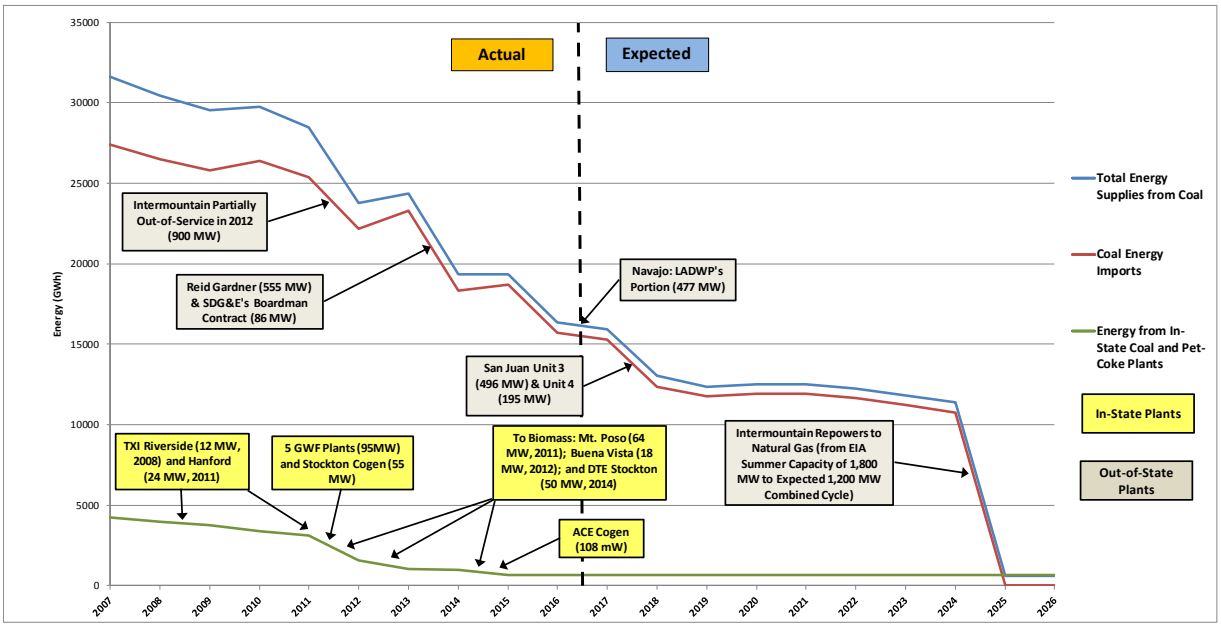
# Actual and Expected Energy From Coal for California − Overview

An important part of California's efforts to reduce greenhouse gas emissions has been reducing its use of coal-fired electricity generation.[1] From 2006 through July 2016, 3,463 megawatts (MW) of capacity from imported and in-state coal-fired plants were removed from California's resource portfolio. By the end of 2015, coal-fired electricity generation plants represented less than 6 percent of the energy used to serve California. About 97 percent of the energy was generated by power plants outside California. Coal-fired generation is expected to serve about 3 percent of California's electricity consumption by 2024, and this generation is expected to decline to zero by 2026. **Figure 1** shows the declining contribution of coal-fired generation in meeting California's annual electrical loads from 1996 through 2026, with notations about contracts for coal-fired generation that have ended and power plant retirements or conversion to another fuel type.

**Figure 1: Actual and Expected Reductions of Energy by Coal-Fired Plants Used to Serve California Loads (2007-2026)**




Sources: 1) Electricity Supply Forms (S-2 and S-5) submitted by load-serving entities for the California Energy Commission's 2009, 2011, 2013, and 2015 *Integrated Energy Policy Reports (IEPR)* available at http://energyalmanac.ca.gov/electricity/; 2) M-S-R Resolution No. 2015-02.

1 According the U.S. Energy Information Agency, carbon dioxide emission rates in pounds of ccarbon dioxide per megawatt-hour of generation is 2,160 for coal and 1,220 for natural gas. Source: https://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11 accessed September 27, 2016.

### *California's Emission Performance Standard*

Senate Bill 1368 (Perata, Chapter 598, Statutes of 2006) required setting an Emission Performance Standard (EPS) for California load-serving entities (LSE) such as Pacific Gas and Electric (PG&E) and Los Angeles Department of Water & Power (LADWP). The EPS applies to baseload generation that is either owned by, or under long-term contract to, any California LSE. (The EPS defines baseload 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 project, among other criteria.

