



### Renewable Energy – Overview

Advancing renewable energy is a key part of the state's efforts to achieve Governor Edmund G. Brown Jr.'s Executive Order B-30-15, establishing a statewide goal to reduce greenhouse gas emissions 40 percent below 1990 levels by 2030.<sup>1</sup> Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016) (SB 32) put into law a statewide goal to reduce greenhouse gas emissions 40 percent below 1990 levels by 2030. The companion bill, Assembly Bill 197 (Garcia, Chapter 250, Statutes of 2016) (AB 197) assures that the state's implementation of its climate change policies is transparent and equitable, with the benefits reaching disadvantaged communities. As part of his vision to reduce greenhouse gas emissions, the Governor called for California to increase to 50 percent the electricity derived from renewable sources by 2030.<sup>2</sup> The Clean Energy and Pollution Reduction Act of 2015 (De León, Chapter 547, Statutes of 2015) (Senate Bill 350)<sup>3</sup> put into law a requirement to serve 50 percent of California's electricity use with renewable energy resources by 2030.

To help support the state's renewable energy goals and policies, the California Energy Commission provides this regular update of statewide progress toward renewable energy goals. This update opens with an overview of California's progress toward the state's Renewables Portfolio Standard, a summary of the amount of renewable capacity installed in-state, and a discussion of progress meeting the Governor's goals for adding renewable capacity in California, with a focus on distributed renewable energy projects (projects close to where the energy is consumed).

The update then discusses each of these topics beginning with providing detail on the renewables portfolio standard; discusses how the growth in renewable energy has been in part spurred by cost declines in wind and solar energy; and takes a closer look at how renewable generation and capacity have grown in California, including county-specific information. Next, the update looks more closely at progress toward the Governor's 12,000 MW distributed generation goal, also including information on installed capacity per county. The update then examines the state's success in meeting the Senate Bill 1 (Murray, Chapter 132, Statutes of 2006) goal of installing 3,000 MW of solar self-generation and how California's programs have helped spur ongoing market growth in rooftop solar. Finally, the update reviews renewable energy siting in California, both for renewable facilities under Energy Commission siting jurisdiction and those under local jurisdictions. This review includes an accounting of renewable projects by county that have received environmental permits but are not yet operational as well as an estimate of the amount of renewable capacity expected to come on-line in 2017.

#### **Renewables Portfolio Standard Targets**

California is a clean energy leader with an aggressive Renewables Portfolio Standard (RPS). California's RPS began in 2002 as a 20 percent requirement by 2017 and increasingly became more aggressive with requirements for 20 percent by 2010 (set in 2006), 33 percent by 2020 (set in 2011), and 50 percent by 2030 (set in 2015).

California is ahead of schedule for meeting the RPS requirements: the Energy Commission estimates that about 27 percent of its electricity retail sales in 2016 were served by renewable energy generated

1 Executive Order B-30-15, <http://gov.ca.gov/news.php?id=18938>.

2 Governor Brown's 2015 inaugural address, January 5, 2015, <https://www.gov.ca.gov/news.php?id=18828>.

3 Public Utilities Code Section 454.52(a) (1) (A) and similar language in 9621(b) (1).



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from sources such as wind, solar, geothermal, biomass, and small hydroelectric, as shown in **Figure 1**. This is a proxy for California’s RPS status as it approximates RPS-eligible generation divided by retail sales, in alignment with RPS statutes.<sup>4, 5, 6</sup> This estimate does not reflect the RPS accounting rules that allow for, among other things, carryover between multi-year compliance periods. For more information, see the section below on “Percentage Renewable is a Proxy for RPS Progress.”

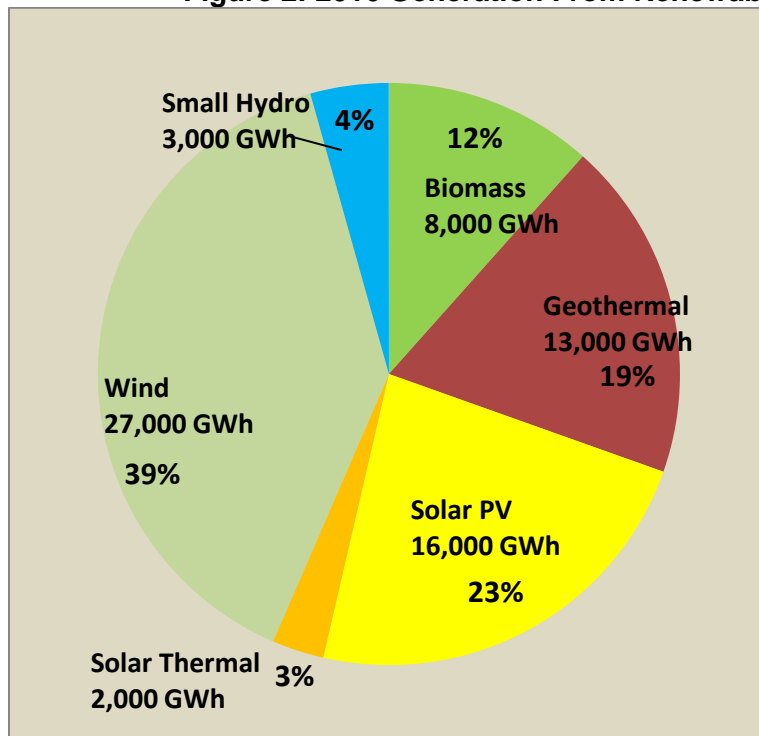
**Figure 1: California’s Progress to Meeting the Percent Renewables Portfolio Standard**



Source: California Energy Commission staff, Data updated October 2016.

**Figure 2** on the next page shows the estimated 2016 retail sales of renewable electricity by fuel type.

**Figure 2: 2016 Generation From Renewable Facilities Serving California**



**2016 Adjusted Retail Sales: 256,400 GWh**

**2016 Estimated Renewables: 68,900 GWh**

Source: California Energy Commission staff based on Quarterly Fuels and Energy Report (QFER) [8], 2015 Power Source Disclosure Filings [11], S-2 Filings [D2], CPUC compliance filings [12], and Energy Commission RPS Compliance Filings [13]. Updated October 2016.

4 All numbers shown are subject to verification. Staff estimated 2016 eligible renewables totaled 68,948 gigawatt-hours (GWh) using the Energy Commission’s Total System Power, Power Source Disclosure Program and Wind Performance Reporting System. The data represent 2015 renewable energy purchases from California load-serving entities. Staff calculated an adjusted statewide retail sales (256,400 GWh) for 2015 data from the *California Energy Demand 2016-2026, Preliminary Electricity Forecast*, mid case less excluded entities, pumping loads, and mid-additional achievable energy efficiency values.

5 With a few exceptions noted in the *RPS Eligibility Guidebook*, large hydroelectric facilities greater than 30 megawatts (MW) are not eligible for California’s RPS. The estimates of total generation and renewable capacity include only RPS-eligible hydroelectric facilities. In contrast, Germany and the U.S. Energy Information Agency account for large hydro as a renewable resource. Roughly 10 to 15 percent of California’s energy generation is from large hydroelectric generation that is not RPS-eligible. (Low end reflects drought years.)

6 Energy generated from self-generation capacity such as rooftop solar is not included in the estimate of renewable generation, although it does lower retail sales of electricity.



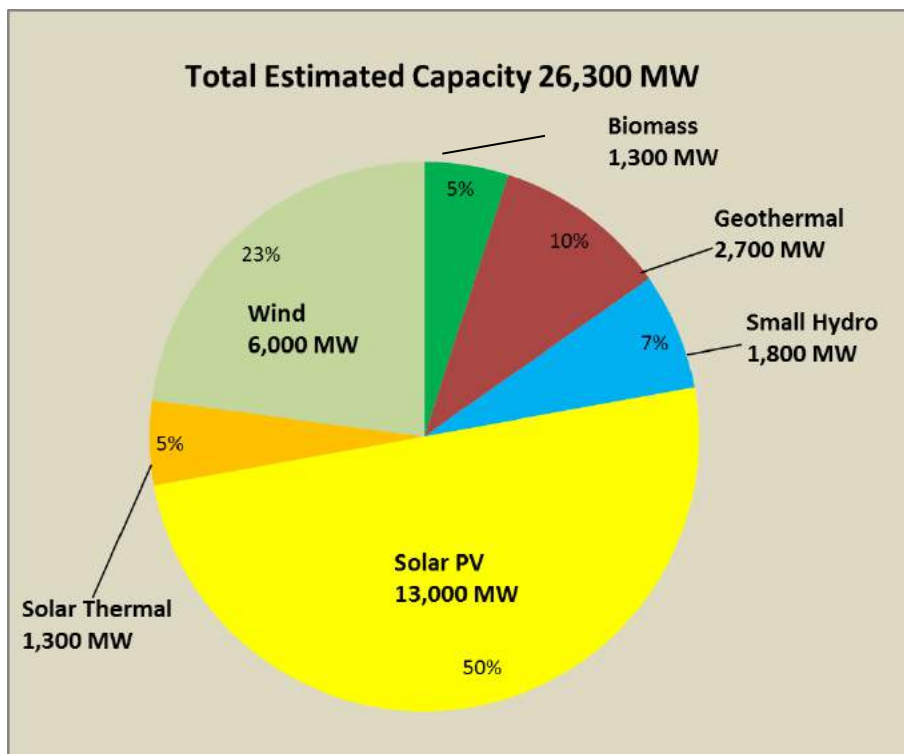
### Renewable Capacity in California

California's operating renewable energy capacity<sup>7</sup> is composed of facilities both within and outside the state. The Energy Commission collects data from power plants with a total nameplate capacity of 1 megawatt (MW) or more that are within California or physically located outside California with a first point of interconnection into California.

Statewide, in-state operating capacity of renewable resources was 26,300 MW as of October 31, 2016.<sup>8,9</sup> The total includes a little more than 5,200 MW of self-generation capacity, almost 5,100 MW of which is self-generation solar photovoltaic (PV).

**Figure 4** shows the mix of in-state renewable resources by fuel type in terms of capacity, including self-generation (energy consumed on-site such as rooftop solar PV).

**Figure 4: In-State Renewable Capacity by Resource Type, Includes Self-Generation (as of October 31, 2016)**



Source: California Energy Commission staff based on Quarterly Fuel and Energy Report, source [8], Renewable Distributed Generation sources [D1]-[D14], Data include only facilities physically located in California. However, there are some instances where in-state facilities have contracted to sell power outside California. See notes for Table 1 for additional information about the data. Not included in Figure 4 are 1,650 MW of renewable energy facilities that are physically located out-of-state but have the first point on interconnection in California. Totals may not sum due to rounding. Also, not included in the pie chart are 157 MW of self-generation for which the fuel type is undefined. The 157 MW are included, however, in the 26,300 MW of total estimated capacity. Data updated October 2016.

