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## California Energy Commission – Tracking Progress

### Renewable Energy – Overview

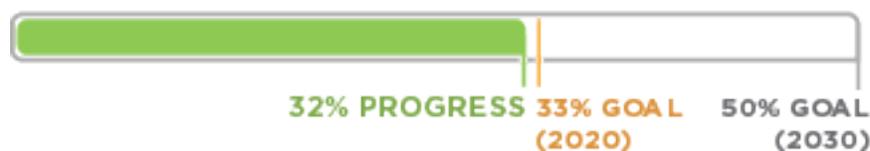
Advancing the use and availability of renewable energy is critical to achieving California’s ambitious climate change goals. Established by Governor Edmund G. Brown Jr. through an executive order, then codified through legislation, California has set ambitious requirements to reduce the state’s greenhouse gas (GHG) emissions 40 percent below 1990 levels by 2030. To support these goals, California has pursued a suite of policies and programs aimed at advancing renewable energy in California and ensuring all Californians, including low-income and disadvantaged communities, benefit from this transition.

The information provided here is an update to the Tracking Progress – Renewable Energy report published in December 2017. It presents the state’s renewable energy goals and progress in meeting these goals as reflected in the achievement of Renewables Portfolio Standard (RPS) targets, the addition of utility-scale renewable energy capacity, and the growth of distributed generation. A summary of the state’s progress toward achieving California’s renewable energy goals is followed by sections with detailed information on each topic. A summary of pertinent legislation is included at the end of this document.

#### *Increasing the Use of Renewable Energy in California*

California’s Renewables Portfolio Standard is one of the most ambitious renewable energy policies in the nation, requiring load serving entities (LSEs) to increase their procurement of eligible renewable energy resources to 33 percent of retail sales by 2020 and 50 percent by 2030. California’s LSEs are ahead of schedule based on an approximation of generation from RPS-eligible<sup>1</sup> sources divided by retail sales. The Energy Commission estimates that 32 percent of 2017 retail electricity sales in California were served by renewable energy facilities, (**Figure 1**) such as wind, solar, geothermal, biomass, and small hydroelectric.<sup>2</sup>

**Figure 1: Progress Toward Meeting California’s Renewable Energy Goals**<sup>i</sup>



Source: California Energy Commission, staff analysis June 2018

The 2017 value of 32 percent represents an increase from the 29 percent reported for 2016 in the August 2017 Tracking Progress. With the 2017 reported progress already at 32 percent, California is well on its way to achieving the 33 percent by 2020 goal.

<sup>1</sup> An RPS-eligible facility is generally defined as a facility that has received an RPS certification by the Energy Commission. However, a small percentage of the generation included in this calculation came from facilities that used renewable fuels but could not be associated with an RPSID before publication of this report consistent with prior reports. For detailed descriptions of the method used, see the notes on figures and tables.

<sup>2</sup> For definitions of all RPS eligible renewable energy generation types, see the *RPS Eligibility Guidebook, Ninth Edition (Revised)*, adopted April 27, 2017, available at <https://efiling.energy.ca.gov/getdocument.aspx?tn=217317>.

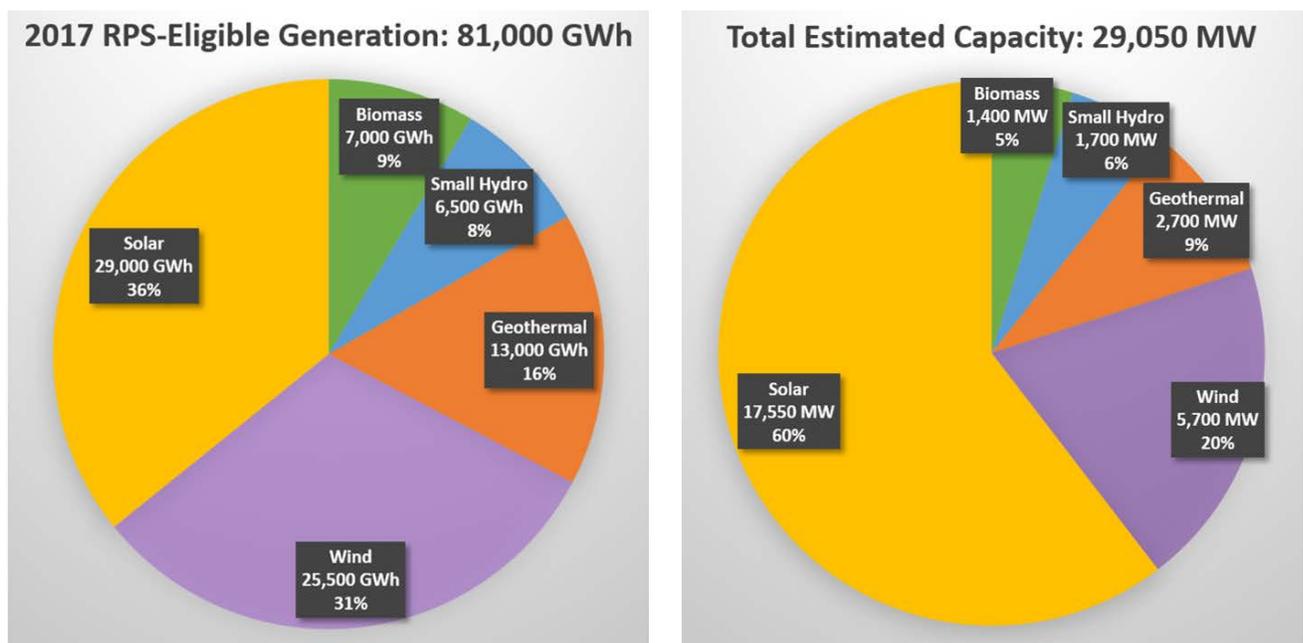


## California Energy Commission – Tracking Progress

### Building More Renewable Energy Capacity in California

**Figure 2** shows the proportions of generation in 2017 from each RPS-eligible renewable technology and total installed/operational renewable capacity by resource type for resources in California. In 2017, solar represented the largest portion of renewable generation for the first time. Solar and wind generation together accounted for more than 67 percent of all renewable electricity generation. Capacity totaled roughly 29,050 MW as of December 31, 2017.<sup>3</sup> This total includes nearly 6,800 MW of renewable self-generation capacity (solar, wind, and biomass) from homes and businesses throughout the state.<sup>4</sup>

**Figure 2: 2017 RPS-Eligible Generation (In-State and Out-of-State)<sup>ii</sup> and Renewable Capacity, Including Renewable Self-Generation<sup>iii</sup>**



Source: California Energy Commission, staff analysis June 2018

Increasing renewable energy capacity in the State was critical to achieving the RPS goals.<sup>5</sup> To help support this growth and expand California’s economy, Governor Brown established a goal of adding 20,000 megawatts (MW) of renewable capacity by 2020, composed of 8,000 MW of large-scale renewable generation<sup>6</sup> and 12,000 MW of renewable distributed generation.<sup>7</sup> As

3 Total installed capacity based on rounded values.

4 The capacity values in Figure 2 are based on facility “nameplate” capacity.

5 *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.

6 Generation facilities larger than 20 MW.

7 Governor Jerry Brown, *Clean Energy Jobs Plan*, 2011 ([https://www.gov.ca.gov/docs/Clean\\_Energy\\_Plan.pdf](https://www.gov.ca.gov/docs/Clean_Energy_Plan.pdf)) defined the 12,000 MW goal to include renewable resources accepted as renewable for purposes of the Renewables Portfolio Standard, sized up to 20 MW, and within the low-voltage distribution grid or supplying power directly to a consumer.



## California Energy Commission – Tracking Progress

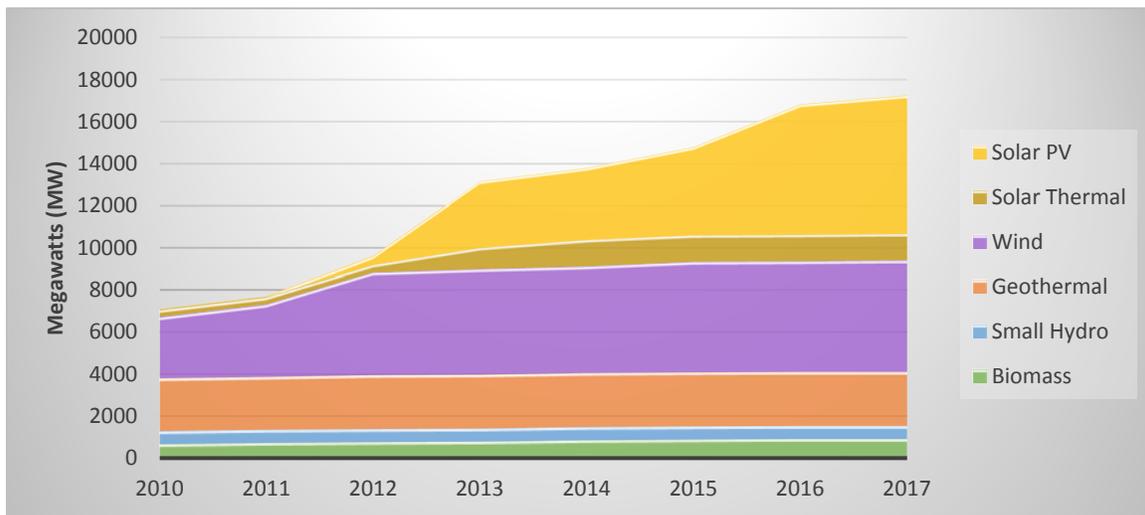
detailed in this report California has already exceeded the 8,000 MW goal and is on track to exceed the 12,000 MW distributed generation goal ahead of schedule.<sup>8</sup>

**Figures 1 and 2** reflect estimates that are a proxy for California’s progress toward meeting RPS goals. The underlying data do not reflect the RPS eligibility and accounting rules. Actual RPS compliance percentages achieved by LSEs are calculated and verified every three to four years based on full RPS compliance periods. Additional information on California’s renewable energy progress is provided in the more detailed sections of this document.

### Large-Scale Renewable Capacity

California has exceeded the 8,000 MW goal for additional large-scale renewables more than 10,000 MW added between January 2011 and December 2017, for a total of more than 17,300 MW of large-scale renewable energy capacity installed in-state. Cumulative large-scale capacity additions between 2010 and 2017 are shown below in **Figure 3**.

**Figure 3: Cumulative Installed Large-Scale Renewable Capacity by Technology Type**



Source: California Energy Commission, staff analysis, June 2018

### Renewable Distributed Generation Capacity

Distributed renewable resources have also been a key focus of state laws, and significant progress has been made in growing California’s distributed renewable capacity. Senate Bill 1 (Murray, Chapter 132, Statutes of 2006) established the California Solar Initiative (CSI) with an ambitious goal for 3,000 MW of distributed solar energy systems to be installed on new and existing residential and commercial sites by 2016 and for solar energy systems to be placed on 50 percent of new homes by 2020.

