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# Total Electricity System Power

## 2015 Total System Power in Gigawatt Hours

| Fuel Type | California In-State Generation (GWh) | Percent of California In-State Generation | Northwest Imports (GWh) | Southwest Imports (GWh) | California Power Mix (GWh) | Percent California Power Mix |
|---|---|---|---|---|---|---|
| Coal | 538 | 0.30% | 294 | 16,903 | 17,735 | 6.00% |
| Large Hydro | 11,569 | 5.90% | 2.235 | 2,144 | 15,948 | 5.40% |
| Natural Gas | 117,490 | 59.90% | 49 | 12,211 | 129,750 | 44.00% |
| Nuclear | 18,525 | 9.40% | 0 | 8,726 | 27,251 | 9.20% |
| Oil | 54 | 0.00% | 0 | 0 | 54 | 0.00% |
| Other | 14 | 0.00% | 0 | 0 | 14 | 0.00% |
| Renewables | 48,005 | 24.50% | 12,321 | 4,455 | 64,781 | 21.90% |
| Biomass | 6,362 | 3.20% | 1,143 | 42 | 7,546 | 2.60% |
| Geothermal | 11,994 | 6.10% | 132 | 757 | 12,883 | 4.40% |
| Small Hydro | 2,423 | 1.20% | 191 | 2 | 2,616 | 0.90% |
| Solar | 15,046 | 7.70% | 0 | 2,583 | 17,629 | 6.00% |
| Wind | 12,180 | 6.20% | 10,855 | 1,072 | 24,107 | 8.20% |
| Unspecified Sources of Power | N/A | N/A | 20,901 | 18,972 | 39,873 | 13.50% |
| Total | 196,195 | 100.0% | 35,800 | 63,410 | 295,405 | 100.0% |

Source: QFER and SB 1305 Reporting Requirements. In-state generation is reported generation from units 1 MW and larger

**Almanac Informa**

Electricity
Natural Gas/ LNG
Petroleum
Power Plants
Renewable Energy
Transportation Energy

Contact: Michael Nyberg, Michael.Nyberg@energy.ca.gov

Data as of July 11, 2016

Total system power is defined as the annual total energy requirement for all load serving entities with end-use loads in California, including self-generation supply for combined heat and power, and other non-utility served loads from power plants that are one (1) megawatt and larger in nameplate capacity.

## Changes from 2014

In 2015, total system power for California was 295,405 gigawatt-hours (GWh), down about 0.5 percent from 2014's total system power of 297,062 GWh[1]. California's in-state electricity production was down by 1.5 percent at 196,195 GWh compared to 199,193 GWh. This decline in total system power, power from electric generation facilities rated at 1 megawatt (MW) and larger, is consistent with the recently published California Energy Demand 2016-2026 Revised Electricity Forecast[2]. Specifically, lower baseline per capita electricity consumption resulting from additional federal appliance standards[3] and higher self-generation from behind the meter roof-top photovoltaic (PV) solar power systems are reducing total retail sales. [4] In short, increased energy efficiency combined with PV self-generation are slowly reducing traditional system power.

Average temperatures in California continued to be above normal during all of 2015, ranking as the second warmest year on record. Both summer and winter months ranked as the hottest on record over the past 120 years. [5] Average temperatures are derived from the daily mean of the maximum and minimum temperatures observed on each calendar day. [6] Drought conditions persisted for much of the year; California's hydroelectric generation was at its lowest level of the past 15 years, dropping another 15 percent (2,484 GWh) from 2014 generation levels and a dramatic 67 percent since 2011, the last wet year in California. By the end of 2015, El Niño conditions had modestly improved precipitation for the state resulting in California having its 13th driest year. Unfortunately, much of the increased precipitation fell as rain and not snow, limiting early snowpack accumulations. Although, by the spring 2016, near-to-above average snowpack was measured in the Sierra Nevada. [7]