<sup>7</sup> *Capacity* refers to the maximum electric output a generator can produce under specific conditions, while *generation* refers to the amount of electricity a generator actually produces over a specific period. Unless otherwise noted, capacity figures in this document refer to *nameplate capacity*, which is the maximum output a generator can produce without exceeding design limits.

<sup>8</sup> The wind data source is the Wind Performance Reporting System (WPRS) which was first used for this analysis in September 2015. Prior to using the WPRS, staff relied on data sources that overstated wind capacity such that the reported wind generation capacity dropped by about 1,000 MW in the September 2015 update relative to the February 2015 update.

<sup>9</sup> There may be some overlap between the self-generation projects reported in Table 5 and non-self-generation projects reported in Table 1 of about 190 MW. When providing the total statewide capacity, 26,300, staff added the wholesale capacity in Table 1 (21,300 MW), and the total self-generation capacity reported in Table 12 (5,200 MW), and netted out the 190 MW of potential overlap to avoid double-counting.



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### *Governor's Goals for Adding Renewable Capacity in California*

Entering his 2011 term, Governor Brown set clean energy goals as part of a plan to help rebuild California's economy.<sup>10</sup> He set an overall goal of adding 20,000 MW of renewable generation in California by 2020, composed of 8,000 MW of large-scale renewable generation and 12,000 MW of renewable distributed generation. California has effectively met the 8,000 MW goal for large-scale renewables and is expected to meet the 12,000 MW goal for distributed generation by 2020.

### *Renewable Distributed Generation*

**Figure 5** (on the next page) shows progress toward the goal of installing 12,000 MW of renewable distributed generation in California by 2020. *Distributed generation* is defined here as projects that are 20 MW or smaller – including both self-generation and projects that generate energy for the market.

As of October 31, 2016, almost 9,400 MW of distributed generation capacity was operating or installed in California, with an additional 900 MW pending.<sup>11</sup> The data include almost 5,100 MW of solar self-generation capacity, which far exceeds the state's goal of installing 3,000 MW of solar energy residential and commercial sites by 2017.

California's programs to support renewable distributed generation could add another 1,800 MW if fully subscribed. Past and current renewable distributed generation programs include utility feed-in tariffs along with state-mandated self-generation incentives such as the Self-Generation Incentive Program, the California Solar Initiative, the New Solar Homes Partnership, publicly owned electric utility (POU) solar programs, and the Emerging Renewables Program. Assuming all pending and additional authorized capacity is successfully installed, California is already on a trajectory to exceed the 12,000 MW goal by 100 MW.

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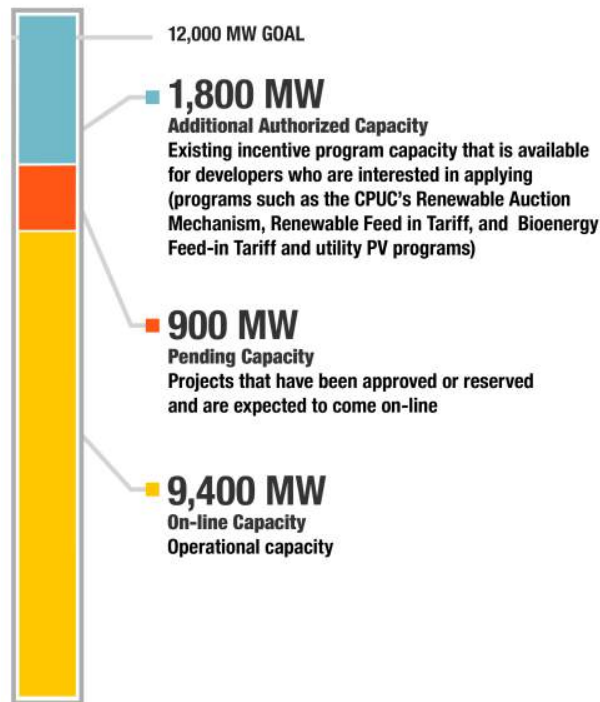
<sup>10</sup> *Clean Energy Jobs Plan*, [https://www.gov.ca.gov/docs/Clean\\_Energy\\_Plan.pdf](https://www.gov.ca.gov/docs/Clean_Energy_Plan.pdf).

<sup>11</sup> Pending projects include projects either with incentive funding reserved from a self-generation incentive program or with a power purchase agreement.



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**Figure 5: Renewable Distributed Generation in California (20 MW or Smaller, Includes Self-Generation)**

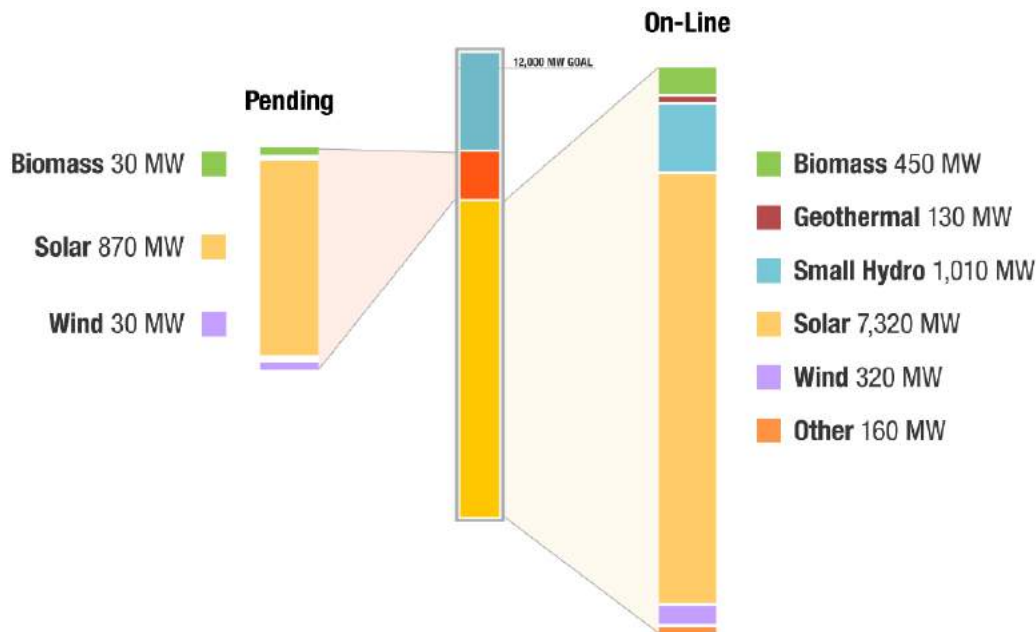


Source: California Energy Commission staff, based on sources [D1] through [D14]. Data updated October 2016. Also includes net energy metering (NEM) projects that have not received California renewable energy incentives [D14].

Source: California Energy Commission staff, Data updated October 2016.

Figure 6 shows the data in Figure 5 by fuel type.

**Figure 6: Renewable Distributed Generation in California by Fuel Type (20 MW or Smaller, Includes Self-Generation)**



Source: California Energy Commission staff, based on sources [D1] through [D14]. Data updated October 2016. Also includes NEM projects that have not received California renewable energy incentives [D14].

Source: California Energy Commission staff, Data updated October 2016.



### Renewable Energy – Additional Information

Below is additional information on the Energy Commission's efforts to track the state's progress toward achieving the RPS, the Governor's 12,000 MW goal for renewable distributed generation, the state's 3,000 MW goal for self-generation solar systems, and permitting and construction of new renewable energy generators in California.

#### *Renewables Portfolio Standard*

The Energy Commission certifies eligible renewable energy resources that can be used to satisfy the RPS procurement requirements of retail sellers and POUs and uses an accounting system to verify the eligibility of RPS claims from retail sellers and POUs.<sup>12</sup> The California Public Utilities Commission (CPUC) is responsible for establishing RPS procurement requirements for retail sellers, determining compliance based on verified renewable generation data provided by the Energy Commission, and imposing penalties for noncompliance.<sup>13</sup> The Energy Commission is responsible for establishing the RPS enforcement procedures and determining compliance for the POUs, and the California Air Resources Board is authorized to impose penalties if POUs don't comply.<sup>14</sup>

The RPS establishes multiyear compliance periods in recognition of the annual variability of renewable resources, particularly from hydroelectric facilities. The RPS requires all utilities in the state to achieve the following targets for retail electricity sales from renewable sources:

- An average of 20 percent in 2011-2013
- 25 percent by the end of 2016
- 33 percent by the end of 2020
- 40 percent by the end of 2024
- 45 percent by the end of 2027
- 50 percent by the end of 2030
- No less than 50 percent in each multiyear compliance period thereafter

#### *Percentage Renewable is a Proxy for RPS Progress*

As discussed above and shown in **Figure 2**, Energy Commission staff estimates that in 2016 California's electricity consumption was about 27 percent renewable as a proxy for measuring progress towards the RPS. The estimate does not necessarily reflect a compliance determination, however, as the RPS includes eligibility and accounting requirements that are not fully captured in the estimate, with highlights described below.

- The Energy Commission certifies if a renewable energy facility is eligible for the RPS. Staff has taken efforts to include only RPS-eligible power plants in this analysis but in some cases staff may have estimated whether a project was eligible.
- The RPS is calculated as a percentage of retail sales. Retail sales are typically based on electricity delivered to residential, commercial, industrial, and agricultural customers. The statute excludes the following electricity consumption from the calculation of retail sales: electricity delivered to federal Department of Energy facilities, military bases, water pumping facilities such

12 Public Utilities Code, § 399.25.

13 Public Utilities Code, § 399.13 – 399.17.

14 Public Utilities Code, § 399.30.



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as the Central Valley Project and the State Water Project, utility use, electric vehicle charging, and street lighting. Staff’s analysis incorporates these specifications for estimating retail sales.

- For the RPS, electricity retail sellers (investor-owned utilities, publicly owned utilities, energy service providers, and community choice aggregators) use renewable energy credits (RECs) to meet their obligation for multi-year compliance periods. A REC represents 1 megawatt-hour of electricity generation from renewable sources. Renewable generation facilities may be located anywhere within the Western Electricity Coordinating Council (WECC) region and sell energy and/or RECs to a California retail seller of electricity to meet its RPS obligation, provided the facility meets all RPS-eligibility criteria established by the Energy Commission. Compliance with California’s RPS program is determined by the amount of RECs retired for compliance within three multiyear compliance periods through 2020. This is not factored into the analysis presented here.
- California’s RPS program defines all renewable procurement from contracts executed after June 1, 2010, into three portfolio content categories, commonly referred to as “buckets.” The determination of whether RECs fall into Category 1, 2, or 3 for RPS-compliance will be made at the end of each compliance period. Category 1 procurement is for both the energy and associated RECs from a RPS-compliant facility. Category 2 procurement is for renewable energy and associated RECs that cannot be delivered directly to a buyer but is instead delivered by substitute energy supplies (firmed and shaped). Category 3 is for the purchase of RECs without the corresponding energy or RECs, referred to as unbundled RECs. While Category 1 and Category 2 RECs include the associated energy delivered within the same calendar year, there can be up to a three-year lag for Category 3 *unbundled RECs* to be retired. This is not factored into the analysis presented here. Therefore, renewable percentages calculated for renewable tracking progress or total system power should not be taken as an indication of compliance with the RPS, but rather a snap shot of renewables as a percentage of retail sales for the specified year.