<sup>8</sup> *Distributed generation* is defined here as projects that are 20 MW or smaller. *Self-generation* is defined as distributed generation systems typically connected through net-energy metering agreements that primarily serve on-site load but are also allowed to export excess power back to the grid. Self-generation is also sometimes referred to as “behind-the-meter” generation. For this analysis, distributed generation and self-generation include only renewable projects.



## California Energy Commission – Tracking Progress

**Figure 4** shows more detail on the progress toward meeting California's 12,000 MW distributed generation goal. As of December 31, 2017, more than 11,700 MW of distributed generation capacity was operating or installed in California, with about 340 MW pending.<sup>9</sup> Preliminary data reported through the first four months of 2018 indicate that California is on track to exceed the 12,000 MW distributed generation goal ahead of schedule. **Figure 4** includes close to 6,700 MW of behind-the-meter solar, which far exceeds the State's CSI goal.

**Figure 4: Renewable Distributed Generation Capacity in California (20 MW or Smaller)<sup>iv</sup> –**



Source: California Energy Commission, staff analysis June 2018

### California's Evolving Electricity Market

As California's renewable energy capacity continues to grow, the State is experiencing new challenges and opportunities associated with integrating the rising amount of renewable generation. The growth in community choice aggregators (CCA), alternative procurement mechanisms for large entities, and the emergence of distributed energy resources are providing customers with more options to choose how and from where they obtain electric services.

### Ensuring the Benefits of Renewables Reach All Californians

In achieving the State's climate and renewable energy goals, the Energy Commission is taking steps to ensure that the benefits are realized by all Californians, especially low-income residents and those in the most vulnerable communities. A summary on progress toward reaching low-income and disadvantaged communities with some of the State's energy initiatives can be found in a separate Tracking Progress document focused on Energy Equity Indicators, which is also available as an interactive web map and a Tracking Progress page.<sup>10</sup>

<sup>9</sup> Pending projects are renewable facilities that have reserved incentive funding through a California Solar Initiative funding program but have not yet been built.

<sup>10</sup> [http://www.energy.ca.gov/sb350/barriers\\_report/equity-indicators.html](http://www.energy.ca.gov/sb350/barriers_report/equity-indicators.html).



## California Energy Commission – Tracking Progress

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### Renewable Energy – Detailed Information

The following pages revisit the same general areas summarized above, with additional data and explanations.

#### *Renewables Portfolio Standard*

Established by legislation in 2002<sup>11</sup> and accelerated and expanded by subsequent legislation, California's RPS establishes increasingly progressive renewable energy procurement targets for the State's load-serving entities (LSEs). The program is jointly administered by the Energy Commission and the California Public Utilities Commission (CPUC). Generation from renewable energy facilities is tracked using the Western Renewable Energy Generation Information System (WREGIS). The Energy Commission certifies facilities as eligible for California's RPS, and verifies the eligibility of renewable energy procurement claims from all LSEs. The Energy Commission transmits a final report of retail sellers' eligible claims to the CPUC to be used for its enforcement and compliance activities. The Energy Commission completes verification, enforcement, and compliance activities for local publicly owned electric utilities.

California is on target to meet the 33 percent by 2020 RPS goal. As discussed above and shown in **Figure 1**, Energy Commission staff estimates that in 2017, the electricity generation serving California consumers was 32 percent renewable. The State's renewable percentage increased from 29 percent in 2016 to 32 percent in 2017. New generation came on-line in 2017, and the State's 2017 reported retail sales<sup>12</sup> decreased compared to 2016, increasing the overall percentage of renewable energy serving California customers.

The 32 percent renewable percentage estimate for 2017 does not represent an RPS compliance determination. This estimate was created using Quarterly Fuel and Energy Report (QFER) and Power Source Disclosure filings, which are not components of RPS procurement reporting or verification, as discussed above.

#### *Renewables Portfolio Standard Compliance*

The RPS establishes multiyear compliance periods in recognition of the temporal variability of renewable resources. The RPS requires all LSEs in the State to achieve escalating procurement targets<sup>13</sup> for each compliance period.<sup>14</sup> The targets for the final year of each compliance period are as follows:

- 20 percent in 2013
- 25 percent in 2016

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<sup>11</sup> Senate Bill 1078 (Sher, Chapter 516, Statutes of 2002).

<sup>12</sup> *California Energy Demand 2018-2030 Revised Forecast*.  
<https://efiling.energy.ca.gov/getdocument.aspx?tn=223244>.

<sup>13</sup> Actual RPS procurement for most LSEs is calculated for multi-year compliance periods, not on an annual basis. Details of RPS procurement requirements can be found in the *RPS POU Regulations*.

<sup>14</sup> Compliance Period Targets for POUs are defined in Section 3204(a) of the RPS POU regulations and in California Public Utilities Commission Decision D. 11-12-020 for retail sellers. The Energy Commission has not at this time formally amended the *RPS POU Regulations* to incorporate the statutorily defined targets for 2024, 2027, and 2030.



## California Energy Commission – Tracking Progress

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- 33 percent in 2020
- 40 percent in 2024
- 45 percent in 2027
- 50 percent in 2030
- No less than 50 percent in each multiyear compliance period thereafter

LSEs are also required to procure a “balanced portfolio” of resources under the RPS.<sup>15</sup> A REC is a certificate of proof associated with the generation of 1 MWh of electricity from an eligible renewable energy resource. LSEs report the retirement of RECs to support their claims of procurement to meet their RPS requirements for multiyear compliance periods. Eligible renewable generation facilities that generate RECs may be located anywhere within the Western Electricity Coordinating Council (WECC)<sup>16</sup> region and may sell energy and/or RECs to California LSEs to meet their RPS obligations, provided the facility is certified as eligible for California’s RPS by the Energy Commission.

### *RPS Compliance Period 2011-2013*

LSEs were required to procure renewable electricity for an average of 20 percent of retail sales for the 2011-2013 compliance period. The Energy Commission adopted verified results for 21 retail sellers and 42 POUs for the 2011–2013 compliance period.<sup>17</sup> For the 2011-2013 RPS compliance period, the California Public Utilities Commission (CPUC) found 14 retail sellers in compliance with the RPS procurement requirements and 6 out of compliance.<sup>18, 19, 20</sup> The Energy Commission found 41 POUs in compliance for the 2011-2013 RPS compliance period, and findings for 2 POUs remain pending. Of the 41 POUs that have been found in compliance in the first compliance period, 26 POUs met their procurement targets and portfolio balance requirements and 16 POUs applied optional compliance measures<sup>21</sup> to meet their procurement requirements. California’s three largest IOUs collectively served 20.9 percent of retail sales with renewable power over the first compliance period.<sup>22</sup> The 42 POUs with verified results served a

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15 Public Utilities Code Sections 399.16 and 399.30.

16 The regional entity that promotes bulk electricity reliability in the Western Interconnection, which includes 14 western states and parts of Canada and Mexico.

17 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.

18 Ibid

19 California Public Utilities Commission Decision D.14-12-023 established a penalty amount of \$50/REC for retail sellers with RPS procurement requirement shortfalls. Two retail sellers have requested a waiver of the penalty pursuant to D.14-12-023.

20 The CPUC did not make a determination for Glacial Energy since they are no longer an electric service provider (ESP).

21 Refer to Section 3206 of the *Enforcement Procedures For The Renewables Portfolio Standard For Local Publicly Owned Electric Utilities (RPS POU Regulations)* which describes optional compliance measures available to POUs.

22 California Public Utilities Commission, RPS Compliance & Reporting, RPS Compliance Period 1 Determinations, <http://www.cpuc.ca.gov/General.aspx?id=3856>.



## California Energy Commission – Tracking Progress

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combined 18.6 percent of retail sales with renewable energy for the 2011–2013 compliance period.<sup>23</sup>

### *RPS Compliance Period 2014-2016*

LSEs were required to increase procurement of renewable electricity over the course of the compliance period to ultimately achieve a target of 25 percent of retail sales served by renewable energy by December 31, 2016. Reported RPS claims indicate that California's three largest IOUs collectively served 35 percent of their 2016 retail electricity sales with renewable power, 30 percent in 2015, and 28 percent in 2014.<sup>24</sup> The 43 POUs reported a combined 21.4 percent of renewable procurement during Compliance Period 2, 2014-2016. Initial reported information indicates that 38 POUs met their procurement targets and portfolio balance requirements. As of June 2018, five POUs have applied optional compliance measures to meet their procurement requirements for this compliance period. These numbers are subject to change during verification of procurement claims. Final verification of claims eligibility for all LSEs for Compliance Period 2, 2014-2016, is currently underway and is anticipated to be complete in the Fall of 2018. Following adoption of final verification results by the Energy Commission, compliance determinations for the 2014-2016 compliance period will be made by the CPUC for retail sellers and by the Energy Commission for POUs.

### *RPS Compliance Period 2017-2020*

LSEs are required to procure renewable electricity equal to 33 percent of retail sales by December 31, 2020. LSEs will complete reporting for 2017, the first year of the third compliance period, in mid-2018.

### *California's Evolving Electricity Market*

Following the 2001-2002 California energy crisis and the subsequent rollback of retail electricity choice, the vast majority of Californians have received bundled electricity service from regulated utilities. In recent years, however, this landscape has been shifting, largely due to the increase in self-generation and the rise of CCAs, which are local public agencies, typically created by joint powers agreements or city or county ordinance, that can directly develop and buy electricity on behalf of their customers. Many CCAs offer products that are more renewable than required by the RPS, and many have specific goals to procure local distributed generation resources.

Legislation in 2002 authorized the formation of CCAs.<sup>25</sup> A CCA automatically enrolls all customers in its service area, unless the customer opts out and chooses to receive service from the IOU operating in the same area. While the CCA is responsible for electricity procurement,

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<sup>23</sup> *Renewables Portfolio Standard Verification Results Lead Commissioner Reports* for POUs for Compliance Period 1 (2011-2013), adopted January 25, 2017. Verification results for Los Angeles Department of Water and Power have not yet been finalized, due to a pending appeal before the Energy Commission.

<sup>24</sup> California Public Utilities Commission 2015, 2016, 2017 Annual RPS Reports.

<sup>25</sup> Established by Assembly Bill 117 (Migden, Chapter 838, Statutes of 2002) and later expanded in 2011 by Senate Bill 790 (Leno, Chapter 599, Statutes of 2011)



## California Energy Commission – Tracking Progress

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the local IOU retains responsibility for transmission and distribution, metering, billing, and customer service. CCA benefits have been cited as providing consumer choice, cost savings to customers, and increased accountability through local governance, as well as allowing cities and counties the flexibility to pursue more aggressive renewable energy goals. Though the CPUC implements the enabling legislation for CCAs, its authority over CCA procurement activities is limited.<sup>26</sup> For instance, the CCA's elected officials set rates and determine procurement strategies within certain parameters, including the RPS mandates. However, the CPUC approved a revised resolution requiring that CCAs comply with CPUC resource adequacy rules to ensure sufficient generation resources are procured for meet peak demand for the coming year.<sup>27</sup> Also, to limit the impact of departing load on IOU customers and to minimize the financial impact of stranding assets originally procured to serve a larger load, CCA customers pay exit fees known as the Power Charge Indifference Adjustment, set by the CPUC.

