

Appendix

Tracking Progress - Renewable Energy

Renewable Energy

The Appendix to the December 2018 Tracking Progress – Renewable Energy report provides detailed information on the topics included in the main tracking progress report. In previous Tracking Progress Reports, this information was included in the main document. An effort has been made to provide easier to understand information, including more graphics and figures, in the Tracking Progress report, and include more substantive topic descriptions in this Appendix. The appendix includes the following topics:

1. A summary of renewable energy related legislation, programs, and goals.
2. Overview of the Renewable Portfolio Standard program.
3. Installed renewable capacity by county and resource type.
4. Permits by capacity, county, and resource type.
5. Distributed generation capacity and generation estimates.
6. Recent expansion of Community Choice Aggregators.
7. Potential of energy storage.

Full Renewable Timeline

California has always been a state with opportunities, with ingenuity and vision, and with the persistence to chart a course to a better future. The state's population continues to grow and there have been significant growth in research institutions, academics, industries, companies, and agriculture. California is the most populous state in the union but uses less energy per capita than nearly any other state. Bolstered by a vibrant and diverse citizenry, progressive lawmaking, and the willingness to tackle global issues, California has been at the forefront of renewable energy development.

This acknowledgement of the vision for a better future is no more evident than in the past 30 years. Even before the 1990s, California understood the importance of energy efficiency and worked to ensure the efficient use of energy by establishing building and appliance standards and visionary regulations and programs, such as the Zero Emission Vehicle program.¹ Over the past 20 years, California has enacted legislation to significantly curb greenhouse gas (GHG) emissions, increase the amount of renewable energy used in the state, and further push for the electrification of the transportation sector.

In 2002, California established its Renewables Portfolio Standard (RPS) program, with the goal of increasing the percentage of renewable energy in the state's electricity mix to 20 percent by 2017. The Energy Commission's 2003 Integrated Energy Policy Report recommended accelerating that goal to 2010, and the 2004 Energy Report Update urged increasing the target to 33 percent by 2020. Governor Schwarzenegger, the Energy Commission, and the California Public Utilities Commission (CPUC) endorsed this enhanced goal for the state as a whole. Achieving these renewable energy goals became even more important with the enactment of AB 32 (Núñez, Chapter 488, Statutes of 2006), the California Global Warming Solutions Act of

¹ <https://arb.ca.gov/msprog/zevprog/zevprog.htm>

2006. This legislation sets aggressive GHG reduction goals for the state and its achievements will depend, in part, on the success of renewable energy programs.

SBX1-2 (Simitian, Chapter 1, Statutes of 2011) was signed by Governor Edmund G. Brown, Jr., in April 2011 to codify the ambitious 33 percent renewable energy by 2020 goal for all California utilities, including Publicly Owned Utilities (POUs) who had previously been setting their own renewable targets.² In his signing comments, Governor Brown noted that, "This bill will bring many important benefits to California, including stimulating investment in green technologies in the state, creating tens of thousands of new jobs, improving local air quality, promoting energy independence, and reducing GHG emissions."

In 2015, Governor Brown extended the renewable procurement requirement by signing SB 350 (De León, Chapter 547, Statutes of 2015), which requires 50 percent renewables by 2030. Most recently, in 2018, the Governor signed SB 100 (De León, Chapter 312, Statutes of 2018), increasing the 2030 renewable procurement requirement to 60 percent and a 100 percent zero carbon goal for 2045. All the while, utilities and the electricity market continue to meet and exceed these goals and expectations.

Under the direction of Governor Brown, the state has implemented aggressive energy and GHG emission reduction strategies and programs. The continued installation of solar photovoltaics (PV) in California leverage a widely available resource, California's sunny weather. Development has been supported by state incentive programs such as the New Solar Homes Partnership (NSHP), part of the Go Solar California campaign, a comprehensive statewide program which also includes the California Solar Initiative (CSI) and POU incentive programs. During the implementation of NSHP, the number of PV system installations has significantly increased, and with the recent passage of new California building standards that require PV on new home constructions, the rate of PV growth will only continue to increase.

As the amount of renewable capacity in California increases, the state has exceeded major installation goals for behind-the-meter renewables, large-scale renewables, and distributed renewables. The implementation of more stringent RPS targets and the declining cost of renewables will continue to fuel this growth in renewable energy. It is estimated that by the end of 2018 California will nearly meet the Million Solar Roofs goal established in SB 1 (Murray, Chapter 132, Statutes of 2006), and may have met the 50 percent PV installation goal for new homes two years early.