In summary, there are important differences between the annual accounting to estimate statewide RPS progress here and the actual RPS accounting requirements used to evaluate compliance for each California electricity retail seller. An accurate accounting of the state’s progress toward the 33 percent and 50 percent renewable mandates cannot be completed until after the close of each multi-year compliance period.

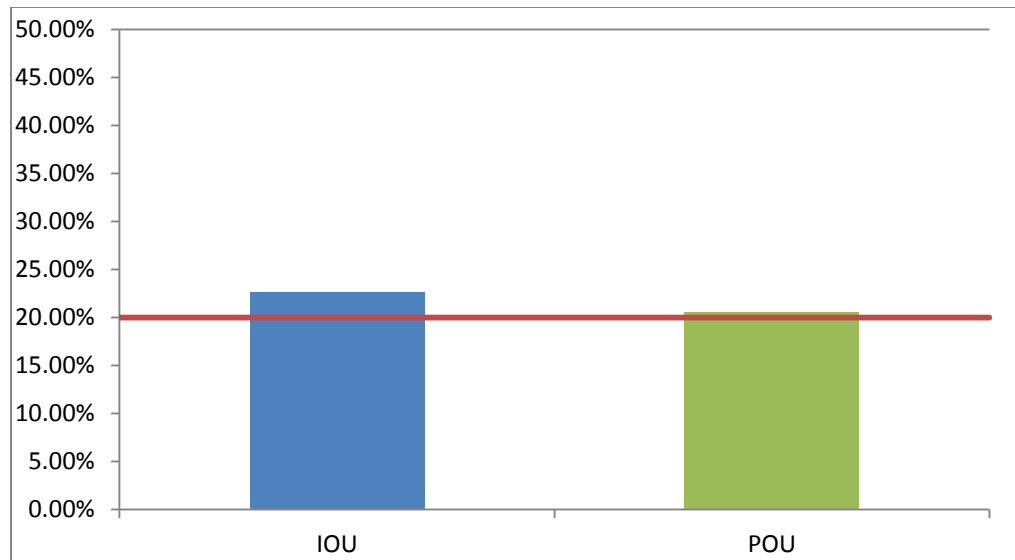
### *RPS Compliance for 2011-2013*

In terms of verified RPS compliance figures, according to the CPUC California’s three largest investor-owned utilities (IOUs) collectively served 22.7 percent of their 2013 retail electricity sales with renewable power. The 43 POUs reported to the Energy Commission a combined 20.6 percent for the 2011–2013 compliance period. The Energy Commission has also adopted verified eligibility results from 21 retail sellers (including PG&E, Bear Valley Electric Service, 3Phases Renewables, LLC) for the 2011–2013 compliance period.<sup>15</sup> Final RPS 2011–2013 compliance results for retail sellers will still need to be determined by the CPUC. **Figure 7** on the next page shows the comparison between IOUs and POUs with the 2011–2013 RPS compliance goal of 20 percent.

<sup>15</sup> McCollough, Brian, et al. 2016. *Renewables Portfolio Standard 2011-2013 Retail Sellers Procurement Verification* Lead Commissioner Report. California Energy Commission, Renewable Energy Division. Publication Number: CEC-300-2016-004-CMF.



Figure 7: Percentage of Retail Sales That Are Renewable Energy



Source: California Energy Commission staff using data from California Public Utilities Commission [D1], Local Publicly Owned Electric Utilities' Reported Renewable Procurement Status for Compliance Period 1 [14].

### Renewable Costs Have Come Down

Cost declines in renewable energy have helped spur market growth for renewables.

As part of the U.S. Department of Energy's (DOE's) SunShot program, the Lawrence Berkeley National Laboratory (LBNL) reported that nationally, the median installed price for utility-scale PV has steadily fallen by nearly 60 percent since the 2007–2009 period, to \$2.7/Watt alternating current ( $W_{AC}$ ) (or \$2.1/Watt direct current [ $W_{DC}$ ]) for projects completed in 2015. (The installed price has declined 45 percent since 2010.) The median installed price in California is somewhat higher, \$2.9/ $W_{AC}$ .<sup>16, 17</sup> Comparable declines have been realized for rooftop PV systems as discussed in more detail below in the section on *Solar Distributed Generation Continues to Grow*. California's renewable energy goals, abundant sunshine, and cost declines for solar PV will continue to drive significant solar PV growth.

The installed cost of wind has also decreased over time. The DOE reported that the average capacity-weighted average installed project costs was about \$1,690/kilowatt (kW) down about 27 percent (\$640/KW) compared to the apparent peak in 2009 and 2010 (\$2,329/kW). Similarly, onshore wind power purchase agreement prices have dropped from a high of around \$70/MWh to an average of about \$20/MWh between 2009 and 2015.<sup>18</sup>

<sup>16</sup> PV project capacity is commonly reported in DC terms (particularly in the residential and commercial sectors). The LBNL analysis reports utility-scale solar in AC terms.

<sup>17</sup> Bolinger, Mark and Joachim Seel, Lawrence Berkeley National Laboratory, *Utility-Scale Solar 2015: An Empirical Analysis of Project Cost, Performance, and Pricing Trends in the United States*, August 2016, [https://emp.lbl.gov/sites/all/files/lbnl-1006037\\_report.pdf](https://emp.lbl.gov/sites/all/files/lbnl-1006037_report.pdf).

<sup>18</sup> Wiser, Ryan, Bolinger, Mark, Barbose, Galen, Darghouth, Naim R., Hoen, Ben, Mills, Andrew D., Rand, Joe, Millstein, Dev, Porter, Kevin, Widiss, Rebecca, Oteri, Frank, Tegen, Suzanne, Tian, Tian, Lawrence Berkeley National Laboratory, *Wind Technologies Market Report*, August 2016, <https://emp.lbl.gov/publications/2015-wind-technologies-market-report>. DOE reports that the average price decline in wind energy PPAs across the United States is largely driven by significant wind





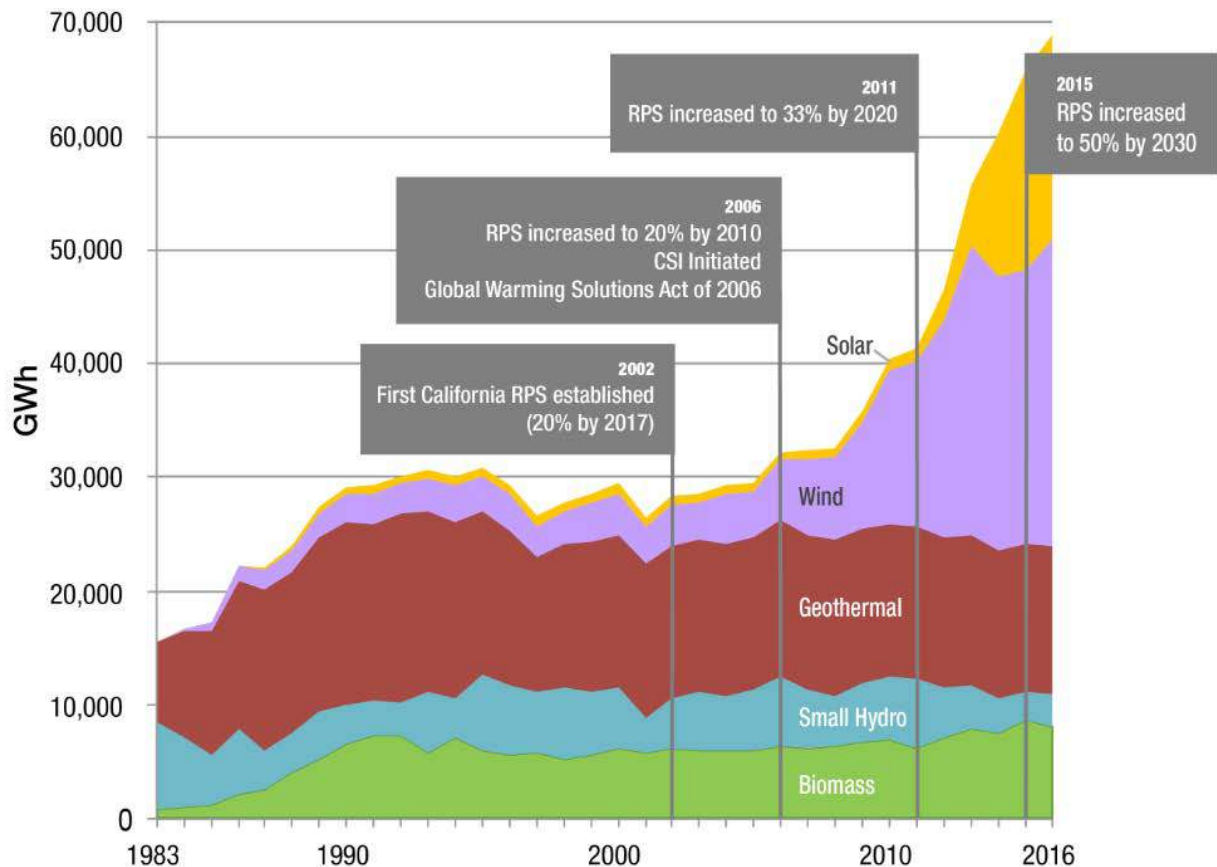
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### Renewable Generation and Capacity in California Have Grown

**Figure 8** on the next page shows renewable generation procured for California from 1983–2015 by resource type. Data in **Figure 8** do not include residential self-generation such as rooftop PV. This graph is updated annually.

The graph shows the upward trend of increased solar generation observed through new solar developments throughout California. **Figure 8** also shows key policy changes in 2002, 2006, 2011, and 2015 that spurred renewable development.

**Figure 8: California Renewable Energy Generation by Resource Type (In-State and Out-of-State)**



Source: California Energy Commission staff based on Quarterly Fuels and Energy Report (QFER) [8], 2015 Power Source Disclosure Filings [11], S-2 Filings [D2], EIA Electric Power monthly [D15], CPUC compliance filings [12], and Energy Commission RPS Compliance Filings [13]. Updated October 2016.