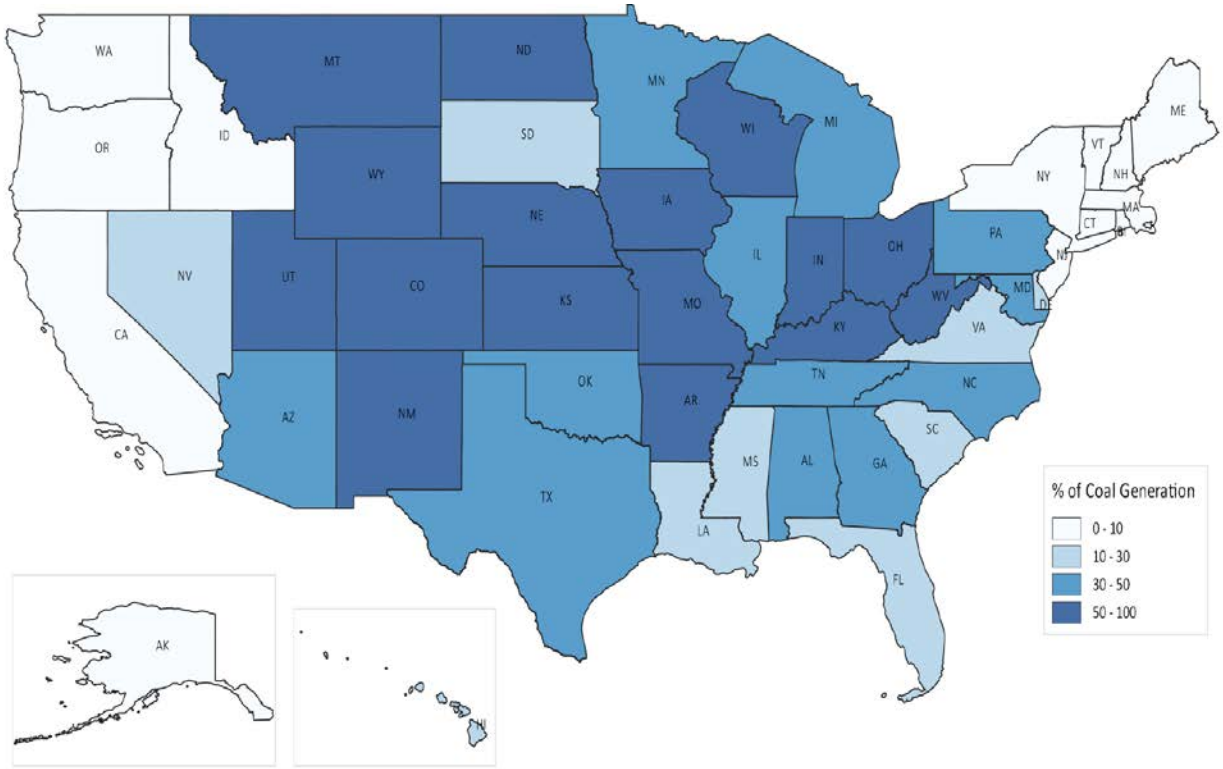
The EPS has been a driving force behind California's utilities ending, or planning to end, affiliations (contracts and/or ownership) with coal-fired generation resources, especially with large out-of-state plants. For example, by 2014, Southern California Edison (SCE), San Diego Gas & Electric (SDG&E), and the California Department of Water Resources had ended their affiliations with baseload coal-fired generation.

Also, the LADWP ended its affiliation with the Navajo power plant in Arizona in the summer of 2016 and is planning to replace the coal-fired Intermountain Power Plant (IPP) in Utah with a new natural gas-fired combined cycle plant. These events were at least partially attributable to the EPS.

California uses less in-state coal-fired electricity generation than most other states. **Figure 2** shows that 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. California's in-state coal-fired generation during 2015 was roughly 0.5 percent of the total in-state electricity generation. 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 do not have in-state coal-fired generation.) Nonetheless, the nation's coal-fired generation has been dropping. Just between 2014 and 2015, coal-fired generation went from about 40 percent to about 33 percent of the total national electric generation portfolio.