In years of low hydroelectric availability, natural gas-fired electric generation typically makes up the difference. However, in-state natural gas-fired electric generation also decreased in 2015 by approximately 3.7 percent (4,515 GWh) to 117,490 GWh. The deficits in both natural gas and hydroelectric generation would be made up by nuclear and utility-scale solar generation. Total in-state solar generation increased 42 percent (4,461 GWh) from 2014 levels to 15,046 GWh. Nuclear generation increased by 9 percent (1,497 GWh) in 2015 with both units at PG&E's Diablo Canyon operating normally throughout most of the year. The increased nuclear generation resulted from a delay until May 2016 for the planned refueling of one of the generating units, originally scheduled to be offline in September 2015. Nuclear energy combined with large hydroelectric and renewable energy account for 40 percent of California's in-state generation.

Total imports from the Northwest and Southwest increased slightly (1.4 percent) from 2014 levels based on net power imports by California balancing authorities. Balancing authorities control power flowing across transmission ties between different regions within the Western Electricity Coordinating Council. Net imports were 99,210 GWh in 2015, up 1,341 GWh from 2014. The following four California balancing authorities report their annual energy imports and exports to the Energy Commission: Balancing Authority of Northern California, California Independent System Operator, Los Angeles Department of Water and Power, and Imperial Irrigation District.

Wind projects in California continued to contribute slightly more than 6 percent of in-state generation in 2015, about 12,180 GWh. Wind generation imports from the Northwest were up slightly from 2014 at 10,855 GWh for 2015 along with an additional 1,072 GWh from the Southwest resulting in a total of 24,107 GWh of total wind generation serving the state's need in 2015, about 0.5 percent more than 2014.

Solar PV generating capacity increased by more than 1,000 MW in 2015 resulting in a 42 percent increase in solar energy generated compared to 2014. By the close of 2015, in-state solar capacity was 5,939 MW. Annual in-state solar energy was 15,046 GWh in 2015, up 4,461 GWh from 2014. Significant new solar PV

projects in California included the Desert Stateline Solar Facility (186 MW) and Alamo Solar (20 MW) in San Bernardino County, McCoy Solar (126 MW) and AP North Lake Solar (20 MW) in Riverside County, North Star Solar (62 MW) in Fresno County, Seville Solar One (20 MW), Seville Solar Two (30 MW), and IVSC 2 (20 MW) in Imperial County, and Hayworth Solar Farm (27 MW), Lost Hills Solar (21 MW), Wildwood Solar I (20 MW), Shafter Solar (20 MW), Maricopa West Solar (20 MW), and Coronal Lost Hills Solar (20 MW) in Kern County.

Reporting requirements for total system power are limited to projects rated at 1 MW and larger. Because most solar PV systems on residential households and businesses are less than 1 MW, data on these installations is not collected through QFER. As distributed generation systems become a more significant portion of the state's generation mix, it may be appropriate to reconsider the exclusion of these smaller, behind-the-meter systems from the total system power summary.

[1]The updated Total System Power totals for 2014 are due to revised reports and updated data submitted by power plants after the February 15, 2015 reporting due date.

[2] Source: California Energy Demand Update Forecast, 2016-2026, Page 12, January 2016 CEC-200-2016-001-V1 http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-03/TN207439_20160115T152221_California_Energy_Demand_20162026_Revised_Electricity_Forecast.pdf

[3] Ibid, Page 16.

[4] Ibid, Page 19.

[5] NOAA National Centers for Environmental Information, State of the Climate: National Overview for Annual 2015, published online January 2016. Retrieved on June 28, 2016 from: http://www.ncdc.noaa.gov/sotc/national/201513.

[6]Vose, R. S., Williams, C. N., Karl, T. R., & Easterling, D. R. (2003, October 23). An Evaluation of the Time of Observation Bias Adjustment in the U.S. Historical Climatology Network. Geophysical Research Letters, 30(20), 2046th ser. Retrieved July 8, 2016, from http://www1.ncdc.noaa.gov/pub/data/ushcn/papers/vose-etal2003.pdf.