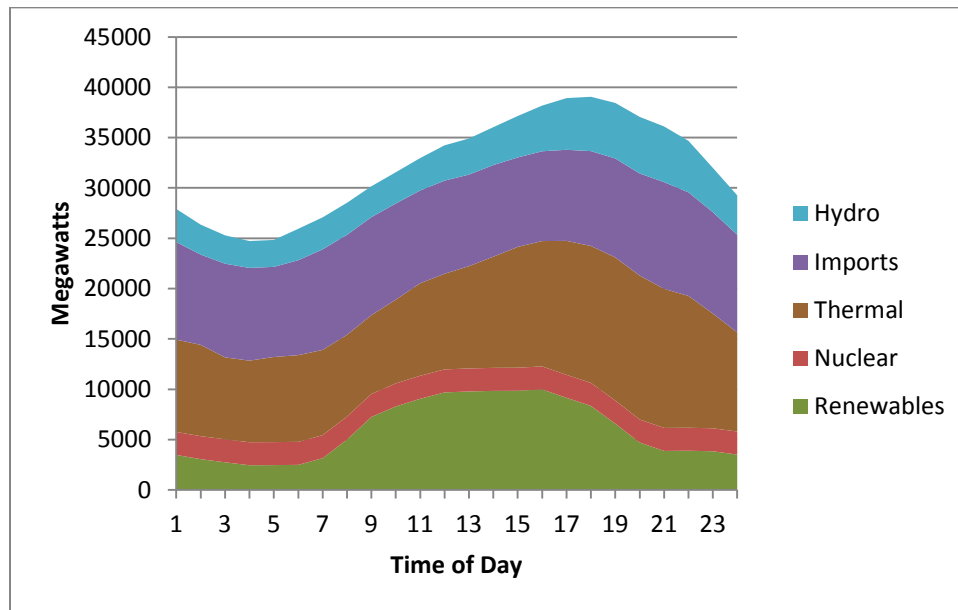
Note: Data for 2016 are estimates.

The California Independent System Operator (California ISO) publishes daily reports on the generation in its service area. **Figure 9** on the next page shows the resource profile on a summer day.

energy development in the interior United States, which is generally associated with relatively low wind energy PPA prices as compared to the Western United States.



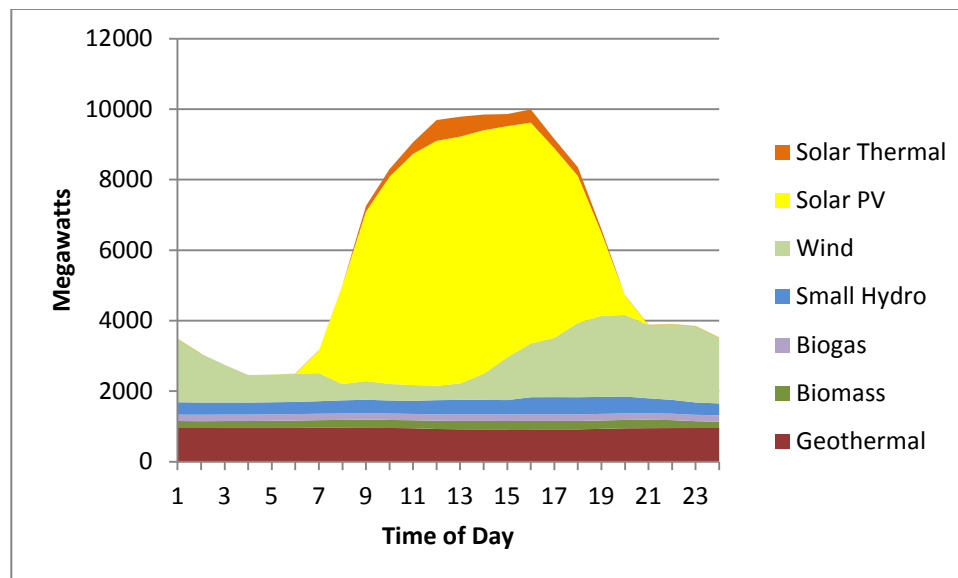
**Figure 9: Hourly Average Breakdown of Total Production by Resource Type**



Source: California ISO Daily Renewables watch July 1, 2016, [http://content.caiso.com/green/renewrpt/20160701\\_DailyRenewablesWatch.pdf](http://content.caiso.com/green/renewrpt/20160701_DailyRenewablesWatch.pdf)

**Figure 10** shows the aggregated, or combined, renewable data from **Figure 9** by fuel type. During the day, solar dominates the renewable mix.

**Figure 10: Hourly Average Breakdown of Renewable Resources**



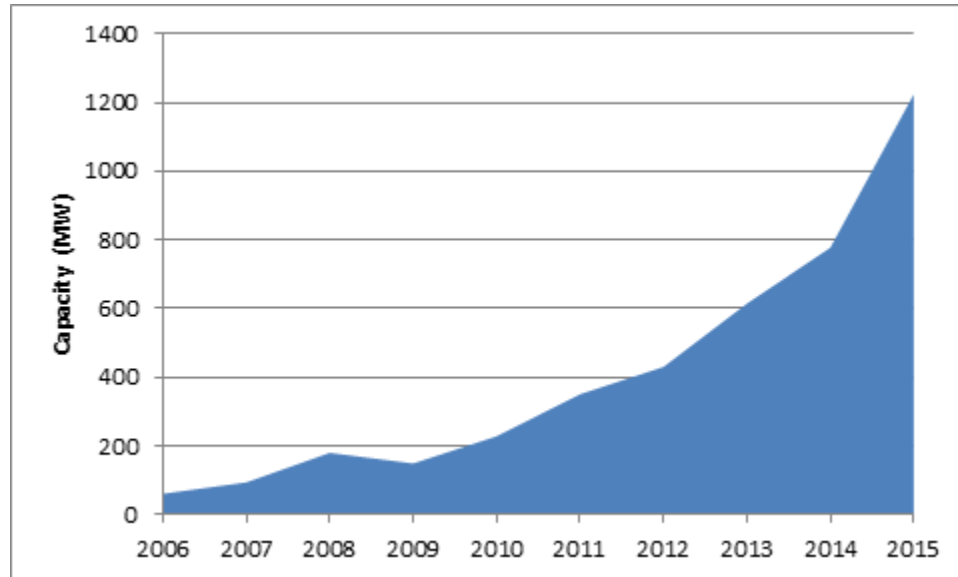
Source: California ISO Daily Renewables watch July 1, 2016, [http://content.caiso.com/green/renewrpt/20160701\\_DailyRenewablesWatch.pdf](http://content.caiso.com/green/renewrpt/20160701_DailyRenewablesWatch.pdf)



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**Figure 11** shows how installed capacity of self-generation has increased statewide from 2006 to 2016. The graph shows the amount of new self-generation interconnected to the electricity system annually. Of the almost 5,100 MW of self-generation solar installed statewide, almost 2,000 MW was installed just in 2014 and 2015.

**Figure 11: Annual Additional Installed Self-Generation Capacity**



Source: California Energy Commission staff based on sources [D8] through [D12], [D14]. Also includes NEM projects that have not received California renewable energy incentives [D14]. Updated October, 2016.

**Table 1** on the following page shows the capacity of renewable energy facilities on-line as of October 31, 2016, by county, excluding self-generation. The table provides data on the number of facilities and MW by fuel type.



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**Table 1: Number and Capacity of In-State Renewable Projects On-Line as of October 31, 2016**

County	Biomass		Geothermal		Small Hydro		Solar PV		Solar Thermal		Wind		Total	
	Count	MW	Count	MW	Count	MW	Count	MW	Count	MW	Count	MW	Count	MW
Alameda	5	30					12	15			17	528	34	572
Amador	1	23			2	14	1	2					4	38
Butte	1	2			9	69	8	9					18	80
Calaveras					7	32	1	2					8	33
Colusa	1	29											1	29
Contra Costa	2	7					11	31			1	38	14	76
El Dorado					8	68							8	68
Fresno	2	56			2	44	40	532					44	632
Glenn					1	5	2	3					3	8
Humboldt	3	61											3	61
Imperial			20	718	8	93	16	1,178			1	265	45	2,253
Inyo			3	302	11	81							14	383
Kern	3	124			5	75	79	1,785			55	3,310	142	5,293
Kings							17	346					17	346
Lake			6	418	2	6	3	3					11	426
Lassen	1	36			1	30							2	65
Los Angeles	13	222			20	216	123	681	1	8			157	1,127
Madera	2	38			10	64	4	25					16	126
Marin	1	0					2	3					3	3
Mariposa					1	9							1	9
Mendocino					4	13	4	7					8	20
Merced	2	13			5	33	11	138			1	19	19	203
Mono			3	40	5	96							8	136
Monterey	3	8					7	9			2	2	12	19
Napa	1	1					2	2					3	3
Nevada					11	82							11	82
Orange	6	82			3	12	1	3					10	97
Placer	3	52			12	93	4	6					19	150
Plumas	2	40			4	28							6	67
Riverside	3	59			6	50	30	1,137	1	250	34	699	74	2,195
Sacramento	1	9			1	14	37	125					39	147
San Benito							3	4					3	4
San Bernardino	1	3			11	38	80	480	11	999	3	7	106	1,526
San Diego	12	44			4	13	36	195			2	51	54	302
San Francisco	1	2					8	14					9	17
San Joaquin	5	82			1	11	5	8			2	4	13	104
San Luis	2	3			1	4	14	1,062					17	1,069
San Mateo	1	11											1	11
Santa Barbara	2	4											2	4
Santa Clara	1	2			1	0	21	30					23	31
Santa Cruz	2	5					1	1					3	6
Shasta	4	144			25	88	5	8			1	101	35	341
Sierra					4	9							4	9
Siskiyou	1	13			5	72							6	86
Solano	1	2					15	32			13	1,027	30	1,063
Sonoma	3	8	12	1,238	1	3	12	14					28	1,263
Stanislaus	2	26			6	21	4	48					12	95
Sutter							4	4					4	4
Tehama					4	21	11	10			1	1	16	32
Trinity					5	9							5	9
Tulare	2	13			7	38	36	202					45	253
Tuolumne	2	33			8	193	1	2					11	228
Ventura	3	7			2	2	3	4					8	13
Yolo	2	31			1	12	7	10			1	1	11	54
Yuba	1	3			3	3	1	1					5	7
<b>Total</b>	<b>104</b>	<b>1,330</b>	<b>44</b>	<b>2,716</b>	<b>227</b>	<b>1,760</b>	<b>681</b>	<b>8,166</b>	<b>13</b>	<b>1,257</b>	<b>134</b>	<b>6,052</b>	<b>1,203</b>	<b>21,300</b>



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### Notes on Table 1: Summary of In-State Renewable Projects On-Line as of October 31, 2016.

This table represents RPS-eligible wholesale suppliers of electricity. It does not include residential self-generation. Totals may not sum due to rounding.

