Mohave was retired 2005 and dismantled.
Reid Gardner Unit 4	Nevada	557 MW total: Unit 1, 100 MW Unit 2, 100 MW Unit 3, 100 MW Unit 4, 257 MW	California Department of Water Resource (CDWR), 220 MW		CDWR's contract for Unit 4 expired July 25, 2013. Units 1, 2, and 3 retired in 2014. Unit 4 will retire by January 2018.
2006 Imports			3,789 MW	27,482 GWh	7 plants operational
2016 Imports			2,679 MW	11,683 GWh	4 plants operational.
2026 Estimated Imports			0 MW	0 GWh	Out-of-state coal-fired affiliations are expected to end by 2025.

Source: Quarterly Fuels and Energy Reports submitted to the Energy Commission with updates verified by Energy Commission staff: 1) 2017 Integrated Energy Policy Report electricity supply filings, 2) Emission Performance Standard compliance filings, and 3) various news articles. http://energyalmanac.ca.gov/electricity/web_qfer/.



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Table 4: Status of Coal and Petroleum Coke Plants in California

Plant Name	County	Capacity (MW)	Primary Fuel Type	Status
Operational				
Argus Cogen	San Bernardino	63	Bituminous coal	Expected to remain operational indefinitely. However, the oldest unit, the 7.5 MW TG #5, is 70 years old and the other two units, each 27.5 MW, are almost 40 years old.
Retired				
Hanford LP	Kings	24	Petroleum Coke	Retired 10/18/2011
TXI Riverside	San Bernardino	12	Bituminous Coal	Retired 3/31/2008
Stockton Cogen	San Joaquin	55	Bituminous coal	Retired 3/31/2012
GWF E. Third Street	Contra Costa	19	Petroleum Coke	Retired 4/26/2012
GWF Loveridge Rd	Contra Costa	19	Petroleum Coke	Retired 4/26/2012
GWF Nichols Rd	Contra Costa	19	Petroleum Coke	Retired 4/26/2012
GWF Wilbur East	Contra Costa	19	Petroleum Coke	Retired 4/26/2012
GWF Wilbur West	Contra Costa	19	Petroleum Coke	Retired 4/26/2012
ACE Cogen	San Bernardino	108	Bituminous coal	Ceased operations on 12/1/2014.
Rio Bravo Poso	Kern	38	Bituminous coal	Rio Bravo Jasmin ceased operations on 10/1/2014. The power purchase agreement (PPA) with SCE was terminated on 1/20/2016.
Rio Bravo Jasmin	Kern	38	Bituminous coal	Rio Bravo Jasmin ceased operations on 10/1/2014. The PPA with SCE was terminated on 1/20/2016.
Converted				
Mt. Poso	Kern	64	Converted to biomass	Converted 11/1/2011. Under contract with PG&E through 2/27/2027. CEC ID was C0016.
DTE Stockton	San Joaquin	50	Converted to biomass	Converted 2/21/2014. New contract end date: 6/30/2038. CEC ID was C0213.
Buena Vista (Jackson Valley)	Amador	18	Converted to biomass	Converted in 2012. Under contract to SMUD through 11/30/2032. CEC ID was C0005.
2007 Totals		593 MW	4,217 GWh	16 plants operational
2016 Totals		63 MW	324 GWh	1 plant operational, 8 retired, 3 ceased operation, 3 converted to biomass

Source: Quarterly Fuels and Energy Reports submitted to the Energy Commission with updates verified by Energy Commission staff.

http://www.energy.ca.gov/almanac/electricity_data/web_qfer/Power_Plant_Statistical_Information.php.



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Other Coal-Fired Generation

California LSEs report in their annual Power Source Disclosure filings the generation they purchase from specific out-of-state coal-fired plants. These purchases are not subject to the EPS because they are not long-term contracts of five years or more. In 2016, the total generation was 557 GWh, being 0.6 percent of specified coal-fired imports and 0.2 percent of all generation for California.⁵

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⁵ Total System Electric Generation for 2016, California Energy Almanac, http://www.energy.ca.gov/almanac/electricity_data/total_system_power.html.