California has ambitious goals of reducing GHG emissions 40 percent below 1990 levels by 2030 and 80 percent by 2050, and advancing the use and availability of renewable energy is critical to achieving those goals. Therefore, the state has pursued a suite of policies and programs aimed at advancing renewable energy and ensuring all Californians, including low-income and disadvantaged communities, benefit from this transition.

In January 2018, Governor Brown furthered California's role as an important climate leader, by signing Executive Order B-48-18 and setting the goal of five million zero-emission vehicles on California roads by 2030. As previously noted, Governor Brown signed SB 100 in September

² California Legislative Information, Senate Bill No. X1-2, April 12, 2011.
https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201120121SB2

2018, which calls for a zero-carbon electricity grid by 2045.³ The bill also advances the state’s RPS to 60 percent by 2030. Also, in September 2018, Governor Brown signed Assembly Bill 3232 (Friedman, Chapter 373, Statutes of 2018),⁴ to advance zero-emissions buildings and sources of heat energy.

Selected Sources of Clean Energy Goals:

Appendix Table 1: California’s Clean Energy Goalsⁱ

Date	Legislation	Goals	Programs
September 12, 2002	Senate Bill 1078 (Sher, Chapter 516, Statutes of 2002)	Required electric utilities and entities under the CPUC’s jurisdiction to meet 20% of their load with renewable energy by December 31, 2017	Established the California Renewables Portfolio Standard Program
August 21, 2006	Senate Bill 1 (Murray, Chapter 132, Statutes of 2006)	Solar energy systems placed on 50 percent of new homes by 2020.	Expands the California Solar Initiative for more customers and requires municipal utilities to create solar rebate programs.
		3,000 MW of solar energy at new and existing residential and commercial sites by the end of 2016	
		1,940 MW for existing in investor-owned utility (IOU) territory	
		700 MW for existing in POU territory	
		360 MW for new in IOU territory	
September 26, 2006	Senate Bill 107 (Simitian, Chapter 464, Statutes of 2006)	RPS requirements increased to 20% by December 31, 2020	

³ California Legislative Information, Senate Bill No. 100, September 10, 2018, https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB100

⁴ California Legislative Information, Assembly Bill No. 3232, September 9, 2018, http://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB3232.

September 27, 2006	Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006)	Limit GHG emissions to 1990 levels by 2020 and reduce GHG emissions 40 percent below 1990 levels by 2030	Directed the Climate Action Team to continue coordinating overall climate policy.
August 8, 2010	Governor Brown's 'Clean Energy Jobs Plan' 2010	20,000 MW of renewable capacity by 2020	
		8,000 MW of large-scale renewables	
		12,000 MW of distributed generation (defined as "localized" and less than 20MW)	
April 12, 2011	Senate Bill X1-2 (Simitian, Chapter 1, Statutes of 2011)	Expanded the RPS to cover all California electricity retailers and increased the required goal to 33% by December 31, 2020	
October 17, 2013	CPUC Ruling 10-12-007 ⁵	Establishes energy storage target of 1,325 MW for PG&E, SCE, and SDG&E by 2020, with installations no later than the end of 2024.	
April 29, 2015	Executive Order B-30-15	Reduce GHG emissions 80 percent below 1990 levels by 2050	

⁵ <http://www.cpuc.ca.gov/General.aspx?id=3462>

October 7, 2015	SB 350 (De León, Chapter 547, Statutes of 2015)	Establishes targets to increase retail sales of renewable electricity to 50 percent by 2030 and double the energy efficiency savings in electricity and natural gas end uses by 2030.	
September 8, 2016	Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016)	Establishes a statewide GHG emission reduction target of 40 percent below 1990 levels by 2030.	
May 9, 2018	Energy Commission Adopts Standards Requiring Solar Systems for New Homes	Requires most new homes have solar systems installed	
September 10, 2018	Senate Bill 100 (De Leon, Chapter 312, Statutes of 2018)	The goal of the program is to achieve that 50% renewable resources target by December 31, 2026, and to achieve a 60% target by December 31, 2030	
		Increase electricity derived from zero-carbon resources to 100 percent by 2045	

Source: California Energy Commission, staff analysis November 2018. This list is not comprehensive, rather it focuses on key renewable energy legislation with responsibilities for the Energy Commission.

California's Renewables Portfolio Standard Program

Established by legislation in 2002⁶ 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 CPUC. Generation from renewable energy facilities is tracked using the

⁶ Senate Bill 1078 (Sher, Chapter 516, Statutes of 2002).