The growth of CCAs is expected to significantly increase the number of retail sellers reporting during the 2017-2020 compliance period. During the 2011-2013 compliance period, only one CCA was serving customers; by the end of the 2014-2016, that number grew to five.<sup>28</sup> As of June 2018, 17 CCAs were serving customers in California, and an additional 8 more CCA launches or expansions are anticipated through 2020.<sup>29</sup> By the end of June 2018, the following CCAs were operating in California: Apple Valley Choice Energy, Clean Power San Francisco, East Bay Community Choice Energy, Marin Clean Energy, Monterey Bay Community Power Authority, Lancaster Choice Energy, Municipal LA County (Phase 1) Peninsula Clean Energy, Pico Rivera Innovative Municipal Energy, Pioneer Community Energy, Rancho Mirage Energy Authority, Redwood Coast Energy Authority, San Jacinto Power, Solana Beach Energy Alliance, Sonoma Clean Power, Silicon Valley Clean Energy, and Valley Clean Energy Authority. RPS compliance reports submitted by the operational CCAs during the first and second RPS compliance periods indicate that they have met current RPS targets.<sup>30</sup> As shown in **Table 1**, the CPUC Renewables Portfolio Standard Annual Report shows that additional renewable generation will be needed for the CCAs to meet the procurement requirements of the third compliance period. This need for additional generation may represent an opportunity for existing or planned renewable facilities in search of long-term contracts.

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26 The following is an excerpt from a report by the CPUC titled, *California's Renewables Portfolio Standard, Annual Report*, November 2017, available at [http://www.cpuc.ca.gov/uploadedFiles/CPUC\\_Website/Content/Utilities\\_and\\_Industries/Energy/Reports\\_and\\_White\\_Papers/Nov%202017%20-%20RPS%20Annual%20Report.pdf](http://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Reports_and_White_Papers/Nov%202017%20-%20RPS%20Annual%20Report.pdf).

"As additional CCAs are formed, the CPUC will oversee a significantly smaller percentage of renewable procurement in the State, as the CPUC has limited jurisdiction over the procurement activities of CCA or ESP providers. If the IOUs lose such large portions of their customer demand, the result will be that the CPUC will not have the authority to monitor most renewable energy procurement activities in as much detail, as it has traditionally done for RPS."

27 Adopted Draft Resolution E-4907 (February 8, 2018), available at <http://docs.cpuc.ca.gov/publisheddocs/published/g000/m208/k956/208956263.pdf>.

28 California Public Utilities Commission 2017 Annual RPS Report.

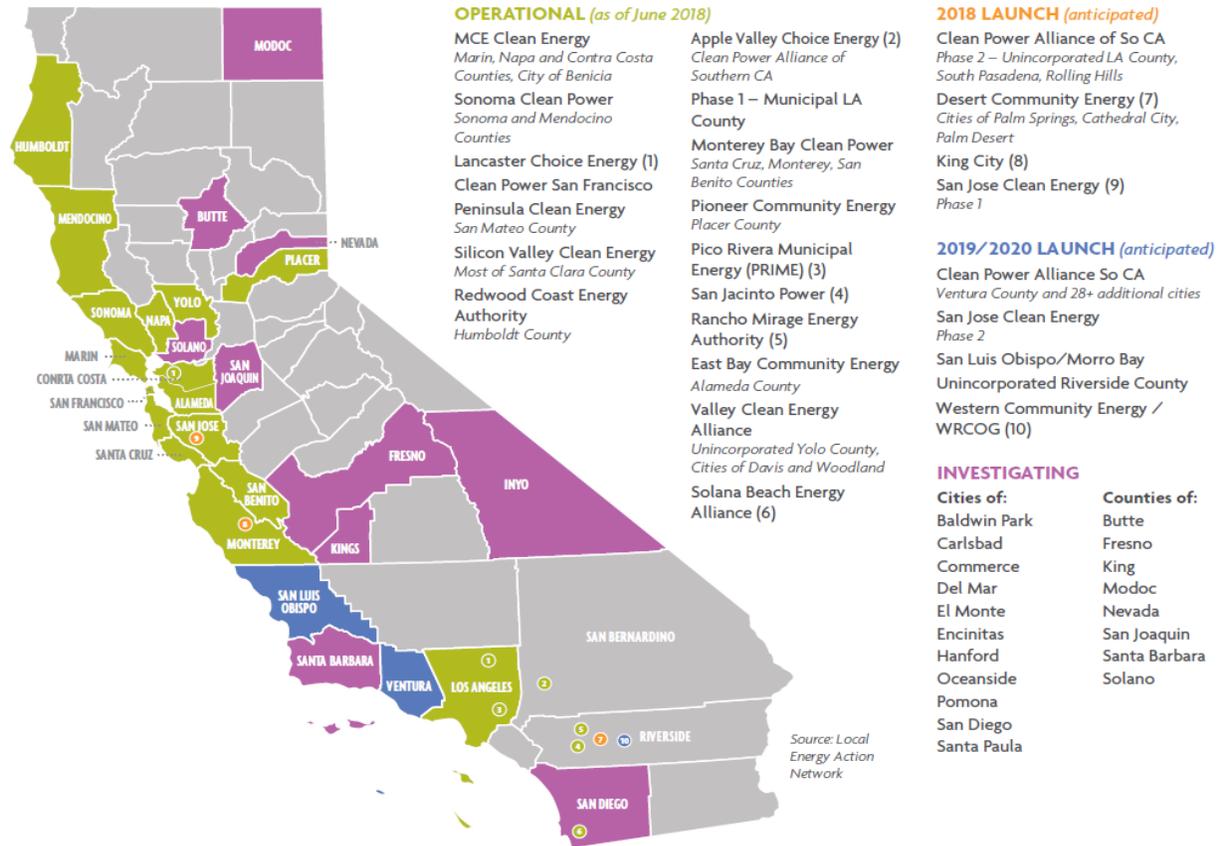
29 <http://www.leanenergyus.org/cca-by-state/california/>, accessed June 19, 2018.

30 CPUC 2017 Annual RPS Report. During RPS Compliance Period 1, only MCE was operational. The other CCAs listed came on-line during Compliance Period 2, except Silicon Valley Clean Energy, which came on-line in 2017 and therefore has not yet been subject to compliance reporting.



# California Energy Commission – Tracking Progress

Figure 5: Operational, Pending, and Potential CCAs<sup>v</sup>



Source: Gridworks [https://gridworks.org/wp-content/uploads/2018/06/Gridworks\\_CCA-Clean-Energy-Overview\\_final-1.pdf](https://gridworks.org/wp-content/uploads/2018/06/Gridworks_CCA-Clean-Energy-Overview_final-1.pdf)

Table 1: Average CCA RPS Procurement Percentages for MCE, SCP, LCE, PCE, and CPSF<sup>vi</sup>

Actuals						Forecasted			
Compliance Period 1			Compliance Period 2			Compliance Period 3			
20% Requirement			25% Requirement			33% Requirement			
2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
28%	29%	30%	48%	39%	47%	46%	38%	38%	30%

Source: CPUC Renewables Portfolio Standard Annual Report, November 2017

The CPUC's report titled, *California Customer Choice, An Evaluation of Regulatory Framework Options for an Evolving Energy Market – the Draft Green Book* – reports that by the end of 2018, as much as 25 percent of IOU retail electric load will be served by a combination of rooftop solar, CCAs and direct access providers.<sup>31</sup> A CPUC staff white paper further predicted that this number could grow to 85 percent in the next decade, which would represent as many

31 [http://www.cpuc.ca.gov/uploadedFiles/CPUC\\_Public\\_Website/Content/Utilities\\_and\\_Industries/Energy\\_-\\_Electricity\\_and\\_Natural\\_Gas/Cal%20Customer%20Choice%20Report%20%20v5-17-18.pdf](http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/Cal%20Customer%20Choice%20Report%20%20v5-17-18.pdf).



## California Energy Commission – Tracking Progress

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as 15 million to 20 million customers.<sup>32</sup> The potential widespread growth of CCAs presents opportunities and challenges for renewable development, as well as raising broader considerations of reliability, load uncertainty, and cost allocation.

As renewable power continues to become more cost competitive and corporate sustainability and environmental programs expand, corporations are accelerating their purchasing of renewable power, and direct corporate purchasing of renewable generation is increasing. For example, Apple announced in early 2018 that it is meeting its 100 percent renewable goal. Apple has developed renewable projects and entered into direct purchase agreements including recently entering into a 200 MW power purchase agreement with NV Energy to purchase electricity from the Techren Solar project. The trend of large entities procuring renewable resources through bilateral power purchase agreements has also grown in recent years with investments from military organizations and universities. According to a National Renewable Energy Laboratory (NREL) analysis, California had 822 MW of renewable energy purchased by corporations as of September 2017.<sup>33</sup>

### *Ensuring the Benefits of Renewables Reach All Californians*

California has undertaken several specific initiatives to ensure that the benefits of the State's clean energy transformation are realized by all Californians, including low-income residents and those in the most vulnerable communities. Senate Bill 350 (De León, Chapter 547, Statutes of 2015) directed the Energy Commission to identify opportunities across State energy programs to ensure they benefit low-income customers and disadvantaged communities. The resulting report, *Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities* (Barriers Study), was adopted by the Energy Commission in December 2016 after extensive stakeholder engagement.<sup>34</sup> The Energy Commission is working closely with other affected agencies to implement the 12 recommendations of the report and enhance current programs to meet the disadvantaged community goals of SB 350. A summary on progress toward reaching low-income and disadvantaged communities with some of the State's energy initiatives can be found in a separate Tracking Progress document focused on Energy Equity Indicators, which is also available as an interactive web map and a Tracking Progress page.<sup>35</sup>

### *Renewable Capacity Located Across the State*

As of December 31, 2017, California had more than 22,250 MW of wholesale renewable capacity, defined as facilities for which generation is exported to the grid and not consumed on-site. **Table 2** shows the quantity of wholesale RPS eligible generators and the total capacity of

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<sup>32</sup>[http://www.cpuc.ca.gov/uploadedFiles/CPUC\\_Public\\_Website/Content/News\\_Room/News\\_and\\_Updates/Retail%20Choice%20White%20Paper%205%208%2017.pdf](http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/News_and_Updates/Retail%20Choice%20White%20Paper%205%208%2017.pdf).

<sup>33</sup> <https://www.nrel.gov/docs/fy17osti/69080.pdf>

<sup>34</sup> [http://www.energy.ca.gov/sb350/barriers\\_report/](http://www.energy.ca.gov/sb350/barriers_report/)

<sup>35</sup> [http://www.energy.ca.gov/sb350/barriers\\_report/equity-indicators.html](http://www.energy.ca.gov/sb350/barriers_report/equity-indicators.html).