[7] NOAA National Centers for Environmental Information, State of the Climate: National Snow and Ice for March 2016, published online April 2016, retrieved on June 28, 2016 from: http://www.ncdc.noaa.gov/sotc/snow/201603.

## Additional Years - Total System Power

Current | 2014 | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 | 2004 | 2003 | 2002 | 2001
Note: 2002 - 2006 called "Gross System Power"

## Total System Power: Definition and Calculation Method

The California Code of Regulations (Title 20, Division 2, Chapter 2, Section 1304 (a)(1)-(2)) requires owners of power plants that are 1 megawatt (MW) or larger in California or within a control area with end users inside California to file data on electric generation, fuel use, and environmental attributes. Filings are submitted to the Energy Commission on a quarterly and annual basis. These filings cover all types of electric generation: wind, solar, geothermal, natural gas, hydroelectric, coal generators, and others. The reporting requirement includes facilities that have generation for onsite use, and non-retail generation with reversible turbines used to pump water. (Some of these facilities use electricity to store water in later months, while others pump water at night to generate electricity during subsequent daytime hours). Energy Commission staff collect and verify these reports to compile a statewide accounting of all electric

generation serving California.

Balancing Authorities (formerly known as Control Area Operators) are also required to report net amounts of electricity flowing across transmission ties from other Balancing Authority Areas.[3] These quarterly reports of electricity imports and exports are at least transparent and do reflect a net import requirement for California.

The net electricity imported from outside California (total imports minus exports) are separated into two geographical regions: the Northwest (NW) and the Southwest (SW) based on the source of the reported import.[4] This allocation of imports by specific fuel type is determined by utilities reporting under the Power Source Disclosure Program, described more fully below.

"Unspecified power" is the amount of energy that not specifically claimed by a utility under the Power Source Disclosure Program. This category includes spot market purchases, wholesale power marketing, purchases from pools of electricity where the original source of fuel is not determined, and "null power". Null power is the generic electricity commodity that remains when the renewable attributes (Renewable Energy Credits, or RECs) are sold separately.

Total System Power is the sum of all in-state generation plus net electricity imports (by fuel type) plus unspecified power. Total System Power cannot be used to track the state's progress for the Renewable Portfolio Standard (RPS) program due to the intricacies, nuances, and special requirements of the RPS legislation. For more information on the RPS program, see the Renewable Portfolio Standard (RPS) page.

[3] The boundaries of electrical California's Balancing Authority Areas do not correspond precisely with the state's geographic boundaries.
[4] The Northwest includes Alberta, British Columbia, Idaho, Montana, Oregon, South Dakota, Washington, and Wyoming. The Southwest includes Arizona, Baja California, Colorado, New Mexico, Nevada, Texas, and Utah.

## Power Source Disclosure Program

The Power Source Disclosure provides current and historical information about the program, requiring retail electricity providers report purchase and sales information to the Energy Commission and their retail customers. The Power Source Disclosure Program was authorized by Senate Bill 1305 (Stats. 1997, Chapter 796, Statutes of 1997), and revised in October 2009 by Assembly Bill 162 (Stats. 2009, Chapter 313). Consistent with the original legislation, retail suppliers of electricity are required to disclose to consumers "accurate, reliable, and simple-to-understand information on the sources of energy that are (being) used..."; (Public Utilities Code Section 398.1(b)).

The statutes require electricity suppliers inform their consumers about the types of generation resources used to provide their electricity. Suppliers are required to use a format developed by the Energy Commission called the Power Content Label. The statutes also require utilities to submit a detailed report of their fuel mix to the Energy Commission. These reports are available to the public upon request to the supplier.

Changes made by SBX1-2 (Chapter 1, Statutes of 2011) affecting the eligibility requirements for electricity products considered to be eligible under California's Renewable Portfolio Standard (RPS) also affect procurement claimed on the Power Content Labels. Because of this, revisions to the Power Source Disclosure Program have been delayed until the POU 33% RPS Regulations are further developed. However, changes to the Power Source Disclosure Program, as outlined in AB 162, do not require adoption of the new regulations to become effective. The requirements of AB 162 and the portions of SB 1305 not changed by AB 162 constitute current, effective law.