Western Renewable Energy Generation Information System (WREGIS).⁷ 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 POU.

Data reported to the CPUC and the Energy Commission to date show that the majority of California utilities' may have procured enough renewables to meet the 33 percent by 2020 RPS goal ahead of schedule. As shown in the *December 2018 Renewable Tracking Progress Report Figure 1*, Energy Commission staff estimates that by the end of 2018, the electricity generation serving California consumers was 34 percent renewable. The State's renewable percentage previously increased from 29 percent in 2016 to 32 percent in 2017. The combination of new on-line renewable generation in 2018, and the 1.3 percent decrease in the State's annual 2018 reported retail sales,⁸ have increased the overall percentage of renewable energy serving California customers.

The 34 percent renewable percentage estimate for 2018 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 targets⁹ for each compliance period.¹⁰ The targets for the final year of each compliance period are as follows:

- 20 percent in 2013
- 25 percent in 2016
- 33 percent in 2020
- 44 percent in 2024
- 52 percent in 2027
- 60 percent in 2030
- No less than 60 percent in each multiyear compliance period thereafter

7 WREGIS is an independent, renewable energy tracking system for the region covered by the WECC. WREGIS tracks renewable energy generation from units that register in the system by using verifiable data and creating RECs for this generation. <https://www.wecc.biz/WREGIS/Pages/Default.aspx>

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

9 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 Section 3204(a) of the California Code of Regulations (CCR).

10 Compliance Period Targets for POU 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 Section 3204(a) to incorporate the statutorily defined targets for 2024, 2027, and 2030.

LSEs are also required to procure a “balanced portfolio” of resources under the RPS.¹¹ A Renewable Energy Certificate (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)¹² 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.

In order to become RPS-eligible, facility owners must comply with the rules of the *RPS Eligibility Guidebook*, obtain certification from the Energy Commission, and have the facility generation tracked by the WREGIS.

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.¹³ For the 2011-2013 RPS compliance period, the CPUC determined 14 retail sellers in compliance with the RPS procurement requirements and 6 out of compliance.^{14, 15, 16} The Energy Commission determined 41 POUs in compliance for the 2011-2013 RPS compliance period, and findings for 2 POUs remain pending. Of the 41 POUs that were in compliance in the first compliance period, 26 POUs met their procurement targets and portfolio balance requirements and 16 POUs applied optional compliance measures¹⁷ 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.¹⁸ The 42 POUs with verified results served a combined 18.6 percent of retail sales with renewable energy for the 2011–2013 compliance period.¹⁹

11 Public Utilities Code Sections 399.16 and 399.30.

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

13 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.

14 Ibid

15 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.

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

17 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.

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

19 *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.

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 32 percent of their 2016 retail electricity sales with renewable power, 28 percent in 2015, and 26 percent in 2014.²⁰ The 43 POU reported a combined 21.3 percent of renewable procurement during Compliance Period 2, 2014-2016. Initial reported information indicates that 37 POU met their procurement targets and portfolio balance requirements. As of November 2018, six POU 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, has been completed and retail seller's data has been sent to CPUC and is anticipated to be complete by the end 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 POU.

RPS Compliance Period 2017-2020

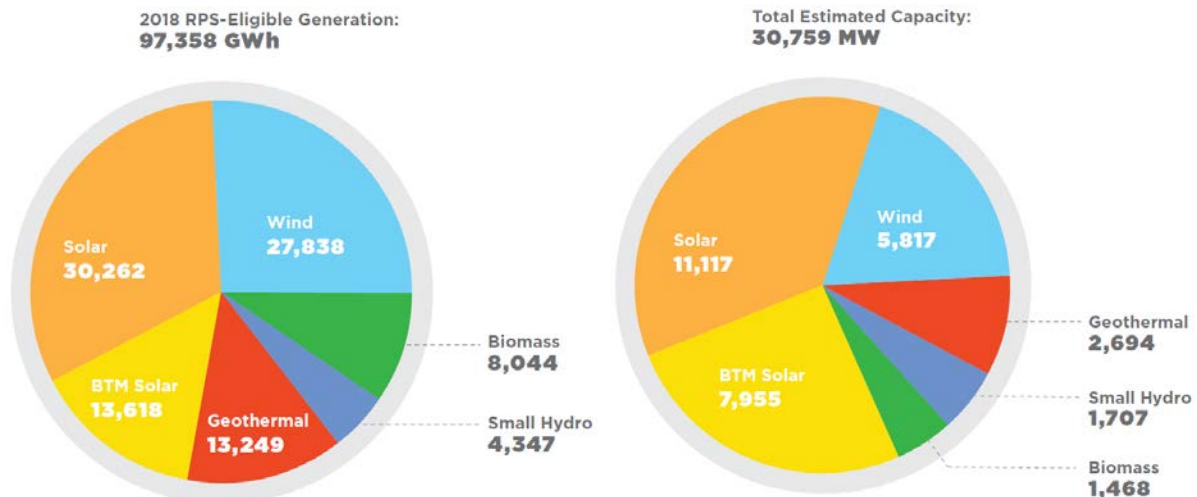
LSEs are required to procure renewable electricity equal to 33 percent of retail sales by December 31, 2020. LSEs reported renewable procurement for 2017, the first year of the third compliance period, in mid-2018.