Sources: California Energy Commission Quarterly Fuels and Energy Report (QFER), source [8]. QFER collects data 45 days after each calendar quarter for power plants 10 MW and larger and annually for plants from 1-10 MW. Plants under 1 MW are not required to report under QFER. The counts are for facilities on-line as of October 31, 2016. CPUC RPS contract database [D1], POU S-2 and S-5 Forms for 2014 [D2], and California ISO facility interconnection [D 14].

1. “Biomass” does not include generation by natural gas plants using out-of-state landfill and digester gas transported through the natural gas pipeline. Also, two facilities are not included as they are not RPS-eligible: Southeast Resource Recovery and Commerce Refuse to Energy.
2. The Small Hydro category includes all RPS-eligible hydroelectric facilities that are rated from 1 MW to 30 MW. It also includes a few larger facilities that may qualify for a load-serving entity’s RPS program.
3. Solar PV represents wholesale installations rate at 1 MW and larger only. It does not include PV installed under a net metering agreement such as residential rooftop solar. Data represent on-line capacity from operating plants. Some projects are developed in multiple phases, and the final project may have a larger capacity.
4. There may be some overlap between the self-generation projects reported in Table 5 and non-self-generation projects reported here of about 190 MW.

Data in **Table 1** include 1,480 MW of new renewable capacity that began operating in 2016 as of October 31, 2016. **Table 2** summarizes capacity additions in 2016, by resource and technology type.

**Table 2: New Renewable Capacity Added in 2016  
(Excluding Self-Generation)**

Resource/Technology	Operating MW
Solar PV	1,440
Solar Thermal	0
Wind	20
Geothermal	0
Biomass	20
<b>Total</b>	<b>1,480</b>

Source: California Energy Commission staff. Totals may not sum due to rounding. Updated October 2016.

The data in **Table 1** include only facilities physically located in California. **Table 3** on the next page shows that an additional 1,650 MW may be accounted for from facilities physically located out-of-state that have the first point of interconnection with a California balancing authority and are considered in-state resources for the RPS.<sup>19</sup> (These data are not included in **Table 2** or **Figure 4**.)

<sup>19</sup> A *balancing authority* maintains the electricity balance between supply and demand within its region. “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. This includes balancing authority areas operated by the California Independent System Operator Corporation, Los Angeles Department of Water and Power, Balancing Authority of Northern California, Imperial Irrigation District, and Turlock Irrigation District. It does not include the Sierra Pacific Power Company (serving primarily Nevada), PacifiCorp West, and the Bonneville Power Administration-Transmission balancing authorities serving the Pacific Northwest.



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**Table 3: Renewable Facilities Located Out-of-State With First Point of Interconnection in California**

Facility and State	Technology	Capacity (MW)
Agua Caliente Solar (AZ)	Solar	290
Copper Mountain I (NV)	Solar	58
Copper Mountain II (NV)	Solar	155
Copper Mountain III (NV)	Solar	255
Mesquite Solar 1 (AZ)	Solar	150
Arlington Valley Solar Energy II (AZ)	Solar	129
Terra-Gen Dixie Valley (NV)	Geothermal	64.7
Non-California Wind Generation Milford 1 (UT)	Wind	203.5
Non-California Wind Generation Milford 2 (UT)	Wind	100.5
Juarez Wind (Baja)	Wind	155.1
Silver State Power South (NV)	Solar	94.4
<b>Total</b>		<b>1,650</b>

Source: California Energy Commission staff. Totals may not sum due to rounding. Updated October 2016.

### 12,000 MW Distributed Generation

**Figure 4** in the *Overview* shows progress toward the Governor’s goal of 12,000 MW of renewable distributed generation by 2020. (*Distributed generation* is defined here as projects that are 20 MW or smaller, including self-generation and projects that produce energy for the market.) Through October 31, 2016, almost 9,400 MW of renewable distributed generation projects were operating in California, including 5,200 MW of self-generation (including almost 5,100 MW of solar PV self-generation from about 616,800 installed projects). **Table 4** summarizes on-line and pending renewable distributed generation by fuel type.

**Table 4: Renewable Distributed Generation Resources, On-Line, and Pending Projects (20 MW or Smaller, Includes Self-Generation, as of October 31, 2016)**

Resource	On-Line (MW)	Pending (MW)	Total (MW)
Biomass	446	32	478
Geothermal	129	0	129
Small Hydro	1,010	2	1,012
Solar	7,325	872	8,197
Wind	318	26	344
Other	157	0	157
<b>Total</b>	<b>9,385</b>	<b>932</b>	<b>10,317</b>

Source: California Energy Commission staff based on sources [D1] through [D14]. Also includes NEM projects that have not received California renewable energy incentives [D14]. The table includes 0.167 MW of hybrid wind/ wind solar projects that are counted in solar. “Other” is a mix of wind, advanced energy storage, or hydro. Further, the “other” category includes any fuel cell, internal combustion engine, combustion turbine, microturbine, steam turbine, or “other” projects that take service under one of the following specific interconnection programs and are therefore considered renewable: Standard NEM, RES\_BCT, Expanded NEM, and NEMBIO. If fuel cell, internal combustion engine, combustion turbine, microturbine, steam turbine, or “other” projects did not start service under those specific interconnection programs, they are not considered renewable. “Other” data were combined to protect the confidentiality of these projects. Totals may not sum due to rounding. Updated October, 2016.



Table 5 shows the breakdown of data used in Figure 6 and Table 4 by California county. Table 5 includes only projects that are 20 MW or less from Table 1.

**Table 5: Capacity of On-Line and Pending Distributed Generation Systems by County (20 MW or Smaller, Includes Self-Generation, as of October 31, 2016)**

County	On-line Capacity (MW)	Pending Capacity (MW)	County	On-line Capacity (MW)	Pending Capacity (MW)
Alameda	267	7	Riverside	615	67
Amador	22	0	Sacramento	158	0
Butte	147	3	San Benito	13	0
Calaveras	20	0	San Bernardino	575	115
Colusa	22	0	San Diego	769	42
Contra Costa	219	5	San Francisco	49	0
El Dorado	85	4	San Joaquin	159	27
Fresno	480	93	San Luis Obispo	70	1
Glenn	23	1	San Mateo	76	1
Humboldt	37	0	Santa Barbara	45	2
Imperial	229	20	Santa Clara	257	7
Inyo	47	6	Santa Cruz	40	0
Kern	990	101	Shasta	137	0
Kings	301	40	Sierra	19	0
Lake	18	1	Siskiyou	59	0
Lassen	1	0	Solano	122	5
Los Angeles	1013	191	Sonoma	125	5
Madera	115	2	Stanislaus	51	0
Marin	39	0	Sutter	32	0
Mariposa	12	0	Tehama	46	1
Mendocino	29	0	Trinity	9	0
Merced	128	5	Tulare	314	135
Mono	63	0	Tuolumne	58	2
Monterey	72	1	Ventura	114	8
Napa	43	0	Yolo	98	4
Nevada	68	0	Yuba	26	0
Orange	340	21	Unknown	316	0
Placer	185	8			
Plumas	19	0	<b>Total Capacity</b>	<b>9,384</b>	<b>931</b>

Sources: California Energy Commission staff based on sources [D1] through [D14]. Also includes NEM projects that have not received California renewable energy incentives [D14]. Updated October 31, 2016. Totals may not sum due rounding.

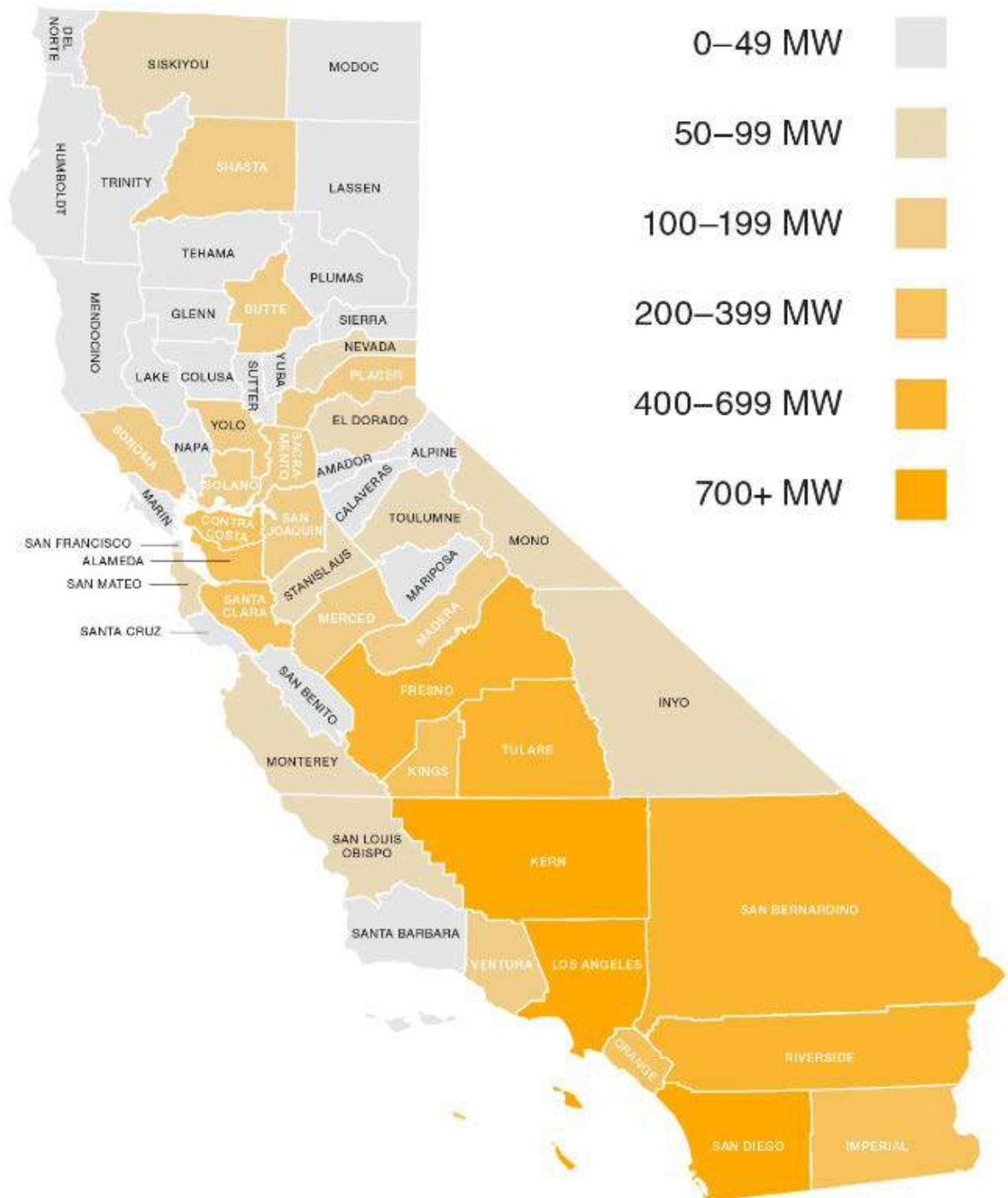
1. The table includes 0.167 MW of hybrid wind/ wind solar projects that are counted in solar.
2. This table includes 144 MW of other renewable that is defined as a wind, advanced energy storage, or hydro. Further, it includes any fuel cell, internal combustion engine, combustion turbine, microturbine, steam turbine, or "other" projects that takes service under one of the following specific interconnection programs and are therefore considered renewable: Standard NEM, RES\_BCT, Expanded NEM, and NEMBIO. If fuel cell, internal combustion engine, combustion turbine, microturbine, steam turbine, or "other" projects did not start service under those specific interconnection programs, they are not considered renewable. The data were combined to protect the confidentiality of utility data.
3. There may be some overlap between the self-generation projects reported here and non-self-generation projects reported in Table 1 of about 190 MW.