In late 2015, M-S-R (composed of 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, although this has not been confirmed. Current expectations are for a 4 percent decrease from 2006 through 2026, when essentially all specified coal-fired generation used to serve California loads ends. This is several years earlier than anticipated in previous updates of this Tracking Progress page because utilities have accelerated ending their ownership of, or contracts for, coal-based power generation. California's emission reduction policies are a major impetus behind these changes, and they continue to apply pressure for reductions in coal-fired generation from both in-state and out-of-state power plants.

**Figure 2: In-State Electric Generation From Coal for Calendar Year 2015**




Sources: California Public Utilities Commission,
http://www.energy.ca.gov/renewables/tracking_progress/documents/current_expected_energy_from_coal.pdf

### *Progress Made in Reducing California's Use of Coal-Fired Generation*

Although not prompted by the EPS, the closure of the 1,636 MW Mohave Generating Station on December 31, 2005, was the first large reduction of coal-fired generation used by California after concerns about greenhouse gas emissions became a high priority. Its closure reduced California's use of coal-fired generation by 612 MW and 3,920 GWh. This generation represented 5 percent of the total capacity from coal use. As shown in **Table 1**, in 2006, coal-fired generation accounted for 6 percent of California's electricity consumption, 18,400 gigawatt-hours (GWh). Hydroelectric generation was relatively high in the western United States in 2006. In 2008, a "normal" hydroelectric year, coal provided 41,366 GWh (13 percent) of the total electricity generation. By 2015, the supply had dropped almost 60 percent to 17,735 GWh. From 2007 through 2015, the total statewide electricity consumption served by imported coal-fired generation fell from 9 percent to 6 percent, but in-state generation remained around 1 percent. Coal-fired generation continued to decline even through the drought years of 2011 through 2015, when hydroelectric generation was low.

*Progress Made in Reducing Coal-Fired Imports*

Essentially all coal-fired generation serving California has been imported. IPP is the only power plant that imports directly to a California balancing area. Energy from Boardman (Oregon), Navajo (Arizona), and San Juan Units 3 and 4 (New Mexico) is imported via the West's bulk transmission in system. **Table 1** shows that 51,852 GWh of electricity was imported from coal-burning plants in 2008, a low hydroelectric generation year. This generation dropped to 17,197 GWh in 2015, despite the very low hydroelectric generation of the then-four-year drought.[2]

**Table 1: In-State and Imported Coal-Fired Generation With First Point of Connection Being a California Balancing Area**