Statewide RPS-Eligible Generation and Capacity

Appendix Figure 2 shows the estimated proportions of generation in 2018 from each RPS-eligible renewable technology and total installed/operational renewable capacity by resource type for resources in California. In 2018, solar represented the largest portion of renewable generation for a second year. Solar, including distributed generation, and wind generation together accounted for more than 81 percent of all renewable electricity generation. Capacity totaled roughly 30,759 MW as of December 31, 2018. This total includes nearly 7,955 MW of renewable self-generation capacity (solar) from homes and businesses throughout the state.

²⁰ California Public Utilities Commission 2015, 2016, 2017 Annual RPS Reports.

Appendix Figure 2: 2017 RPS-Eligible Generation (In-State and Out-of-State) and Renewable Capacity, Including Renewable Self-Generation



Source: California Energy Commission, staff analysis November 2018

RPS-Eligible Capacity

By December 31, 2018, California is estimated to have more than 22,804 MW of wholesale renewable capacity, defined as facilities for which generation is exported to the grid and not consumed on-site. **Appendix Table 2** shows the quantity of wholesale RPS eligible generators and the total capacity of those generators, broken down by county for in-state facilities and by state for out-of-state facilities. **Appendix Table 2** is based on data collected by the Energy Commission from power plants within California. Out-of-state facilities with a first point of interconnection in a California balancing authority are aggregated, or collected, and listed by state at the bottom of **Appendix Table 2**.

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 (California ISO) (which covers about 80 percent of California and a small part of Nevada), Los Angeles Department of Water and Power, Balancing Authority of Northern California, Imperial Irrigation District, and Turlock Irrigation District.

Appendix Table 2 includes more than 455 MW of capacity that came on-line in 2018.

Appendix Table 2: Number and Total Capacity of RPS Eligible Wholesale Facilities Estimated to be On-Line as of December 31, 2018