## California Energy Commission – Tracking Progress

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those generators, broken down by county for in-state facilities and by state for out-of-state facilities. **Table 2** is based on data collected by the Energy Commission from power plants within California or located out of state with a first point of interconnection in a California balancing authority.<sup>36</sup> Facilities with a first point of interconnection in a California balancing authority are aggregated, or collected, and listed by state at the bottom of the table. This table includes more than 1,000 MW of capacity that came on-line in 2017.

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<sup>36</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 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.



## California Energy Commission – Tracking Progress

**Table 2: Number and Total Capacity of RPS Eligible Wholesale Facilities On-Line as of December 31, 2017<sup>vii</sup>**

County	Biomass		Geothermal		Small Hydro		Solar PV		Solar Thermal		Wind		Total	
	#	MW	#	MW	#	MW	#	MW	#	MW	#	MW	#	MW
Alameda	4	24					5	8			4	228	13	261
Amador	1	23			2	14	1	2					4	38
Butte	1	2			11	70	4	4					16	76
Calaveras					8	32	2	2					10	34
Colusa	1	29											1	29
Contra Costa	2	7					5	34			1	38	8	79
El Dorado					9	69							9	69
Fresno	2	56			4	37	35	673					41	766
Glenn					2	6	1	2					3	7
Humboldt	3	61			2	2							5	64
Imperial			20	718	11	98	16	1,128			1	265	48	2,209
Inyo			3	302	17	157	1	3					21	463
Kern	4	124			6	76	78	2,470			49	3,280	137	5,951
Kings							21	478					21	478
Lake			5	396	2	6	2	2					9	403
Lassen	1	36			1	30							2	65
Los Angeles	12	203			22	213	137	1,017					171	1,433
Madera	2	38			9	69	2	22					13	128
Marin	2	4					3	3					5	7
Mariposa					1	9							1	9
Mendocino					4	13	3	6					7	19
Merced	2	13			7	35	9	135			1	18	19	202
Mono			3	40	3	21							6	61
Monterey	3	8					3	134			3	4	9	146
Napa	1	1			1	0	1	0					3	1
Nevada					11	82							11	82
Orange	5	84			4	13	5	7					14	104
Placer	3	52			13	93	3	5					19	149
Plumas	2	47			8	39							10	86
Riverside	2	55			7	50	27	1,152	1	250	30	643	67	2,150
Sacramento	4	10			1	14	35	127					40	151
San Benito							3	5					3	5
San Bernardino	1	1			14	39	85	655	11	999	3	7	114	1,701
San Diego	10	41			6	16	27	143			2	51	45	251
San Francisco	1	2					23	14					24	16
San Joaquin	5	82			2	12	7	11			2	4	16	108
San Luis Obispo	1	2			1	4	6	806					8	811
San Mateo	1	11											1	11
Santa Barbara	3	7			2	1	1	40					6	48
Santa Clara	2	3			2	1	6	12					10	16
Santa Cruz	3	5					1	1					4	7
Shasta	4	144			31	91	3	6			1	101	39	342



## California Energy Commission – Tracking Progress

County	Biomass		Geothermal		Small Hydro		Solar PV		Solar Thermal		Wind		Total	
	#	MW	#	MW	#	MW	#	MW	#	MW	#	MW	#	MW
Sierra					6	21							6	21
Siskiyou	1	13			8	72							9	86
Solano	2	10					7	15			13	1,035	22	1,060
Sonoma	3	8	12	1,238	1	3	5	8					21	1,256
Stanislaus	2	25			7	21	24	59					33	105
Sutter							1	1					1	1
Tehama					4	22	3	4			1	1	8	26
Trinity					8	16							8	16
Tulare	2	14			8	38	31	307					41	359
Tuolumne	2	33			8	85	1	2					11	120
Ventura	2	4			4	3	2	3					8	10
Yolo	2	31			1	12	2	4			1	1	6	47
Yuba	1	3			3	3							4	6
Other <sup>37</sup>					1	1	18	120					19	121
<b>In-State Total</b>	<b>105</b>	<b>1,317</b>	<b>43</b>	<b>2,694</b>	<b>282</b>	<b>1,707</b>	<b>655</b>	<b>9,626</b>	<b>12</b>	<b>1,249</b>	<b>112</b>	<b>5,678</b>	<b>1,210</b>	<b>22,250</b>
Arizona							5	837					5	837
Nevada			1	65			5	812					6	876
Utah											2	304	2	304
Mexico (Baja)											1	155	1	155
<b>Grand Total</b>	<b>105</b>	<b>1,317</b>	<b>44</b>	<b>2,750</b>	<b>282</b>	<b>1,707</b>	<b>665</b>	<b>11,274</b>	<b>12</b>	<b>1,249</b>	<b>115</b>	<b>6,137</b>	<b>1,224</b>	<b>24,450</b>

Source: California Energy Commission, staff analysis June 2018

<sup>37</sup> These facilities came on-line in 2017 but could not be associated with a county.

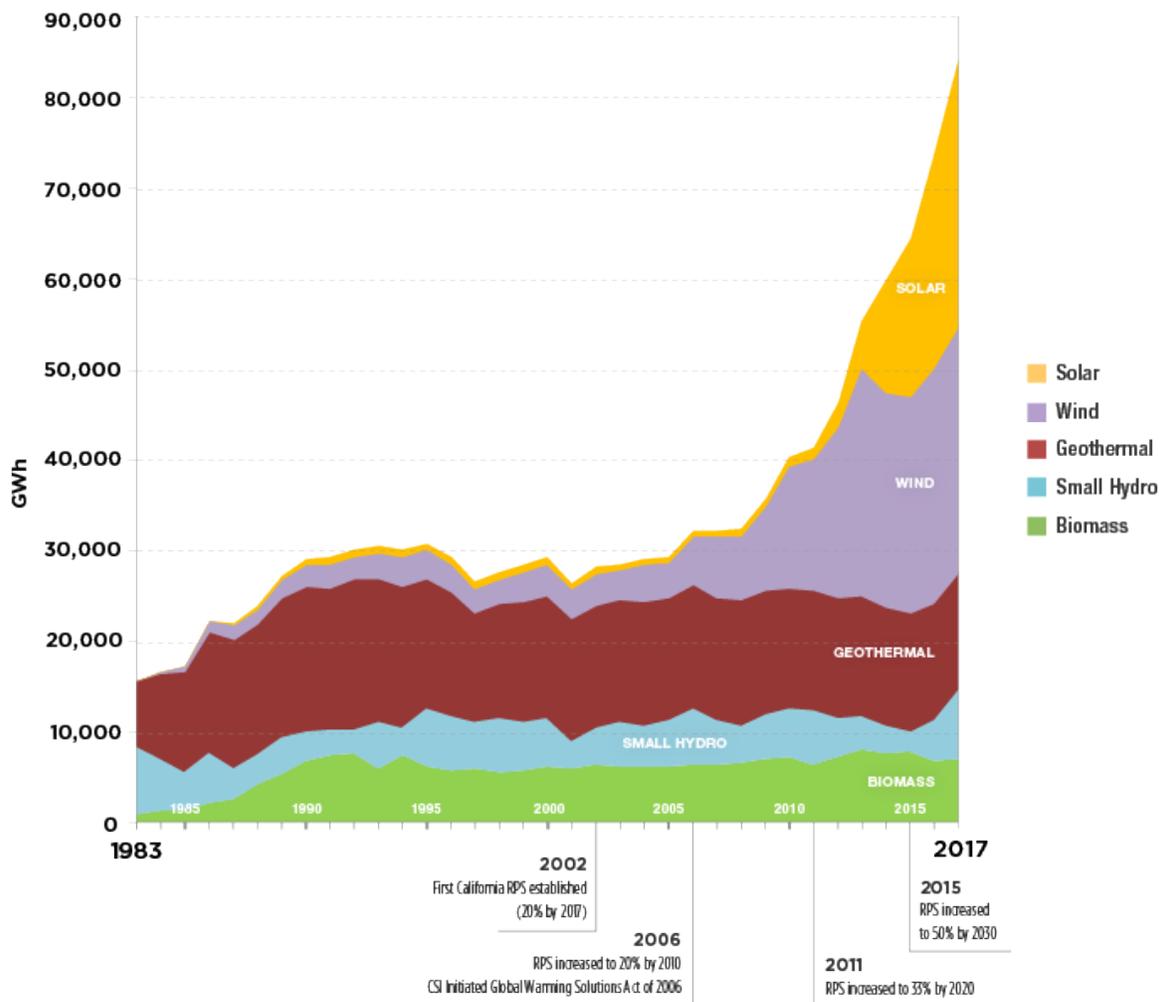


## California Energy Commission – Tracking Progress

### Renewable Generation: Continued Progress

**Figure 6** shows renewable generation procured and generated by California utilities from 1983–2017 by resource type, compiled using California electric energy generation data<sup>38</sup> and total system power data.<sup>39</sup> These data do not include self-generation. These data are higher than the 81,000 GWh cited previously for RPS-eligible generation, as this figure includes some non-RPS eligible renewable generation included on total system power calculations annually. **Figure 7** also shows key policy changes in 2002, 2006, 2011, and 2015 to advance renewable development.

**Figure 6: Renewable Energy Generation 1983-2017 by Resource Type**<sup>viii</sup>



Source: California Energy Commission, staff analysis June 2018

38 [http://www.energy.ca.gov/almanac/electricity\\_data/electricity\\_generation.html](http://www.energy.ca.gov/almanac/electricity_data/electricity_generation.html).

39 [http://www.energy.ca.gov/almanac/electricity\\_data/total\\_system\\_power.html](http://www.energy.ca.gov/almanac/electricity_data/total_system_power.html).