Figure 12 on the next page graphically shows the data in Table 5.



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Figure 12: Map of Capacity of On-Line and Pending Distributed Generation Systems by County (20 MW or Smaller, Includes Self-Generation, as of October 31, 2016)



Source: California Energy Commission staff





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### Senate Bill 1: 3,000 Megawatts of Self-Generation Solar Systems

Enacted 10 years ago, Senate Bill 1 (Murray, Chapter 132, Statutes of 2006) set the following goals for installed self-generation photovoltaic systems:

3,000 megawatts of solar energy systems on new and existing residential and commercial sites by 2017 and placing solar energy systems on 50 percent of new homes by 2020.

The state has already far exceeded the 3,000 MW goal with the installation of 5,100 MW, as noted. Below are the three components of the 3,000 MW goal:

1. 1,940 MW for IOUs for businesses and existing homes (including low-income programs) as part of the California Solar Initiative (CSI).
2. 700 MW for the POUs.
3. 360 MW for IOUs for the New Solar Homes Partnership (NSHP).

As of June 2016, the CSI program provided incentives for 1,813 MW of installed capacity and reserved funding for more than 140 MW of pending capacity toward achieving the goal of 1,940 MW for commercial buildings and existing homes in IOU service territories.<sup>20</sup>

Rebate funding through the CSI overseen by the CPUC, for both residential and nonresidential solar PV installations, has been exhausted, and the CSI program is closed. This includes CSI program activities in the Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas & Electric Company service territories. In addition, the MW target for Southern California Edison's nonresidential solar PV installations has been or has nearly been reached with current installed and pending capacity. CSI still has some applications that are pending and may or may not come on-line.<sup>21</sup>

Based on annual SB 1 reports submitted to the Energy Commission, as of the end of 2015, POUs have installed nearly 400 MW toward their 700 MW goal.<sup>22</sup>

The NSHP implements the Energy Commission's portion of the CSI and provides financial incentives to encourage the installation of eligible solar energy systems on new residential construction. The number of systems supported and funded by the NSHP program has continued to grow through the past few quarters. The ongoing recovery of the market from the housing crisis (coincident with the start of the NSHP program) has resulted in ever-increasing amounts of builders and homeowners applying to the program. The capacity installed each year under the program has increased from just fewer than 4 megawatts (MW) in 2009 to around 20 MW in 2015, with results through the first half of 2016 suggesting this trend will continue. More than 75 builders/developers and more than 30 retailers and installers participate in the program. KB, Lennar, Richmond American, Pardee, Shea, Standard Pacific, and Meritage are some of the leading builders, while SunPower, SolarCity, SunStreet, and Petersen Dean typically install the solar energy systems.

As of October 28, 2016, about 192 MW was reserved or installed, which demonstrates substantial progress toward the program goal of 360 MW as shown in **Table 6** on the next page.

20 [http://www.californiasolarstatistics.ca.gov/reports/agency\\_stats/](http://www.californiasolarstatistics.ca.gov/reports/agency_stats/), updated June 30, 2016.

21 <http://www.csi-trigger.com/>, updated June 30, 2016.

22 [http://www.energy.ca.gov/sb1/pou\\_reports/](http://www.energy.ca.gov/sb1/pou_reports/). Data reported through December 31, 2015.



## California Energy Commission – Tracking Progress

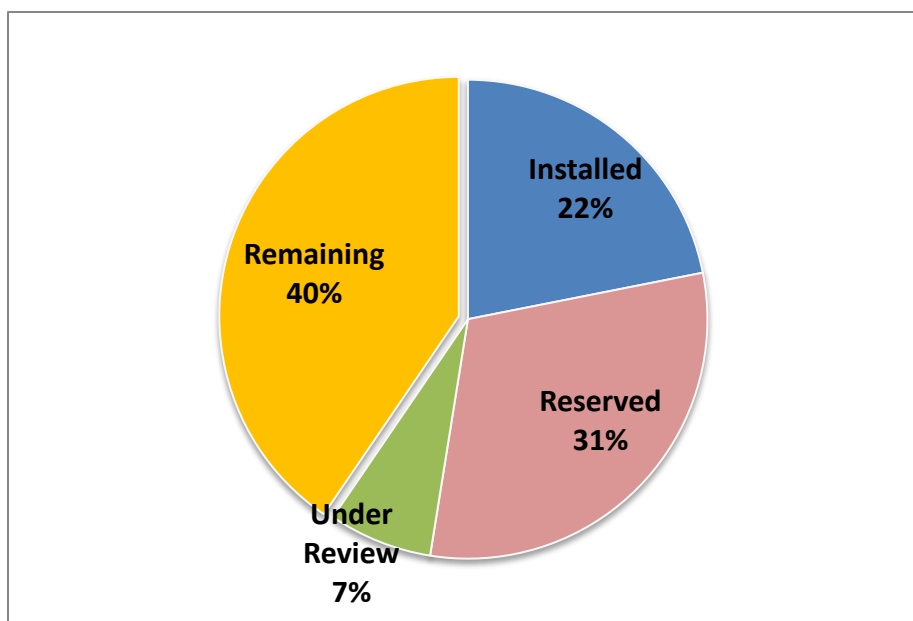
**Table 6: NSHP Program Activity**

	Number of Systems	\$ Millions	MW (AC)
<b>Reserved</b>	31,184	\$92.1	111
<b>Installed</b>	25,844	\$156.5	81
<b>Total</b>	<b>57,028</b>	<b>\$248.6</b>	<b>192</b>

Source: <http://www.gosolarcalifornia.ca.gov/about/nshp.php>. Updated October 2016.

As shown in **Figure 13**, the program reserved funds or installed 53 percent of the total capacity goal. Further, applications for systems corresponding to 7 percent of the overall capacity goal are under review by the Energy Commission. Assuming all capacity under review is approved and installed, 40 percent of the overall program capacity goal remains for newly submitted applications.

**Figure 13: Progress Toward NSHP 360 MW Goal**



Source: California Energy Commission staff. Updated October 2016.

The NSHP program also assists lower-income residents by providing higher per-watt incentives for eligible residential affordable housing projects with tax-exempt system owners. Since the program began, the NSHP program has funded the installation of more than 7 MW on low-income developments, with incentives totaling more than \$20 million. Offering higher incentives for affordable housing projects is intended to remove barriers to solar adoption for low-income communities, but barriers remain. For the NSHP, barriers include the slow growth of new affordable housing construction or insufficient funding to overcome tight financial conditions for affordable housing building developers.<sup>23</sup> Another barrier is that multifamily building designs are more complex and may not have

<sup>23</sup> Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, and Bill Pennington. 2016. *A Study of Barriers and Solutions to Energy Efficiency, Renewables, and Contracting Opportunities Among Low-Income Customers and Disadvantaged Communities*. California Energy Commission. Publication Number: CEC-300-2016-009-SD.



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sufficient or proper roof space to integrate a well-designed solar system. Also, some affordable housing developers may not be aware that they may qualify for monetary assistance from NSHP. Finally, state incentive programs such as the NSHP can have complex eligibility requirements that may discourage participation.<sup>24</sup> Consistent with SB 350, the Energy Commission is evaluating the barriers to accessing energy efficiency upgrades and renewable energy for low-income customers, including those living in disadvantaged communities, with recommendations for how to address these barriers. The report is expected to be complete in January 2017.

The NSHP program also provides a critical bridge toward achieving California's zero-net-energy goal for new homes by helping builders become familiar with the challenges and intricacies of installing solar energy systems in new construction in advance of anticipated zero-net-energy requirements in California's Title 24 Building Standards. This experience should allow a smooth and successful transition for builders and homeowners once new standards to implement zero-net energy are in place.

On November 13, 2015, the Energy Commission requested additional funding from the CPUC to meet the statutorily authorized \$400 million under SB 1 for the NSHP program. On June 9, 2016, CPUC approved Decision 16-06-006 authorizing an additional \$111.78 million to the NSHP program for continued financial incentives to install solar energy systems on new, energy-efficient homes with the Energy Commission as the program administrator.

### *Solar Distributed Generation Continues to Grow*

Because of the success of the CSI program and the solar market in general, many solar systems continue to be installed without CSI funding. Through SB 1 incentives, Californians installed about 2,300 MW of solar PV, and nearly 2,800 MW of PV have been installed in California without SB 1 rebates. The state's net energy metering (NEM) policy, the federal investment tax credit, and cost reductions in solar PV have helped spur continued market growth.

NEM supports customer investment in grid-connected distributed renewable energy generation by providing consumers a financial credit for power generated onsite and fed back to the utility. The credit is used to offset the customer's electricity bill.<sup>25</sup> Customers who install small solar, wind, biogas, and fuel cell generation facilities (1 MW or less) to serve all or part of their electricity needs are eligible.

The 30 percent federal investment tax credit (ITC) has helped advance the market for rooftop solar. The tax credit was scheduled to fall to between zero and 10 percent at the beginning of 2017 for homeowners and utility-scale development, respectively, but was extended five years on December 18, 2015. Below is the schedule for the federal investment tax credit:

2016 – 30 percent  
2017 – 30 percent  
2018 – 30 percent  
2019 – 30 percent  
2020 – 26 percent  
2021 – 22 percent

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<sup>24</sup> Based on discussion at the July 8, 2016, Energy Commission workshop on the New Solar Homes Partnership <http://www.gosolarcalifornia.org/documents/nshp.php>.

<sup>25</sup> <http://www.cpuc.ca.gov/General.aspx?id=3800>.