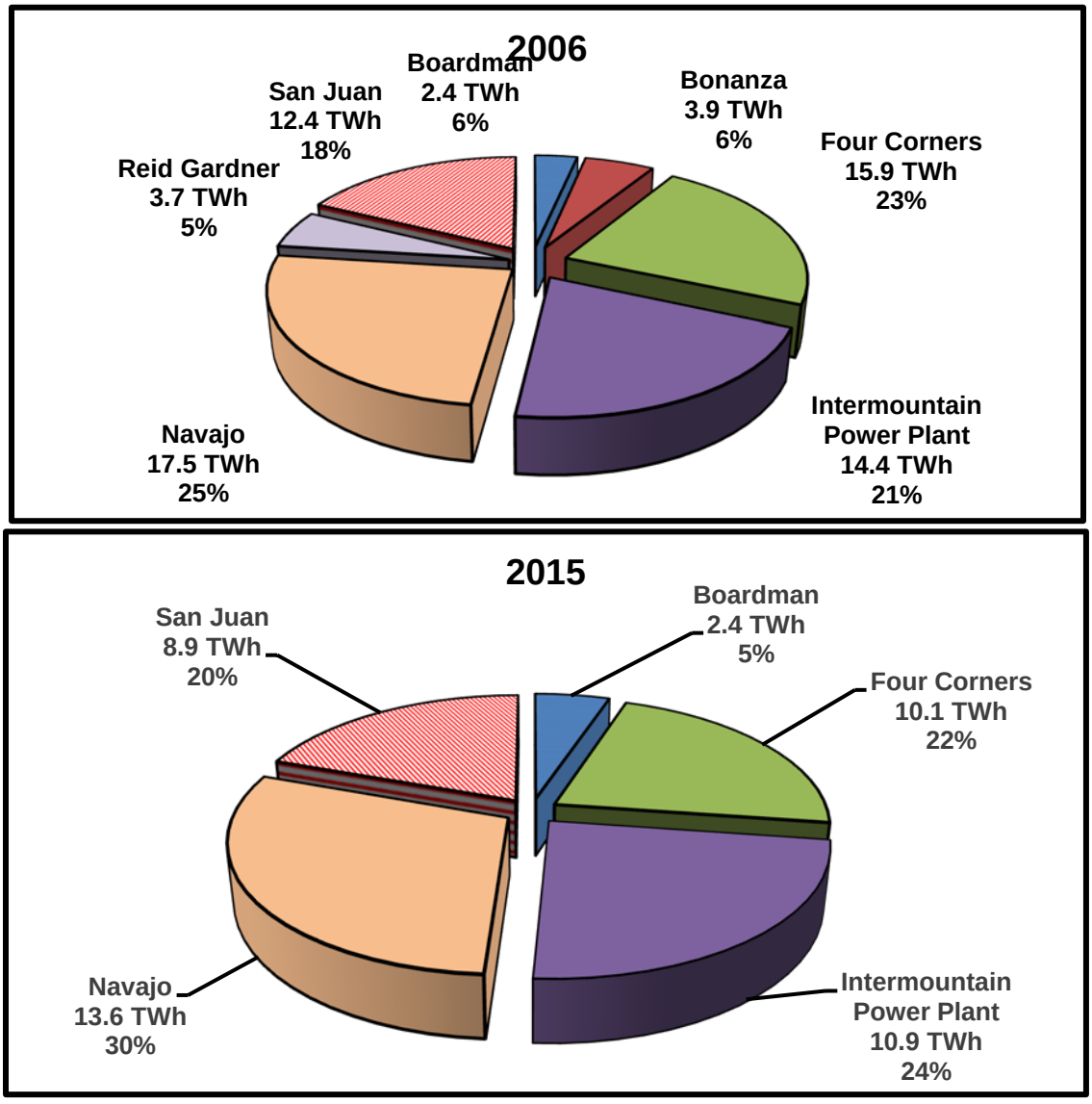
| Used to Serve California Loads (2006–2015) Year | Total Generation to Serve California Loads | Coal-Fired Generation | | |
|---|---|---|---|---|
| | | In-State | Imported | Total |
| **2006** | 298,316 | 4,190 | 28,622 | 32,812 |
| | | 1.4% | 9.6% | 11.0% |
| **2007** | 304,909 | 4,217 | 45,821 | 50,038 |
| | | 1.4% | 15.0% | 16.4% |
| **2008** | 307,450 | 3,977 | 51,852 | 55,829 |
| | | 1.3% | 16.9% | 18.2% |
| **2009** | 298,449 | 3,735 | 19,019 | 22,754 |
| | | 1.3% | 6.4% | 7.6% |
| **2010** | 291,184 | 3,406 | 19,019 | 22,425 |
| | | 1.2% | 6.5% | 7.7% |
| **2011** | 293,779 | 3,120 | 20,850 | 23,970 |
| | | 1.1% | 7.1% | 8.2% |
| **2012** | 302,320 | 1,580 | 21,106 | 22,686 |
| | | 0.5% | 7.0% | 7.5% |
| **2013** | 296,250 | 1,018 | 22,175 | 23,193 |
| | | 0.3% | 7.5% | 7.8% |
| **2014** | 297,062 | 1,011 | 17,877 | 18,888 |
| | | 0.3% | 6.0% | 6.4% |
| **2015** | 295,405 | 538 | 17,197 | 17,735 |
| | | 0.2% | 5.8% | 6.0% |

Note: Total may not equal in-state plus imported due to rounding.
Sources: California Energy Commission, California Electricity Data, Facts, & Statistics, Data, Facts, & Statistics, *Total Electric System Power*

2 A 1,600 increase in solar generation from 2011 to 2015 reduced coal-fired generation in 2015 as well as avoiding any substantial increase in natural gas-fired generation. http://www.energy.ca.gov/almanac/renewables_data/

**Figure 3** shows plant shares of imports for both 2006 and 2015, with IPP providing the most in both years. By 2015, the number of out-of-state coal-fired power plants decreased from seven to five. More information about out-of-state coal-fired plants is shown in **Table 3**.