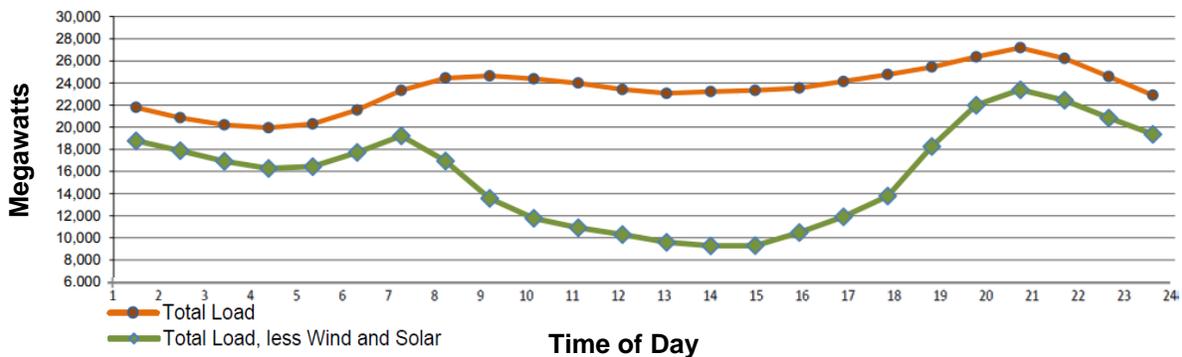


# California Energy Commission – Tracking Progress

## Renewable Generation Profiles

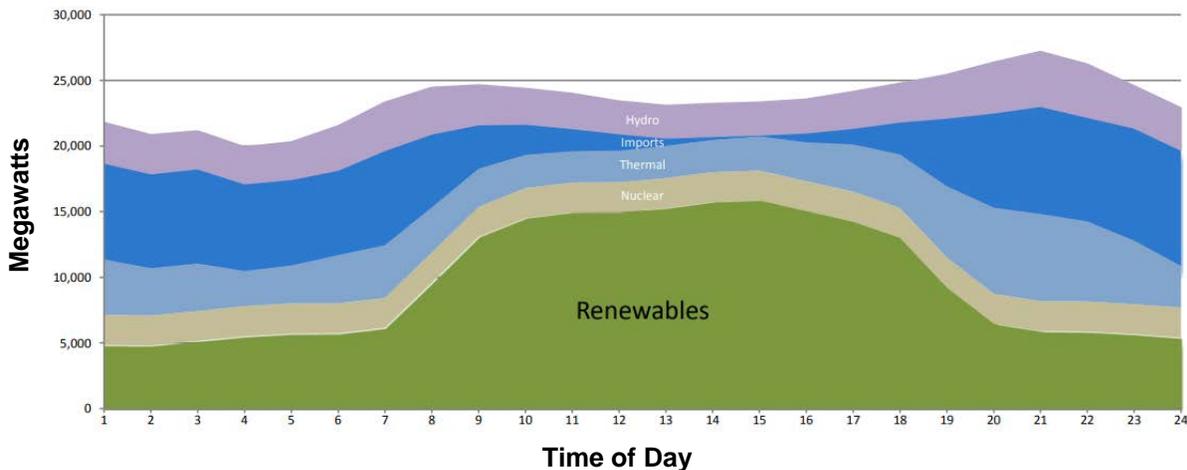
The growth in renewables, particularly solar generation, has dramatically changed California’s generation profile, and California’s grid operators have had to adapt to these changes. For example, on May 26, 2018, 73.9 percent of instantaneous load on the California Independent System Operator (California ISO) grid was served by a mix of renewable resources.<sup>40</sup> California ISO experienced a new instantaneous solar generation record on April 27, 2018, when solar capacity peaked at 10,539 MW at 1:40 pm.<sup>41</sup> **Figure 7** shows the total load and the total load without wind and solar (net load) on April 27, 2018. **Figure 8** shows the California ISO’s 24-hour snapshot of the overall resource profile, demonstrating how much of the state’s overall production capacity on that day came from renewables.

**Figure 7: Average Hourly Net Load in California ISO on 4/27/18<sup>ix</sup>**



Source: [http://content.caiso.com/green/renewrpt/20180427\\_DailyRenewablesWatch.pdf](http://content.caiso.com/green/renewrpt/20180427_DailyRenewablesWatch.pdf)

**Figure 8: Hourly Average Breakdown of Total Production by Resource Type on 4/27/18<sup>x</sup>**



Source: [http://content.caiso.com/green/renewrpt/20180427\\_DailyRenewablesWatch.pdf](http://content.caiso.com/green/renewrpt/20180427_DailyRenewablesWatch.pdf)

40 <https://efiling.energy.ca.gov/GetDocument.aspx?tn=223856>

41 <https://pv-magazine-usa.com/2018/06/25/summer-solstice-sets-solar-record-in-california/>.



## California Energy Commission – Tracking Progress

### Energy Storage Supports Renewable Integration

Energy storage technologies capture electricity or heat for later use, which can be particularly helpful when there is too much electricity or not enough to meet demand. As California increases its use of intermittent resources such as solar and wind, storage is one of several tools that can help ensure the reliability of the grid and maximize the benefits of renewable energy resources. A summary of California’s progress in supporting the development and integration of energy storage can be found in the Energy Storage Tracking Progress report.<sup>42</sup>

### Potential Additional Capacity - Renewable Energy Facility Siting in California

This section contains information on planned renewable projects in California. Utility-scale

**Belridge Solar Project**  
A large and unique project is under development by Aera Energy and Glasspoint Solar in Kern County that will incorporate a solar thermal plant and a solar PV plant to create both steam for oil extraction and electricity. The developer anticipates that it will be California’s largest solar energy project with 850 MW(thermal) of solar thermal energy output (producing 12 million barrels of steam from sunlight reflected by mirrors) and 26.5 MW of electricity from the solar electric plant. The developer estimates that replacing the use of natural gas to produce steam will offset roughly 376,000 tons of carbon dioxide emissions. Project construction is expected to begin in 2019 with steam and electricity generation beginning in 2020. For more information see <https://www.glasspoint.com/belridgesolar/>

renewable energy facilities proposed in California must receive environmental permits in compliance with the California Environmental Quality Act (CEQA). The Energy Commission has statutory responsibility for licensing thermal power plants 50 MW and larger, along with all associated infrastructure, such as transmission lines to the first point of interconnection with the grid, fuel supply lines, and water pipelines. Typically, local jurisdictions like counties and cities are responsible for permitting solar photovoltaic (PV) and wind projects. For projects proposed on federal lands, federal agencies like the U.S. Bureau of Land Management or the U.S. Forest Service may

be responsible for renewable energy project permitting.

About 640 MW of new solar PV capacity is estimated to come on-line by the end of 2018. These resources have been permitted and have received power purchase agreements.

More broadly, there are about 8,000 MW of renewable energy projects that have received permits to build in California but are not yet operational, as shown in **Table 3**. These include projects with and without secured purchase contracts. Most of these proposed projects seek to interconnect to the California ISO-controlled grid.<sup>43</sup>

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), the status of a project is often amended. Therefore, the renewable energy siting information presented in **Table 3** reflects a snapshot in time.

42 [http://www.energy.ca.gov/renewables/tracking\\_progress/documents/energy\\_storage.pdf](http://www.energy.ca.gov/renewables/tracking_progress/documents/energy_storage.pdf)

43 Operators of generation resources interested in interconnecting to the California ISO-controlled grid submit an interconnection request to the grid operator. The California ISO regularly performs clustered interconnection studies in phases, which inform the interconnection customer about grid conditions that might affect decisions about deliverability status, project size, meeting the interconnection financial security posting requirements, and so forth. Resources in the interconnection queue are reassessed annually.



## California Energy Commission – Tracking Progress

**Table 3: Renewable Projects With Environmental Permits<sup>xi</sup>**

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			1	20					1	90			2	110
Colusa			1	20									1	20
Contra Costa	1	4	3	18									4	21
El Dorado											1	3	1	3
Fresno			14	362									14	362
Glenn	1	2											1	2
Imperial			14	969			3	212					17	1,181
Kern	3	3	18	1,036					8	828			29	1,867
Kings			5	442									5	442
Lassen			1	8									1	8
Los Angeles			17	326					1	2	1	4	19	332
Madera	1	2	3	73									4	75
Mariposa	1	2											1	2
Merced			4	208					1	80			5	288
Mono							1	33					1	33
Monterey	1	4	3	154					1	3			5	161
Napa			1	7									1	7
Orange			4	7									4	7
Placer	1	2											1	2
Riverside	1	1	9	1,962									10	1,963
Sacramento			3	9									3	9
San Bernardino	1	3	12	344	1	50							14	397
San Diego			2	122					1	69			3	191
San Joaquin			4	25									4	25
Santa Barbara	1	2											1	2
Santa Clara	1	3	6	16									7	19
Solano			1	1									1	1
Sonoma							3	137					3	137
Stanislaus			4	220									4	220
Tulare	1	2	1	46									2	48
Ventura			2	5									2	5
Yolo			1	2					1	2			2	3
Yuba	1	3	1	1									2	4
<b>Grand Total</b>	<b>15</b>	<b>33</b>	<b>135</b>	<b>6,401</b>	<b>1</b>	<b>50</b>	<b>7</b>	<b>381</b>	<b>14</b>	<b>1,073</b>	<b>2</b>	<b>7</b>	<b>174</b>	<b>8,000</b>

Source: California Energy Commission, staff analysis June 2018

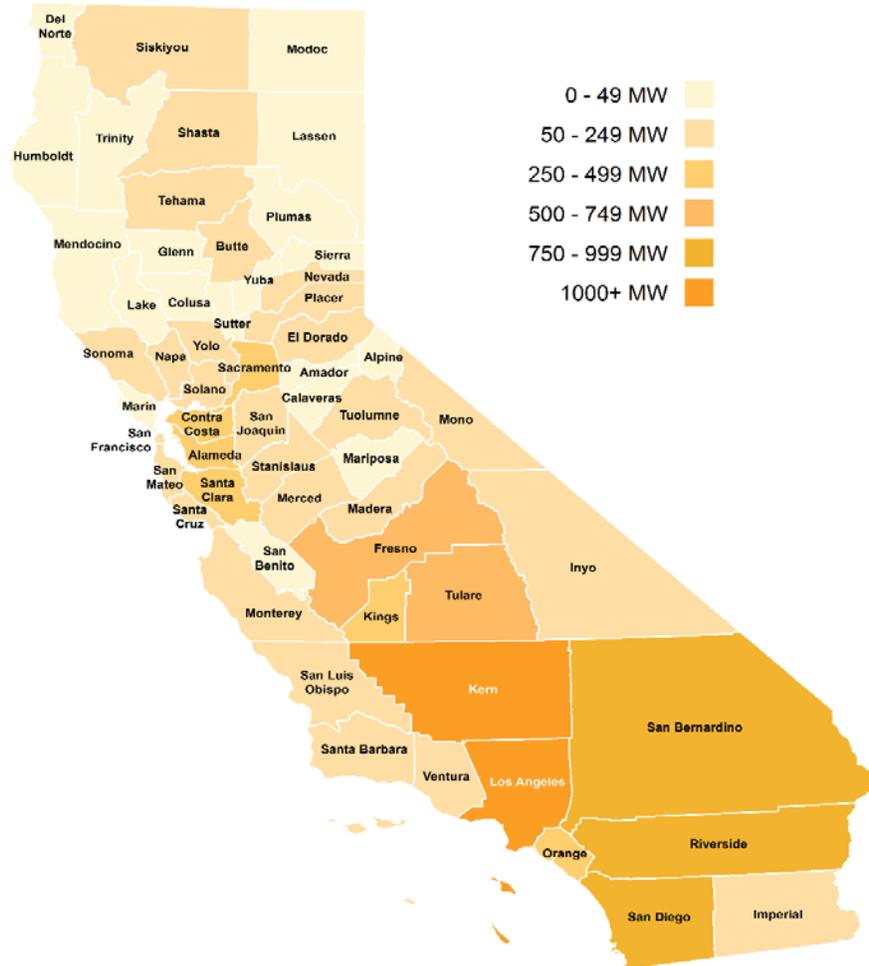


# California Energy Commission – Tracking Progress

## Distributed Renewable Capacity Continues to Grow

California has seen significant growth in the amount of distributed generation, including smaller-scale facilities that sell electricity to the market, as well as systems installed primarily to provide electricity “onsite” that also export excess power back to the grid, often under a “net-energy-metering” agreement. **Figure 9** shows the geographic breakdown of distributed generation capacity as of December 31, 2017.