## Power Content Label

Power content label provides current information on how to report specified and unspecified power generation

## Unspecified Power

The term unspecified power is used in the context of allocating fuel types of power generation serving the state of California. California uses a variety of fuel types for power generation including natural gas, hydroelectric, geothermal, and other renewable and non-renewable sources. Unspecified power refers to the situation where the original fuel type of the generator is unknown. This only applies to power imported from out of state.

## What is Unspecified Power?

Prior to 2009 there was no category allowed for "unspecified power" in the Net System Power Report - everything had to be allocated under Net System Power. Accordingly, the Electricity Analysis Office (EAO) developed a generation profile mix of the Northwest and Southwest. Essentially, EAO calculated a Total System Power profile for each region. From these profiles, EAO allocated specified claims and then prorated the remainder of the resource mix to the unspecified category. The problem with this methodology was that it treated all unspecified imports as if they were made up of a mix of resources. This method combined both base load power and marginal power as equal. Obviously this was not a good methodology to follow but at the time it was the only one available.

The averaging methodology applied to the old Net System Power reports was widely recognized as flawed because it overestimated the role of baseload plants in the western spot market. Baseload plants selling to California are/were tied to long-term contracts. Most of the unspecified imports are spot market sales that represent about half of the imports. These sales primarily occur when there is surplus generation on the market that is less expensive than variable costs of some California plants.

System averaging does not reflect rate based utility portfolios, dispatch dynamics and short-term market transactions. Surplus, or marginal generation, is what typically serves the spot market. Hydro and coal used to be the marginal resource through the mid-1990's, but load growth surpassed coal generation capacity. Generally, hydroelectric and natural gas-fired electricity generation are considered the marginal generation sources in the interconnected western electricity system. There may be some surplus coal available during off-peak periods, but California generators are usually at minimum load levels during these periods.

The Total System Power table does not show all long-term coal contracts. Most of these are associated with smaller public owned utilities. However, at most, the volume will push the fractional totals by only a few percentage points. The new Power Source Disclosure regulations are expected to reveal these transactions [draft regulations posted May 5, 2011 in Docket 2010-PSDR-01]. In addition, Air Resources Board's mandatory reporting requirements should already be collecting coal imports.

The Power Source Disclosure Program, modified in 2009, allows for "unspecified" imports. Now, EAO can accurately assess specified claims for imports and leaves the remaining unspecified imports as just that, imports not traceable to source fuel type(s).

## Methodology for Determining Unspecified Power within Total System Power

For out of state imports, the Energy Commission collects quarterly electric energy import data from Balancing Authorities (BA) within California. The BAs report both imports and exports (exchanges) from other BAs both within California and those out of state. The difference between imports and exports results in net imports.

The net imports are mapped, based on the originating BA, to either the Northwest or Southwest import categories. The Northwest includes Alberta, British Columbia, Idaho, Montana, Oregon, South Dakota, Washington, and Wyoming. The Southwest includes Arizona, Baja California, Colorado, New Mexico, Nevada, Texas, and Utah.

California utilities make specified claims on imported power that directly match a fuel type to an out of state resource. For example, a California-based utility will make a specified claim for wind generation from the Oregon-Washington border (Northwest). Once all of the utilities' specified claims have been accounted for, any remaining net imported power is classified as unspecified power.

Generally, the unspecified power category would be comprised of short-term market purchases from those power plants that do not have a contract with a California utility. Much of the Pacific Northwest spot market purchases are served by surplus hydro and newer gas-fired power plants. The Southwest spot market purchases would be comprised of new combined cycle power and some coal. Generally, a marginal supply approach for the determination of spot market supply would yield the most accurate assessment of power included in the unspecified power category.

Finally, there is the issue of null power. Null power refers to power that was originally renewable power but from which the renewable energy credits have been unbundled and sold separately. Null power is not attributable to any technology or fuel type.