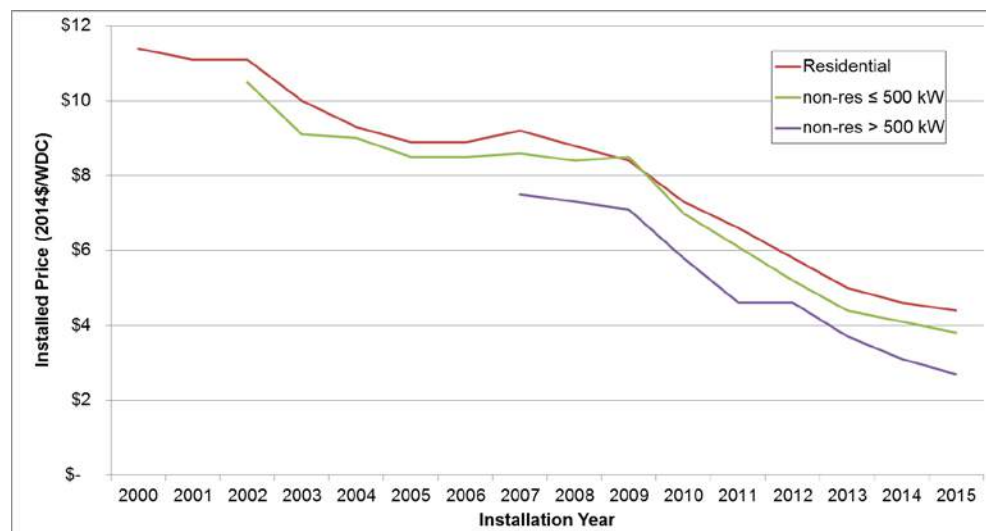


## California Energy Commission – Tracking Progress

The permanent 10 percent federal investment tax credit for commercial projects remains in place after 2021, per existing tax law. The federal budget bill also extended the production tax credit (PTC) for wind<sup>26</sup> and allows wind developers to opt for the ITC instead of the PTC. The same schedule shown above for solar applies to the federal ITC available for wind. In addition to solar and wind, eligibility for the PTC has been extended to additional types of renewable energy projects; biomass, landfill gas, geothermal, incremental hydroelectric, and ocean energy projects will qualify for a 30 percent PTC if construction begins by December 2016. Since the 30 percent ITC available for fuel cells will not be extended, fuel cell projects would need to be in service by December 2016 to qualify under existing law.

To achieve a self-sustaining market and ultimately transform California’s commercial and residential solar markets, continued declines in the cost of PV systems is a key. **Figure 14** shows the median installed prices of residential and nonresidential solar PV systems in California. From 2000 to 2015, median installed system costs have declined from \$12 per watt to under \$5 per watt.<sup>27</sup> Analysts at the DOE SunShot Initiative expect PV system prices to continue to decline.<sup>28</sup>

**Figure 14: Residential and Nonresidential PV System Sample and Median Installed Price**



Source: Barbose, Galen, Naïm Darghouth, Dev Millstein, Sarah Cates, Nicholas DiSanti, and Rebecca Widiss. Lawrence Berkeley National Laboratory, August 2016. *Tracking the Sun IX: The Installed Price of Residential and Non-Residential Photovoltaic Systems in the United States*. Table B-4.

The DOE SunShot Initiative set a goal of reducing total installed home PV system costs to \$1.50/watt by 2020. Although module prices continue to decrease, the current trajectory “does not achieve the SunShot targets by 2020.”<sup>29</sup> Nonhardware or “soft costs” such as permitting and interconnection have

26 The PTC extension for wind projects that have commenced construction through December 2016 qualify for the full PTC value for 10 years. Projects with construction beginning in 2017 qualify for 10 years of credits at 80 percent of the full PTC value, 60 percent for projects started in 2018, and 40 percent for projects started in 2019.

27 Barbose, Galen Naïm Darghouth, Dev Millstein, Sarah Cates, Nicholas DiSanti, and Rebecca Widiss. Lawrence Berkeley National Laboratory, August 2016. *Tracking the Sun IX The Installed Price of Residential and Non-Residential Photovoltaic Systems in the United States*.

28 U.S. DOE, November 2012. SunShot: *Photovoltaic (PV) Pricing Trends: Historical, Recent, and Near-Term Projections*. <http://www.nrel.gov/docs/fy13osti/56776.pdf>.

29 Ardani, Kristen, Dan Seif, Robert Margolis, Jesse Morris, Carolyn Davidson, Sarah Truitt, and Roy Torbert. *Non-Hardware (“Soft”) Cost-Reduction Roadmap for Residential and Small Commercial Solar Photovoltaics, 2013-2020*. National Renewable Energy Laboratory. August 2013. [www.nrel.gov/publications](http://www.nrel.gov/publications).



## California Energy Commission – Tracking Progress

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become a major driver for PV system prices.<sup>30</sup> A National Renewable Energy Laboratory study found that aggressive strategies to reduce soft costs are needed.

### *Renewable Energy Facility Siting in California*

The Energy Commission has statutory responsibility for licensing thermal power plants 50 MW and larger, along with infrastructure associated with the plant, such as transmission lines to the first point of interconnection with the grid, fuel supply lines, and water pipelines, among others. The Energy Commission's 12-month, one-stop permitting process is a certified regulatory program under the California Environmental Quality Act (CEQA) and includes many opportunities for public participation. Although coordinated with all applicable state, local, and regional agencies, the Energy Commission's certification addresses all CEQA requirements for new power plants under its jurisdiction and is in-lieu of all permits otherwise required by local, regional, or state agencies. The Energy Commission also coordinates with all applicable federal agencies to ensure that certification incorporates the necessary conditions to address any federal requirements.

Due to frequent changes in project circumstances (for example, loss of developer financing, delays obtaining power purchase agreements, and inability to meet other agencies' permitting requirements), project status data are fluid. Therefore, the renewable energy siting information presented in **Tables 7 through 9** reflects a snapshot in time relative to the status of projects in the Energy Commission siting database.

The Energy Commission has made substantial progress in licensing renewable energy facilities. **Table 7 and Table 8** on the following page provide status data and details on recent renewable energy siting cases that are under Energy Commission jurisdiction.

**Table 9** on page 23 shows renewable energy projects in California that are not expected to be on-line by the end of 2016 but received environmental permits on or before June 30, 2016, including those outside the Energy Commission's jurisdiction.

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<sup>30</sup> Ardani, *op. cit.*



## California Energy Commission – Tracking Progress

**Table 7: California Energy Commission – Jurisdictional Renewable Energy Facility Status for Projects Approved Since 2010 – Operational or Under Construction**

Projects On-Line	Type	Status	Capacity (MW)	County
Genesis Solar Energy Project – NextEra Energy	Solar Thermal	Operational	250	Riverside
Ivanpah Solar – BrightSource, NRG Energy, Google	Solar Thermal	Operational	370	San Bernardino
Abengoa Mojave Solar Project – Mojave Solar LLC	Solar Thermal	Operational	250	San Bernardino
Blythe Solar Units 1 & 2 – NextEra Blythe Energy Center LLC	Solar PV	Operational	235	Riverside
<b>Subtotal:</b>			<b>1,105</b>	

Source: California Energy Commission, [[http://energy.ca.gov/sitingcases/all\\_projects.html](http://energy.ca.gov/sitingcases/all_projects.html)], updated October, 2016. Capacity represents net nameplate capacity and excludes onsite and parasitic loads.

**Table 8: California Energy Commission – Jurisdictional Renewable Energy Facility Status for Projects Not Under Construction**

Not Under Construction	Type	Status	Capacity (MW)	County
Black Rock 1, 2, and 3 Geothermal Power Project (formerly Salton Sea Geothermal) - Cal Energy	Geothermal	Approved, On Hold	159	Imperial
Victorville Hybrid Gas-Solar – City of Victorville (513 MW Gas + 50 MW Solar)	Solar Thermal/ Natural Gas	Approved, On Hold	50	San Bernardino
Palmdale Hybrid Gas-Solar – Summit Power Group LLC (formerly City of Palmdale) (520 MW Gas + 50 MW Solar)	Solar Thermal/ Natural Gas	AFC Approved Amendment Under Review to Eliminate Solar	[50]	Los Angeles
Rice Solar Energy Project – Rice Solar Energy LLC /SolarReserve LLC	Solar Thermal	Approved, On Hold	150	Riverside
Blythe Solar Units 3 & 4 – NextEra Blythe Energy Center LLC	Solar PV	Approved, On Hold	250	Riverside
<b>Subtotal:</b>			<b>609</b>	
<b>Total for All Projects Listed in Tables 7 and Table 8</b>			<b>1,714</b>	

Source: California Energy Commission, updated October, 2016. Capacity represents net nameplate capacity and excludes onsite and parasitic loads.



## California Energy Commission – Tracking Progress

**Table 9: Renewable Projects That Have Received Environmental Permits – Not Operational**

County	Biomass/ Landfill Gas		Solar PV		Solar Thermal		Geothermal		Wind		Small hydro		Total	
	Count	MW	Count	MW	Count	MW	Count	MW	Count	MW	Count	MW	Count	MW
Alameda			3	19					1	90			4	108
Colusa			1	20									1	20
Contra Costa			1	11									1	11
Fresno			24	561									24	561
Glenn	1	2	1	38									2	40
Imperial			15	1,116			3	212					18	1,328
Inyo			1	4									1	4
Kern			25	1,540					12	1,519			37	3,059
Kings			9	222									9	222
Lassen			1	5									1	5
Los Angeles	1	27	27	617							1	4	29	648
Madera			2	71									2	71
Merced			3	205									3	205
Mono							1	33					1	33
Monterey	1	4	3	284									4	288
Napa			1	7									1	7
Orange			3	9									3	9
Placer	1	2											1	2
Riverside			14	1,508									14	1,508
San Benito			1	247									1	247
San Bernardino			21	604	1	50							22	654
San Diego			3	147					2	200			5	347
San Joaquin			3	24									3	24
Santa Barbara			1	40									1	40
Santa Clara	1	3	5	11									6	14
Solano			1	1									1	1
Sonoma							3	113					3	113
Stanislaus			5	270									5	270
Tulare	1	2	5	174									6	176
Yolo			1	2					1	2			2	3
Yuba			1	1									1	1
<b>Grand Total</b>	<b>6</b>	<b>40</b>	<b>181</b>	<b>7,760</b>	<b>1</b>	<b>50</b>	<b>7</b>	<b>360</b>	<b>16</b>	<b>1,810</b>	<b>1</b>	<b>4</b>	<b>212</b>	<b>10,020</b>

Source: California Energy Commission staff. Totals may not sum due to rounding. Capacity represents nameplate capacity. Solar PV capacity is AC. Includes projects in preconstruction or under construction but does not include projects projected to be on-line by December 31, 2016. Updated October, 2016.