**Figure 9: Map of On-Line Renewable Distributed Generation Capacity, by County<sup>xii</sup>**



Source: California Energy Commission, staff analysis June 2018

## California Achieves the Goal of 3,000 Megawatts of Behind-the-Meter Solar Systems

Behind-the-meter resources continue to increase throughout the State, the vast majority of which are solar PV systems.<sup>44</sup> **Figure 10** shows California’s annual growth of new interconnected solar behind-the-meter capacity, based on Energy Commission filings, reported

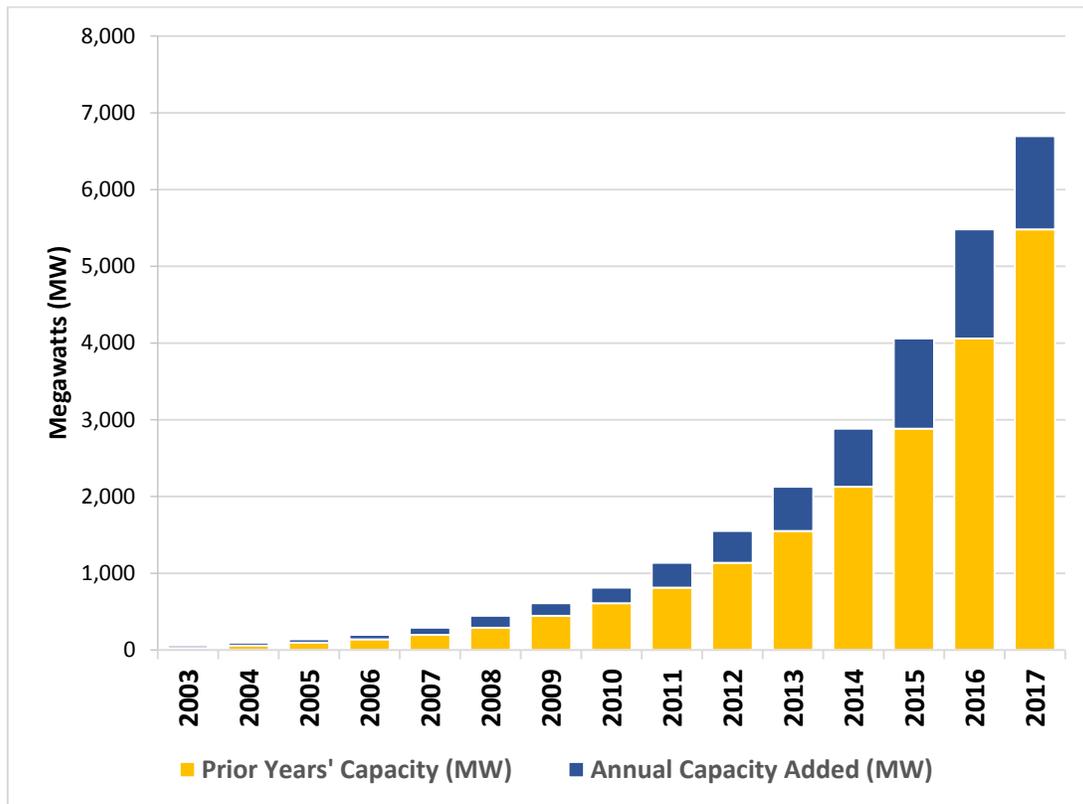
<sup>44</sup> Staff estimates that nearly 100 MW of behind-the-meter capacity comes from non-solar resources.



## California Energy Commission – Tracking Progress

interconnections through 2017, and state incentive program records. Of the close to 6,700 MW of behind-the-meter solar installed statewide, nearly 5,600 MW has been installed since 2011. The total capacity shown in **Figure 10** represents more than 780,000 systems installed on homes and businesses across California.

**Figure 10: Total and Incremental Behind-the-Meter Solar Capacity by Year<sup>xiii</sup>**



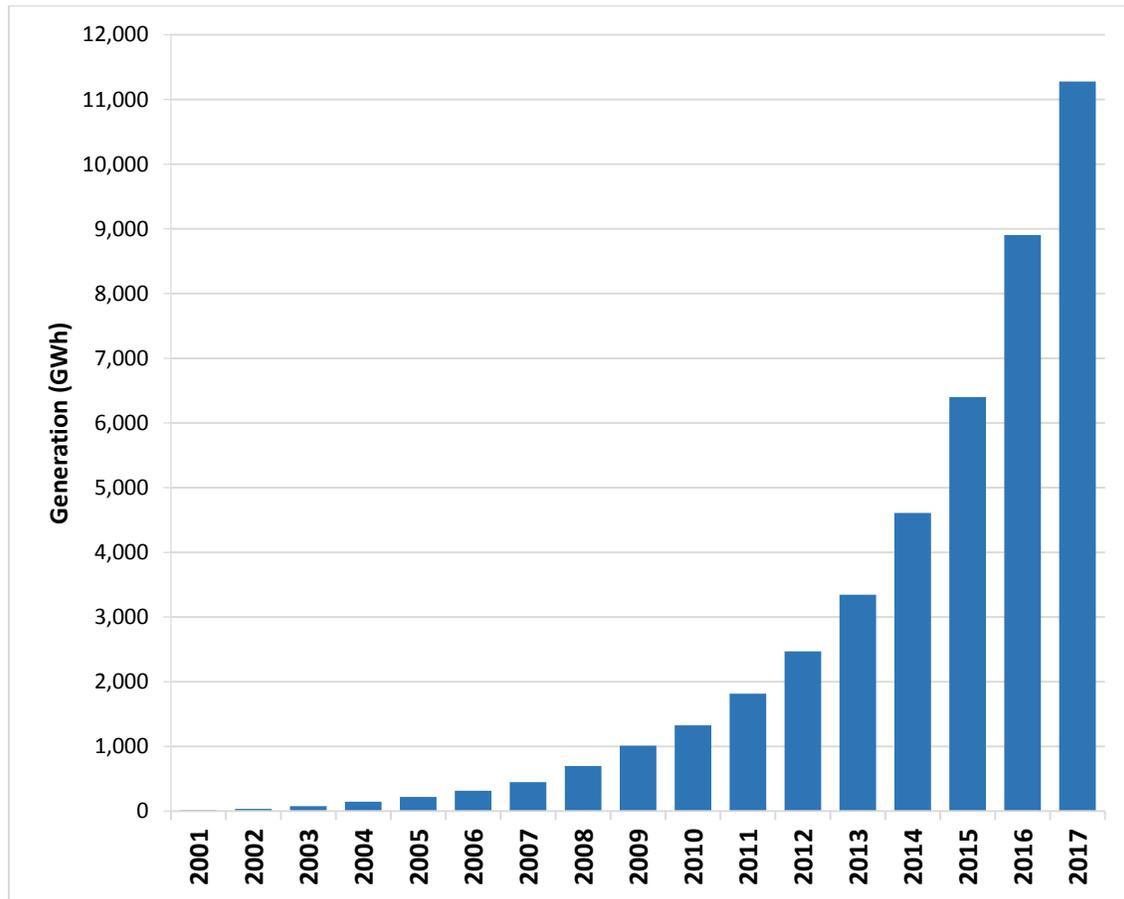
Source: California Energy Commission staff analysis, June 2018

**Figure 11** shows estimated generation from the behind-the-meter systems represented in **Figure 10**. Energy Commission staff developed these estimates based on expected solar load profiles for each climate zone in California. The generation from behind-the-meter systems has increased from almost zero in 2001 to more than 11,000 GWh in 2017. In the most recent years, estimated generation from these resources more than tripled, increasing from 3,000 GWh in 2013 to 11,000 GWh in 2017.



## California Energy Commission – Tracking Progress

Figure 11: Estimated Generation From Behind-the-Meter Solar, 2001-2017<sup>xiv</sup>



Source: California Energy Commission staff analysis, June 2018

### California Solar Initiative (CSI)

In 2006, the California Solar Initiative was created by Senate Bill 1. The CSI program, implemented by various program administrators and overseen by the CPUC, was designed with many components, including a general-market solar incentive program, low-income solar incentive programs, a new solar homes program, and individual programs administered by publicly owned utilities. The CPUC administers the “general-market” CSI commercial and residential incentives program, as well as two affordable housing programs for existing buildings, the Multi-Family Affordable Solar Housing (MASH) and Single-Family Affordable Solar Homes (SASH). The Energy Commission administers the New Solar Homes Partnership (NSHP) and also maintains equipment lists<sup>45</sup> of eligible PV modules, inverters, and other solar equipment that can be used for CSI incentive funding. These lists are also used support IOU

<sup>45</sup> While equipment on the lists have undergone tests to achieve minimal safety and performance standards, the Energy Commission does not independently confirm manufacturers' self-reported information. The Energy Commission and the State of California make no claim or warranty on the equipment and its safety, performance or durability.



## California Energy Commission – Tracking Progress

review of interconnection applications, affordable housing incentive programs, and other states' solar incentive programs.

The CSI general market program, which closed to new applications on December 31, 2016, exceeded the goal of installing 1,750 MW.<sup>46</sup> As of February 1, 2017, the program had installed roughly 1,800 MW, with another 100 MW reserved in pending projects.<sup>47</sup> As of July 2017, MASH has supported the installation of 33 MW of interconnected solar in more than 400 projects statewide and has reserved funding for projects totaling an additional 28 MW.<sup>48</sup> The SASH program provides incentives for solar PV systems on existing owner-occupied low-income households. So far, SASH has supported the installation of more than 6,000 systems and, including pending and reserved projects, is on track to install almost 20 MW of capacity.<sup>49</sup>

### *New Solar Homes Partnership (NSHP) Program*

The NSHP program provides financial incentives to encourage the installation of eligible solar energy systems on new home construction. The NSHP Program supports the achievement of the state's distributed solar goals with a specific goal of installing 360 MW of solar on newly constructed homes. In 2015, Senate Bill 83 (Committee on Budget and Fiscal Review, Chapter 24, Statutes of 2015) extended the life of the NSHP and required all incentives to be reserved no later than June 1, 2018, and disbursed no later than December 31, 2021.

As of June 1, 2018, about 120 MW of solar capacity had been installed, and incentive funding for an additional 300 MW had been reserved, for a total of 430 MW, as shown in **Table 4**. As shown in **Figure 12**, with combined paid and pending projects, the NSHP program anticipates meeting or exceeding the 360 MW goal.

**Table 4: NSHP Program Activity<sup>xv</sup>**

	Number of Systems	\$ Millions	MW (AC)
Reserved	78,956	\$174.67	310
Installed	37,824	\$185.83	120
Total	116,780	\$360.5	430

Source: California Energy Commission, staff analysis, June 2018

46 For more information, see <http://www.gosolarcalifornia.ca.gov/about/csi.php>.

47 <http://www.cpuc.ca.gov/General.aspx?id=6043> accessed June 2018.