County	Biomass		Geothermal		Small Hydro		Solar PV		Solar Thermal		Wind		Total	
	#	MW	#	MW	#	MW	#	MW	#	MW	#	MW	#	MW
Alameda	10	29	0	0	0	0	5	8	0	0	4	228	19	265
Amador	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Butte	1	23	0	0	2	14	1	2	0	0	0	0	4	38
Calaveras	2	2	0	0	11	70	4	4	0	0	0	0	17	76
Colusa	0	0	0	0	8	32	2	2	0	0	0	0	10	34
Contra Costa	1	29	0	0	0	0	0	0	0	0	0	0	1	29
El Dorado	6	8	0	0	0	0	5	34	0	0	1	38	12	80
Fresno	1	0	0	0	9	69	0	0	0	0	0	0	10	69
Glenn	6	57	0	0	4	37	38	752	0	0	0	0	48	846
Humboldt	0	0	0	0	2	6	1	2	0	0	0	0	3	7
Imperial	3	61	0	0	2	2	0	0	0	0	0	0	5	64
Inyo	3	1	20	718	11	98	17	1,153	0	0	1	265	52	2,235
Kern	0	0	3	302	17	157	1	3	0	0	0	0	21	463
Kings	12	130	0	0	6	76	79	2,490	0	0	49	3,280	146	5,977
Lake	2	2	0	0	0	0	21	478	0	0	0	0	23	480
Lassen	0	0	5	396	2	6	2	2	0	0	0	0	9	403
Los Angeles	1	36	0	0	1	30	0	0	0	0	0	0	2	65
Madera	32	224	0	0	22	213	139	1,023	0	0	2	1	195	1,462
Marin	4	38	0	0	9	69	2	22	0	0	0	0	15	129
Mariposa	4	4	0	0	0	0	3	3	0	0	0	0	7	7
Mendocino	0	0	0	0	1	9	0	0	0	0	0	0	1	9
Merced	0	0	0	0	4	13	3	6	0	0	0	0	7	19
Mono	7	16	0	0	7	35	10	138	0	0	1	18	25	208
Monterey	0	0	3	40	3	21	0	0	0	0	0	0	6	61
Napa	4	8	0	0	0	0	3	134	0	0	7	9	14	152
Nevada	1	35	0	0	0	0	1	2	0	0	0	0	2	37
Orange	5	2	0	0	1	0	1	0	0	0	0	0	7	2
Placer	0	0	0	0	11	82	0	0	0	0	0	0	11	82
Plumas	8	86	0	0	4	13	5	7	0	0	0	0	17	105
Riverside	3	52	0	0	13	93	3	5	0	0	0	0	19	149
Sacramento	2	47	0	0	8	39	0	0	0	0	0	0	10	86
San Benito	9	60	0	0	7	50	27	1,152	1	250	30	643	74	2,155
San Bernardino	5	11	0	0	1	14	35	127	0	0	0	0	41	151
San Diego	0	0	0	0	0	0	3	5	0	0	0	0	3	5
San Francisco	8	9	0	0	14	39	87	661	11	999	5	9	125	1,717
San Joaquin	25	49	0	0	6	16	27	143	0	0	3	182	61	390
San Luis Obispo	2	3	0	0	0	0	23	14	0	0	0	0	25	16
San Mateo	7	82	0	0	2	12	7	11	0	0	2	4	18	108
Santa Barbara	5	2	0	0	1	4	6	806	0	0	0	0	12	812
Santa Clara	3	13	0	0	0	0	0	0	0	0	0	0	3	13
Santa Cruz	9	13	0	0	2	1	1	40	0	0	0	0	12	54
Shasta	20	12	0	0	2	1	6	12	0	0	0	0	28	25
Sierra	4	6	0	0	0	0	1	1	0	0	0	0	5	7
Siskiyou	5	144	0	0	31	91	3	6	0	0	1	101	40	342
Solano	1	20	0	0	6	21	0	0	0	0	0	0	7	41
Sonoma	1	13	0	0	8	72	0	0	0	0	0	0	9	86

Stanislaus	4	10	0	0	0	0	7	15	0	0	14	1,035	25	1,060
Sutter	6	9	12	1,238	1	3	7	10	0	0	0	0	26	1,259
Tehama	2	25	0	0	7	21	24	59	0	0	0	0	33	105
Trinity	2	1	0	0	0	0	1	1	0	0	0	0	3	2
Tulare	0	0	0	0	4	22	3	4	0	0	1	1	8	26
Tuolumne	0	0	0	0	8	16	0	0	0	0	0	0	8	16
unknown	9	18	0	0	8	38	32	407	0	0	0	0	49	463
Ventura	2	33	0	0	8	85	1	2	0	0	0	0	11	120
Yolo	0	0	0	0	1	0	18	120	0	0	0	0	19	121
Yuba	9	7	0	0	4	3	2	3	0	0	0	0	15	14
California Total	263	1,468	43	2,694	284	1,707	669	9,869	12	1,249	122	5,817	1,393	22,804
Arizona							5	837					5	837
Nevada			1	65			5	812					6	876
Utah											2	304	2	304
Mexico (Baja)											1	155	1	155
Grand Total	263	1,468	43	2,759	284	1,707	669	11,517	12	1,249	122	6,276	1,393	24,976

Source: California Energy Commission, staff analysis November 2018

Potential Additional Capacity – California Renewable Energy Facility Siting

Utility-scale 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. Typically, local jurisdictions such as counties and cities are responsible for permitting solar PV and wind projects. For projects proposed on federal lands, federal agencies such as the U.S. Bureau of Land Management or the U.S. Forest Service may be responsible for renewable energy project permitting. **Appendix Table 3** provides the current number and total capacity of renewable permits submitted to the Energy Commission by county.