## Renewable Siting – Planning for Growth

As of September 30, 2016, an estimated 10,020 MW of renewable capacity has been permitted throughout California that could come on-line in the future, as shown above in **Table 9**.<sup>31</sup> (This capacity does not include self-generation.) Staff analysis estimates that about 2,200 MW of the permitted projects have also secured power purchase agreements,<sup>32</sup> suggesting a high likelihood that the power plants will be constructed. Of the 2,200 MW of permitted projects with contracts, about 920 MW are expected to come on-line in 2017, mostly solar. **Table 10** shows the amount of renewable capacity expected to come on-line in 2017 by fuel type.

**Table 10: New Renewable Capacity Expected Online in 2017  
(Not Including Self-Generation)**

Resource/Technology	Capacity (MW)	Percent of Total
Solar PV	785	85.2%
Solar Thermal	0	0
Small Hydro	4	<0.1%
Wind	132	14.3%
Biomass	0	0%
Geothermal	0	0%
<b>Total</b>	<b>920</b>	<b>100%</b>

Source: California Energy Commission staff. Updated October 2016. Total may not sum due to rounding

Bringing on new renewable generation to meet the 2030 RPS requirement will require new investments in the state's electric transmission system. This effort will require planning and coordination across the state and the West. During 2016, the Energy Commission, California Natural Resources Agency, CPUC, California ISO, and the Bureau of Land Management have conducted the Renewable Energy Transmission Initiative (RETI 2.0) as a nonregulatory planning forum intended to identify the constraints and opportunities for new transmission needed to access additional renewable resources, and help meet the state's long-term greenhouse gas reduction and renewable energy goals.

The interagency RETI 2.0 management team held more than 16 stakeholder meetings and workshops to explore combinations of renewable generation that may be developed in California and throughout the West that can help meet the greenhouse gas reduction and renewable energy goals. Technical input groups and a wide range of stakeholders have provided input to build an understanding of transmission implications of renewable development scenarios, and identify land-use and environmental opportunities and constraints to accessing these resources. The RETI 2.0 management team presented the conclusions and recommendations in a draft report in November and expects to finalize the report in early 2017. Information on the RETI 2.0 stakeholder activities and findings can be found at <http://www.energy.ca.gov/reti/>.

31 Table 9 includes projects approved on or before September 30, 2016, and are not on-line or expected to be on-line by the end of 2016. Projects expected to be online by December 31, 2016 are not included.

32 The analysis compares the list of permitted projects with information available from the POU's 2015 Electricity Resource Plans, other POU reporting, and California Public Utilities Commission's (CPUC) status of RPS contracts filed by the investor-owned utilities. Other POU reporting came from LADWP staff providing the updated LADWP project contract list in June 2016.





### *Additional References:*

For more information on the Renewables Portfolio Standard, please see <http://www.energy.ca.gov/portfolio/index.html>. For more information on investor-owned utility, electric service provider, and community choice aggregator progress, see the RPS Quarterly Reports and the Status of RPS Projects, available at [http://www.cpuc.ca.gov/RPS\\_Homepage/](http://www.cpuc.ca.gov/RPS_Homepage/).

Project viability information is available at <http://www.cpuc.ca.gov/NR/rdonlyres/CFD76016-3E28-44B0-8427-3FAB1AA27FF4/0/FourthQuarter2010RPSReporttotheLegislature.pdf> (page 4) and <http://www.cpuc.ca.gov/PUC/energy/Renewables/procurement.htm> (Project Viability Calculator).

For more information on the *Bioenergy Action Plan* and the latest proceeding, see [http://www.energy.ca.gov/bioenergy\\_action\\_plan/index.html](http://www.energy.ca.gov/bioenergy_action_plan/index.html).

For more information on the amount of new renewable procurement required to achieve 33 percent by 2020 (also known as the Renewable Net Short), see [http://www.energy.ca.gov/2013\\_energypolicy/documents/](http://www.energy.ca.gov/2013_energypolicy/documents/).

For further information on all (renewable and nonrenewable) Energy Commission-jurisdictional power plants, see [http://energy.ca.gov/sitingcases/all\\_projects.html](http://energy.ca.gov/sitingcases/all_projects.html).

For additional information on RETI 2.0, see <http://www.energy.ca.gov/reti/>.

For more information on RPS-eligibility, see the *Renewables Portfolio Standard (RPS) Eligibility Guidebook*, see <http://www.energy.ca.gov/renewables/documents/>.

### *Data Sources:*

#### **Statewide Electricity Retail Sales**

*California Energy Demand Update 2015 - 2025 Forecast.*

<http://www.energy.ca.gov/2014publications/CEC-200-2014-009/CEC-200-2014-009-SF.pdf>

#### **Renewables**

The following data sources were used to prepare the figures:

[1] California Hydroelectric Statistics and Data. Total Hydroelectricity Production (In gigawatt-hours; includes imports). [http://www.energy.ca.gov/almanac/renewables\\_data/hydro/](http://www.energy.ca.gov/almanac/renewables_data/hydro/). (For 1983-1996, small hydropower is estimated as 13 percent of all hydropower reported on this table.)

[2] California Biomass and Waste-to-Energy Statistics and Data. Biomass and Waste-to-Energy Electricity Production for 1983-1996. These data include two waste-to-energy plants that are not RPS-eligible. [http://www.energy.ca.gov/almanac/renewables\\_data/biomass/](http://www.energy.ca.gov/almanac/renewables_data/biomass/).

[3] California Geothermal Energy Statistics and Data. Geothermal Electricity Production. These data used for 1983-1996. [http://www.energy.ca.gov/almanac/renewables\\_data/geothermal/](http://www.energy.ca.gov/almanac/renewables_data/geothermal/).

[4] California Solar Energy Statistics and Data. Solar Thermal Electricity Production. These data used for 1983-1996. <http://energyalmanac.ca.gov/renewables/solar/index.html>.



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- [5] California Wind Energy Statistics and Data. Wind Electricity Production. These data used for 1983-1996. <http://www.energy.ca.gov/wind/index.html>.
- [6] California Electrical Energy Generation, 1997 to 2001. Total Production, by Resource Type (gigawatt-hours). [http://energyalmanac.ca.gov/electricity/electricity\\_generation.html](http://energyalmanac.ca.gov/electricity/electricity_generation.html). (For 1997-2001 small hydropower is estimated as 13 percent of all hydropower reported on this table).
- [7] Gross System Power from the Net System Power Report (2002-2006) and Revised Total Electricity System Power for California (2007-current). In-state and imports. [http://energyalmanac.ca.gov/electricity/electricity\\_generation.html](http://energyalmanac.ca.gov/electricity/electricity_generation.html).
- [8] The Quarterly Fuel and Energy Report is data-collected consistent with California Code of Regulations, Title 20, Division 2, Chapter 3, Section 1304 (a) (1)-(3). For more information, please contact Michael Nyberg, [Michael.Nyberg@energy.ca.gov](mailto:Michael.Nyberg@energy.ca.gov).
- [9] Status of RPS Projects. CPUC tracks contracts for projects that are on-line, under development, and pending CPUC approval. Withdrawn and cancelled projects are also included. The project list is updated monthly. [http://www.cpuc.ca.gov/RPS\\_Homepage/](http://www.cpuc.ca.gov/RPS_Homepage/)
- [10] California Energy Commission Energy Facility Status of Power Plant Projects since 1996. [http://www.energy.ca.gov/sitingcases/all\\_projects.html](http://www.energy.ca.gov/sitingcases/all_projects.html).
- [11] Power Source Disclosure filings (SB 1305). <http://www.energy.ca.gov/pcl/>.
- [12] CPUC RPS compliance filings, <http://www.cpuc.ca.gov/General.aspx?id=3856>.
- [13] California Energy Commission RPS compliance filings.
- [14] Local Publicly Owned Electric Utilities' Reported Renewable Procurement Status for Compliance Period 1, [http://www.energy.ca.gov/portfolio/pou\\_rulemaking/2013-RPS-01/POU\\_Reported\\_2011-2013\\_RPS\\_Percentage\\_Table.pdf](http://www.energy.ca.gov/portfolio/pou_rulemaking/2013-RPS-01/POU_Reported_2011-2013_RPS_Percentage_Table.pdf)
- [15] California ISO Daily Renewables Watch, <http://www.caiso.com/green/renewableswatch.html> .

### Renewable Distributed Generation

The following data sources were used to prepare the figures:

- [D1] California Public Utilities Commission, [http://www.cpuc.ca.gov/RPS\\_Homepage/](http://www.cpuc.ca.gov/RPS_Homepage/).
- [D2] California Energy Commission, S-2 and S-5 Supply Forms from 2015 available at [http://www.energy.ca.gov/almanac/electricity\\_data/s-2\\_supply\\_forms\\_2015/](http://www.energy.ca.gov/almanac/electricity_data/s-2_supply_forms_2015/).  
<https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=15-IEPR-02>.
- [D3] Southern California Edison SB 32 procurement <http://www.sce.com/EnergyProcurement/renewables/crest.htm>.
- [D4] Pacific Gas and Electric SB 32 procurement <http://www.pge.com/b2b/energysupply/wholesaleelectricssolicitation/standardcontractsforpurchase/>.



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- [D5] San Diego Gas & Electric SB 32 procurement <http://www.sdge.com/regulatory-filing/654/feed-tariffs-small-renewable-generation>.
- [D6] SMUD: <https://www.smud.org/en/business/environment/solar-for-your-business/feed-in-tariffs.htm>.
- [D7] LADWP: [https://www.ladwp.com/ladwp/faces/ladwp/commercial/c-gogreen/c-gg-localrenewableenergyprogram?\\_adf.ctrl-state=ano50oi7c\\_4&\\_afLoop=237938105011783](https://www.ladwp.com/ladwp/faces/ladwp/commercial/c-gogreen/c-gg-localrenewableenergyprogram?_adf.ctrl-state=ano50oi7c_4&_afLoop=237938105011783).
- [D8] Self-Generation Incentive Program: <http://energycenter.org/index.php/incentive-programs/self-generation-incentive-program>.
- [D9] New Solar Homes Partnership <https://www.newsolarhomes.org/WebPages/Public/Reports.aspx>.
- [D10] California Solar Initiative <http://www.californiasolarstatistics.ca.gov/>.
- [D11] Senate Bill 1 Solar PV: [http://energy.ca.gov/sb1/pou\\_reports/index.html](http://energy.ca.gov/sb1/pou_reports/index.html).
- [D12] Historical generation in California: [http://www.energy.ca.gov/almanac/electricity\\_data/web\\_qfer/](http://www.energy.ca.gov/almanac/electricity_data/web_qfer/).
- [D13] Data from the California ISO on facilities interconnected in 2016.
- [D14] Q3 2016 IOU Interconnection Reports.
- [D15] U.S. Energy Information Administration Electric Power Monthly, November 2015, Table 1.17.B. <http://www.eia.gov/electricity/monthly/pdf/epm.pdf>.

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