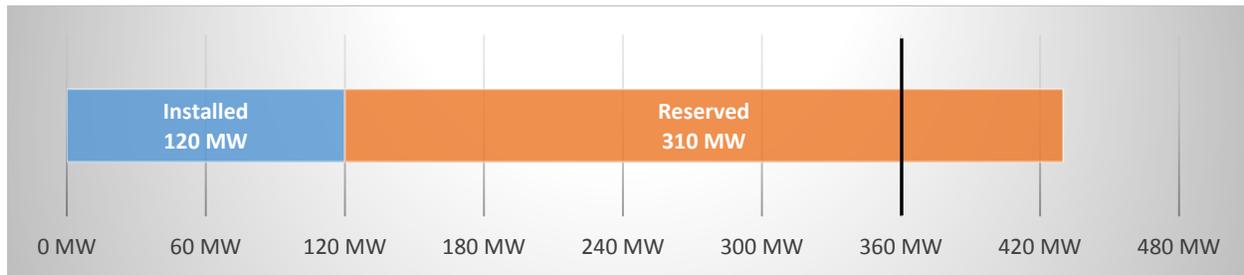
48 CSI MASH Program <http://www.cpuc.ca.gov/General.aspx?id=3752>.

49 CSI SASH Program <http://www.cpuc.ca.gov/General.aspx?id=3043>.



## California Energy Commission – Tracking Progress

Figure 12: Progress Toward NSHP 360 MW Goal<sup>xvi</sup>



Source: <http://www.gosolarcalifornia.ca.gov/about/nshp.php>. Updated June 2018

The NSHP program also assists lower-income residents by providing higher per-watt incentives for eligible residential affordable housing projects. Since it began, the NSHP program has funded the installation of more than 12 MW of capacity on affordable housing developments, with paid incentives totaling more than \$29 million. In 2017, the NSHP program provided more than \$2 million in incentives to 27 affordable housing projects across the state supporting the installation of more than 1 MW of new solar capacity. These affordable housing incentives accounted for more than 10 percent of the total incentives paid through the program in 2017.

Following on the success of the NSHP program and significant advances in building energy efficiency, in May 2018, the Energy Commission adopted Building Energy Efficiency Standards that require solar photovoltaic systems on new homes, starting in 2020. For residential homeowners, based on a 30-year mortgage, the Energy Commission estimates that the standards will add about \$40 to an average monthly payment but save consumers \$80 on monthly heating, cooling and lighting bills, benefitting homeowners over the long term.<sup>50</sup>

“Under these new standards, buildings will perform better than ever; at the same time, they contribute to a reliable grid. The buildings that Californians buy and live in will operate very efficiently while generating their own clean energy. They will cost less to operate, have healthy indoor air and provide a platform for ‘smart’ technologies that will propel the state even further down the road to a low-emissions future.”  
-Commissioner Andrew McAllister

### California Is Benefiting From Dramatic Decreases in the Cost of Renewables

Continued cost declines in key renewable energy sources, mainly solar and wind energy, have helped maintain a fast pace of market growth for renewables. As part of the U.S. Department of Energy’s (DOE) SunShot program, the Lawrence Berkeley National Laboratory (LBNL) reports the median installed prices for solar energy systems quarterly and annually. These values are broken down by system size. The most recent LBNL report shows that for projects completed in 2016, the cost of installing utility-scale PV (systems greater than 5 MW) has fallen by two-thirds since the 2007–2009 period, to \$2.2/watt alternating current ( $W_{AC}$ ) (or \$1.7/watt direct current [ $W_{DC}$ ]), with the median utility-scale installed price in California being marginally higher, at

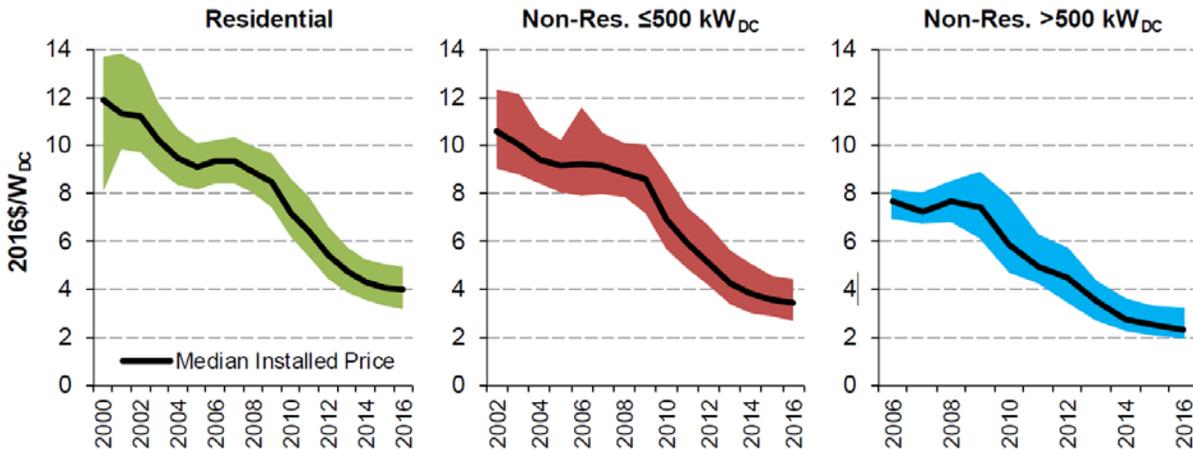
50 [http://www.energy.ca.gov/releases/2018\\_releases/2018-05-09\\_building\\_standards\\_adopted\\_nr.html](http://www.energy.ca.gov/releases/2018_releases/2018-05-09_building_standards_adopted_nr.html).



## California Energy Commission – Tracking Progress

\$2.4/W<sub>AC</sub>.<sup>51</sup> **Figure 13** displays median installed system costs (solid line) and the 20<sup>th</sup>-80<sup>th</sup> percentile range (shaded areas) for residential systems (green), small nonresidential systems ( $\leq 500$  kW in red), and large nonresidential systems ( $>500$  kW in blue).<sup>52</sup>

**Figure 13: U.S. Residential and Nonresidential PV System Prices**<sup>xvii</sup>



Source: U.S. Dept. of Energy, *Tracking the Sun 10*

The installed cost of wind has also decreased over time. The DOE reported that for projects completed in 2016, the national average capacity-weighted installed cost was about \$1.59/watt, down \$0.78/watt from 2010.<sup>53</sup> The report did not include California-specific values, purportedly because there were not significant installations in 2016.

The RPS program has helped achieve large reductions in cost for renewable electricity between 2008 and 2016, the price of utility scale solar contracts reported to the CPUC have gone down 77 percent, and between 2007 and 2015 reported prices of wind contracts have gone down 47 percent.<sup>54</sup>

51 Bolinger, Mark, Joachim Seel, and Kristina Hamachi LaCommare. September 2017. *Utility-Scale Solar 2016: An Empirical Analysis of Project Cost, Performance, and Pricing Trends in the United States*. Lawrence Berkeley National Laboratory. [https://emp.lbl.gov/sites/default/files/utility-scale\\_solar\\_2016\\_report.pdf](https://emp.lbl.gov/sites/default/files/utility-scale_solar_2016_report.pdf).

52 Barbose, Galen, Naïm Darghouth, Dev Millstein, Kristina LaCommare, Nicholas DiSanti, and Rebecca Widiss. September 2017. *Tracking the Sun 10: The Installed Price of Residential and Non-Residential Photovoltaic Systems in the United States*. Lawrence Berkeley National Laboratory. Figure 6.

53 Wisner, Ryan and Mark Bollinger. August 2017. *2016 Wind Technologies Market Report*, Lawrence Berkeley National Laboratory. [https://emp.lbl.gov/sites/default/files/2016\\_wind\\_technologies\\_market\\_report\\_final\\_optimized.pdf](https://emp.lbl.gov/sites/default/files/2016_wind_technologies_market_report_final_optimized.pdf). The majority of recent wind installations are in the U.S. interior and not in California. These national costs may not closely track California costs.

54 [http://www.cpuc.ca.gov/uploadedFiles/CPUC\\_Website/Content/Utilities\\_and\\_Industries/Energy/Reports\\_and\\_White\\_Papers/Nov%202017%20-%20RPS%20Annual%20Report.pdf](http://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Reports_and_White_Papers/Nov%202017%20-%20RPS%20Annual%20Report.pdf).



## California Energy Commission – Tracking Progress

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### Additional References:

For more information on the Renewables Portfolio Standard, see

<http://www.energy.ca.gov/portfolio/index.html>.

For more information on investor-owned utility, electric service provider, and CCA 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/).

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



## California Energy Commission – Tracking Progress

### Sources of Clean Energy Goals:

**Table 5: California’s Clean Energy Goals<sup>xviii</sup>**

Goals	Source
<b>Reduce GHG emissions 40 percent below 1990 levels by 2030</b>	Senate Bill (SB) 32 (Pavley, Chapter 249, Statutes of 2016), Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006)
<b>Reduce GHG emissions 80 percent below 1990 levels by 2050</b>	Executive Order B-30-15
<b>Increase electricity derived from renewable energy sources to 50 percent by 2030—build on prior RPS mandate of 33 percent by 2020</b>	<ul style="list-style-type: none"> <li>• 50 percent RPS by 2030, SB 350 (De León, Chapter 547, Statutes of 2015);</li> <li>• 33 percent RPS by 2020, SB x1 2 (Simitian, Chapter 1, Statutes of 2011-12 First Extraordinary Session).</li> <li>• 20 percent by 2010 for IOUs, SB 107 (Simitian, Chapter 464, Statutes of 2006 (other provisions included expanding the RPS reporting requirements of the publicly owned utilities.))</li> <li>• 20 percent by 2017, SB 1078 (Sher, Chapter 516, Statutes of 2002)</li> </ul>
<b>3,000 MW of solar energy at new and existing residential and commercial sites by the end of 2016</b> -1,940 MW for existing in IOU territory -700 MW for existing in POU territory -360 MW for new in IOU territory	SB 1 (Murray, Chapter 132, Statutes of 2006)
<b>Solar energy systems placed on 50 percent of new homes by 2020</b>	SB 1 (Murray, Chapter 132, Statutes of 2006)
<b>20,000 MW of renewable capacity by 2020</b> -8,000 MW of large-scale renewables -12,000 MW of distributed generation (defined as “localized” and <20MW)	Governor Brown’s ‘Clean Energy Jobs Plan’ 2010
<b>Ensure climate change and clean energy policies are transparent and equitable, with the benefits reaching disadvantaged communities</b>	SB 350 (De León, Chapter 547, Statutes of 2015)

Source: California Energy Commission, staff analysis June 2018



## California Energy Commission – Tracking Progress

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### Data Sources

#### Statewide Electricity Retail Sales

*California Energy Demand 2018-2030 Revised Forecast.*  
<https://efiling.energy.ca.gov/getdocument.aspx?tn=223244>

#### Renewables

The following data sources were used to prepare the figures in this report:

[R1] 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).