**Figure 3: Coal Energy Direct Imports in 2006 and 2015**
**(Energy Is in Terawatt-Hours, TWh)**




Source: Electricity Supply Forms (S-2 and S-5) submitted by LSEs for the California Energy Commission's 2009, 2011, 2013, and 2015 *Integrated Energy Policy Reports (IEPR)* available at http://energyalmanac.ca.gov/electricity/.

Note: Directly imported means a power plant located out-of-state but has its first point of connection in a California balancing area. Intermountain Generating Station is the only coal-fired power plant in this category, being directly connected with the LADWP system.

**Table 3: Status of Out-of-State Coal Plants**

| 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. Plant is expected to retire by 12/31/2020. |
| Intermountain | Utah | 1,775 MW | Anaheim 236 MW, Burbank 75 MW; Glendale 35 MW; LADWP 1,198 MW; Pasadena 94 MW; Riverside 137 MW | | On October 19, 2016, the Energy Commission approved LADWP's EPS compliance filing to replace the existing IPP coal-fired contract with a contract for a new 1,200 MW, natural gas-fired combined-cycle plant by 7/1/25.This would be almost two years before the current contract ends. Glendale and Pasadena filed identical contracts for consideration by the Energy Commission at its November 2016 business meeting. Burbank and Riverside filings are expected before 12/30/16. |
| San Juan Units 3 and 4 | New Mexico | 1,683 MW total: Unit 1, 340 MW Unit 2, 340 MW Unit 3, 496 MW Unit 4, 507 MW | Unit 3: 496 MW: Azusa 30MW; Banning 19 MW; Colton 30 MW; Glendale 20 MW; Imperial ID 102 MW. Unit 4: Anaheim 50 MW; Modesto 72 MW; Redding 22 MW; Silicon Valley Power 51 MW. | | 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 |
| **2015 Imports** | | | **2,716 MW** | **18,342 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 and available at http://energyalmanac.ca.gov/electricity/web_qfer/ with updates verified by Energy Commission staff.

### *Progress Made in Reducing In-State Coal-Fired Generation*

**Table 4** provides a summary about in-state plants. In-state coal-fired generation served about 1 percent of California loads until 2012, when seven plants were retired, taking 150 MW of capacity out of the system. In 2014, in-state generation dropped to less than 0.5 percent, primarily due to the retirement of the 108 MW ACE Cogeneration plant in December. With the retirement of the ACE Cogeneration plant, staff estimates that in-state generation in 2015 will be about 0.02 percent of the state's load. (ACE Cogeneration provided about one-third of the total in-state coal-fired generation in 2013.) The last remaining coal-fired power plant in California is the 63 MW Argus Cogen plant in San Bernardino.

### *Actions That May Accelerate Reductions in California's Use of Coal-Fired Generation*

As shown above, the largest known coal-fired generation resource serving California is IPP in Utah. Six publicly owned utilities (Anaheim, Burbank, Glendale, Pasadena, Riverside, and LADWP) are considering contracts to replace IPP with a natural gas-fired, combined-cycle plant and to continue purchasing power from mid-2027 through mid-2077. In fact, on September 21, 2016, LADWP filed an application for determination of compliance with the Energy Commission, and the City of Pasadena is expected to file a similar application soon. The 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.

Furthermore, 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 522,000 MWh per year. If Anaheim ends its affiliation with San Juan Unit 4, another reduction of 345,000 MWh per year would take place. Although speculative, 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.

The U.S. Environmental Protection Agency's *Clean Power Plan* is the most recent regulatory action that may spur retirement and conversion of existing coal-fired power plants and prevent construction of new facilities. The *Clean Power Plan* establishes interim and final carbon dioxide emission performance rates for two subcategories of fossil fuel-fired electric generating units: fossil fuel-fired electric steam generating units (generally, coal- and oil-fired power plants) and natural gas-fired, combined-cycle generating units. Although the *Clean Power Plan*'s impact on California's use of specified coal-fired imports is expected to be minimal due to the EPS, the *Clean Power Plan* may have substantial impacts on the unspecified portion of imports that may include coal-fired generation.

**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. |
| **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 Estimated Totals** | | **63 MW** | **310 GWh** | 1 plant operational, 8 retired, 3 ceased operation, 3 converted to biomass |

Source: Quarterly Fuels and Energy Reports submitted to the Energy Commission and available at http://www.energy.ca.gov/almanac/electricity_data/web_qfer/Power_Plant_Statistical_Information.php with updates verified by Energy Commission staff.

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**Next Update:**

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