[R2] Power Source Disclosure filings (SB 1305). <http://www.energy.ca.gov/pcl/>.

[R3] CPUC RPS compliance filings, <http://www.cpuc.ca.gov/General.aspx?id=3856>.

[R4] California Energy Commission RPS compliance filings.

[R5] 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).

[R6] California ISO Daily Renewables Watch,  
[http://content.caiso.com/green/renewrpt/20180427\\_DailyRenewablesWatch.pdf](http://content.caiso.com/green/renewrpt/20180427_DailyRenewablesWatch.pdf).

[R7] RPS Certified Facilities Database – Public Search. <https://rps.energy.ca.gov/Login.aspx>

#### 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 2017 available at <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-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/wholesaleelectricssuppliersolicitation/standardcontractsforpurchase/>.

[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).



## California Energy Commission – Tracking Progress

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[D8] Self-Generation Incentive Program (June 2018): <http://californiadgstats.ca.gov/downloads/>.

[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://www.energy.ca.gov/sb1/pou\\_reports/](http://www.energy.ca.gov/sb1/pou_reports/)

[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 2017.

[D14] NEM Currently Interconnected Data Set (April 30, 2018):  
<http://californiadgstats.ca.gov/downloads/>

[D15] U.S. Energy Information Administration Electric Power Monthly, November 2015, Table 1.17.B. <http://www.eia.gov/electricity/monthly/pdf/epm.pdf>.

[D16] Behind-the-meter solar estimates were developed by California Energy Commission staff to support the IEPR demand forecast according to the method described in Appendix A of the demand forecast: <https://efiling.energy.ca.gov/getdocument.aspx?tn=223244>.

### Historical References

[H1] California Electrical Energy Generation, 1983-2002. Total Production, by Resource Type (gigawatt-hours). [http://www.energy.ca.gov/almanac/electricity\\_data/electricity\\_generation.html](http://www.energy.ca.gov/almanac/electricity_data/electricity_generation.html). (For 1983-2000, small hydropower is estimated as 13 percent of all hydropower reported on this table).

[H2] 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).

[H3] 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/)

[H4] 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).

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## California Energy Commission – Tracking Progress

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Media inquiries should be sent to the Media and Public Communications Office at (916) 654-4989 or by email at [mediaoffice@energy.ca.gov](mailto:mediaoffice@energy.ca.gov).

The following section provides resources for more information on Energy Commission programs, projects, State energy goals, California electricity retail sales, and data sources used for the figures and tables in this report.



## California Energy Commission – Tracking Progress

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### Notes on Figures and Tables:

#### <sup>i</sup> **Figure 1**

- Staff estimated 2017 renewable energy generation totaled 81,013 GWh primarily using data from the Energy Commission's Quarterly Fuels and Energy Report and Power Source Disclosure Program, which captures in-state renewable energy generation assumed to have been purchased by California load-serving entities and 2017 out-of-state renewable energy procurement.
- Staff estimated an adjusted statewide 2017 retail sales totaled (251,553 GWh) using the *California Energy Demand 2018-2030 Revised Forecast* mid case, including additional achievable energy efficiency and photovoltaic impacts, less line losses, self-generation, and pumping loads.
- The renewables procurement percentage estimate does not represent verified eligible RPS procurements and thus is not an official determination of RPS compliance or progress.
- Retail sales and generation data are rounded to the nearest 500 GWh.
- Estimates reported here of total generation and renewable energy capacity do not include large hydroelectric power plants (above 30 MW), as they are not eligible for California's RPS with a few exceptions noted in the RPS Eligibility Guidebook. Roughly 10 to 15 percent of California's energy generation in any given year is from large hydroelectric generation.
- Self-generation from sources such as rooftop solar is not included in the Figure 1 estimate of renewable energy generation, although it does lower retail sales of electricity, thus decreasing overall RPS compliance.

#### <sup>ii</sup> **Figure 2 Generation**

- This chart represents an estimate of all generation in 2017. It is a revision of the published amounts in the December 2017 edition of this tracking progress report. It is mostly based on actual generation figures reported by power plant owners during the first two quarters of 2018. Some estimates were included when reported values were unavailable.
- These generation values include all in-state RPS eligible resources, all resources with first point of interconnection in California, and all out-of-state resources procured under long-term or short-term contracts.
- Electricity generated from self-generation capacity is not included in this estimate of renewable energy generation.

#### <sup>iii</sup> **Figure 2 Capacity**

- Data include only facilities physically in California, including some facilities that may have contracted to sell power outside California. The entire nameplate capacity of these facilities is included in the capacity total.
- Data do not include 2,172 MW of renewable energy facilities that are physically out of state but have the first point on interconnection in California.
- Approximately 200 MW of solar PV facilities from the Quarterly Fuels and Energy Report were excluded in Figure 3 to avoid potential double counting because they were assumed to be primarily used for self-generation and may already be included in other data sources.
- Data includes approximately 100 MW of renewable self-generation that uses either wind, biomass, digester gas, or gas derived from biomass. self-generation. These facilities were identified through their participation in SGIP and cross referenced with facilities from other sources.
- The generation data shown in Figure 2 do not include unbundled renewable energy credits (RECs). Unbundled RECs a REC from an eligible renewable energy resource that is not procured as part of the same contract or ownership agreement with the underlying energy from that eligible renewable



## California Energy Commission – Tracking Progress

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energy resource; this includes RECs that were originally procured as a bundled product but were subsequently resold separately from the underlying energy.

- Totals may not sum due to rounding.

### Figure 3

- Data only include facilities larger than 20MW and is based on commercial operations dates reported through the Quarterly Fuels and Energy Report.

### iv Figure 4

- Staff included only facilities from the Quarterly Fuels and Energy Report for facilities with a nameplate capacity between 1 MW and 20 MW.
- Renewable distributed generation sources were cross-referenced with the Quarterly Fuels and Energy Report to remove potential duplicates.
- Pending projects include projects with incentive funding reserved from a state-funded renewable energy incentive program.

### v Figure 5

- Map credit Gridworks
- [https://gridworks.org/wp-content/uploads/2018/06/Gridworks\\_CCA-Clean-Energy-Overview\\_final-1.pdf](https://gridworks.org/wp-content/uploads/2018/06/Gridworks_CCA-Clean-Energy-Overview_final-1.pdf)

### vi Table 1

- CPUC Renewables Portfolio Standard Annual Report, November 2017. Data compiled from CCA RPS Compliance Reports, August 2017.
- [http://www.cpuc.ca.gov/uploadedFiles/CPUC\\_Website/Content/Utilities\\_and\\_Industries/Energy/Reports\\_and\\_White\\_Papers/Nov%202017%20-%20RPS%20Annual%20Report.pdf](http://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Reports_and_White_Papers/Nov%202017%20-%20RPS%20Annual%20Report.pdf).

### vii Table 2

- 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.
- “Biomass” does not include generation by natural gas plants using out-of-state landfill and digester gas transported through the natural gas pipeline. Please check the RPS online database for the most up-to-date listings of RPS-certified power plants.
- The “Small Hydro” category includes all RPS-eligible hydroelectric facilities. It also includes a few larger facilities that may qualify for a load-serving entity's RPS program per the RPS Eligibility Guidebook. Please check the RPS online database for the most up-to-date listings of RPS-certified power plants.
- “Solar PV” 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.
- Approximately 200 facilities (~200 MW) of QFER facilities were excluded from this table because they were assumed to be self-generation projects.
- Totals may not sum due to rounding.

### viii Figure 6

- Data was compiled using a combination of California Electric Energy Generation data ([http://www.energy.ca.gov/almanac/electricity\\_data/electricity\\_generation.html](http://www.energy.ca.gov/almanac/electricity_data/electricity_generation.html)) and Total System Power data. ([http://www.energy.ca.gov/almanac/electricity\\_data/total\\_system\\_power.html](http://www.energy.ca.gov/almanac/electricity_data/total_system_power.html))



## California Energy Commission – Tracking Progress

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- Includes out-of-state resources with first interconnection point in California.
- This does not include large hydropower and does not include self-generation or behind-the-meter generation.

### <sup>ix</sup> **Figure 7**

- Source: California ISO
- [http://content.caiso.com/green/renewrpt/20170516\\_DailyRenewablesWatch.pdf](http://content.caiso.com/green/renewrpt/20170516_DailyRenewablesWatch.pdf).

### <sup>x</sup> **Figure 8**

- Source: California ISO
- [http://content.caiso.com/green/renewrpt/20170516\\_DailyRenewablesWatch.pdf](http://content.caiso.com/green/renewrpt/20170516_DailyRenewablesWatch.pdf).

### <sup>xi</sup> **Table 3**

- Renewable Projects with Environmental Permits include all projects that received environmental projects but have not yet been built or operated. Some projects are under construction and some are not currently moving forward due to business or other considerations. Some projects with approved permits may never be completed or operated.
- The renewable energy siting information presented in Table 4 reflects a snapshot in time relative to the status of projects in the Energy Commission siting database. Data as of June 1, 2018.
- Totals may not sum due to rounding.
- Capacity represents nameplate capacity.
- Solar PV capacity is AC.
- Includes projects in preconstruction or under construction.

### <sup>xii</sup> **Figure 9**

- Figure represents a geographic breakdown of renewable distributed generation as presented in Figure 5.

### <sup>xiii</sup> **Figure 10**

- Reported data is based on estimates through the end of 2016 created to support the IEPR demand forecast. The estimates were created according to the methodology described in Appendix A of the revised demand forecast.
- Staff supplemented these estimates with 2017 IOU interconnections from the NEM interconnected database, and also with reported figures from SMUD and forecasted figures for Los Angeles.
- Approximately 9 MW of additional forecasted POU interconnections in 2017 were not included.

### <sup>xiv</sup> **Figure 11**

- Energy Commission staff estimates behind-the-meter solar generation by sorting installed capacity by forecasting zone and then multiplying it by a production factor for each hour of the year for each forecasting zone. Each successive year, staff applies a 0.5 percent degradation factor to the estimated generation and then adds the generation from the newly installed PV systems assuming that no BTM capacity has been retired.

### <sup>xv</sup> **Table 4**

- Source: Energy Commission (<http://www.gosolarcalifornia.ca.gov/about/ns hp.php>)

### <sup>xvi</sup> **Figure 12**

- Source: Energy Commission (<http://www.gosolarcalifornia.ca.gov/about/ns hp.php>)



## California Energy Commission – Tracking Progress

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xvii **Figure 13**

- Source: Barbose, Galen, Naïm Darghouth, Dev Millstein, Kristina LaCommare, Nicholas DiSanti, and Rebecca Widiss. Lawrence Berkeley National Laboratory. *Tracking the Sun X: The Installed Price of Residential and Non-Residential Photovoltaic Systems in the United States*. Figure 5. September 2017.

xviii **Table 5**

- Compiled by Energy Commission staff