Appendix Table 3: Renewable Projects with Environmental Permits

County	Biomass/ Landfill Gas		Geothermal		Small Hydro		Solar PV		Solar Thermal		Wind		Total	
	#	MW	#	MW	#	MW	#	MW	#	MW	#	MW	#	MW
Alameda							1	20			1	55	2	75
Colusa							1	20					1	20
Contra Costa	1	4					1	5					2	9
El Dorado					1	3							1	3
Fresno							8	166					8	166
Glenn	1	2											1	2
Imperial											1	135	1	135
Inyo			3	212			15	764					18	976
Kern							1	1					1	1
Kings							23	1,260			9	1,058	32	2,318
Lassen							6	442					6	442
Los Angeles							1	8					1	8
Madera	1	12			1	4	18	564			1	2	21	582
Mariposa	1	2					3	73					4	75
Merced	1	2											1	2

Mono							2	202			1	80	3	282
Monterey			1	33									1	33
Napa	1	4					4	156			1	3	6	163
Nevada							1	7					1	7
Orange					1	1							1	1
Placer							4	7					4	7
Riverside	2	2											2	2
Sacramento	1	1					11	1,966			1	40	13	2,007
San Bernardino							1	2					1	2
San Diego	1	3					13	344	1	50			15	397
San Joaquin							2	122			1	69	3	191
San Luis Obispo							2	22					2	22
Santa Barbara							1	3					1	3
Santa Clara	1	2											1	2
Solano	1	13					5	11					6	24
Sonoma							1	1					1	1
Stanislaus			3	137									3	137
Tulare							4	220					4	220
Ventura	1	2					1	46					2	48
Yolo							3	6					3	6
Yuba							1	24			1	2	2	26
Grand Total	14	51	7	381	3	8	134	6,460	1	50	17	1,443	176	8,400

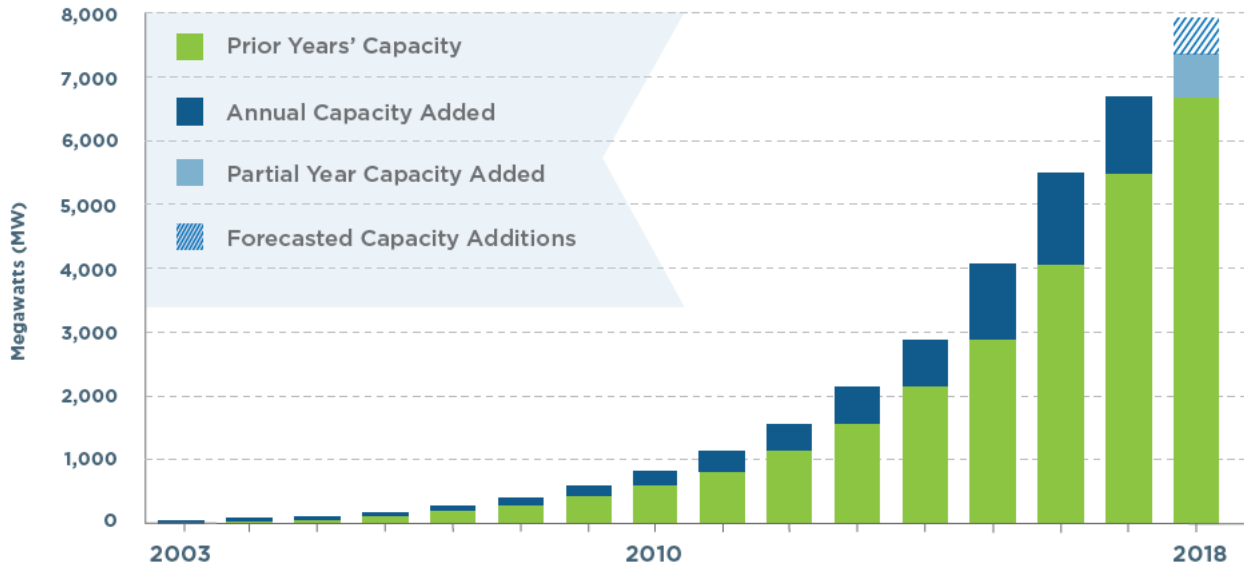
Source: California Energy Commission, staff analysis November 2018

Operators of generation resources interested in interconnecting to the California Independent System Operator (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 including deliverability status, project size, and meeting the interconnection financial security posting requirements. Resources in the interconnection queue are reassessed annually.

Solar Distributed Generation

Behind-the-meter resources continue to increase throughout the state, the vast majority of which are solar PV systems. **Appendix Figure 3** shows California's annual growth of new interconnected solar behind-the-meter capacity, based on Energy Commission filings, partial reported 2018 interconnections, and state incentive program records. Of the over 7,900 MW of behind-the-meter solar installed statewide, over 6,800 MW has been installed since 2011. The total capacity shown in **Appendix Figure 3** represents more than 958,000 systems installed on homes and businesses across California.

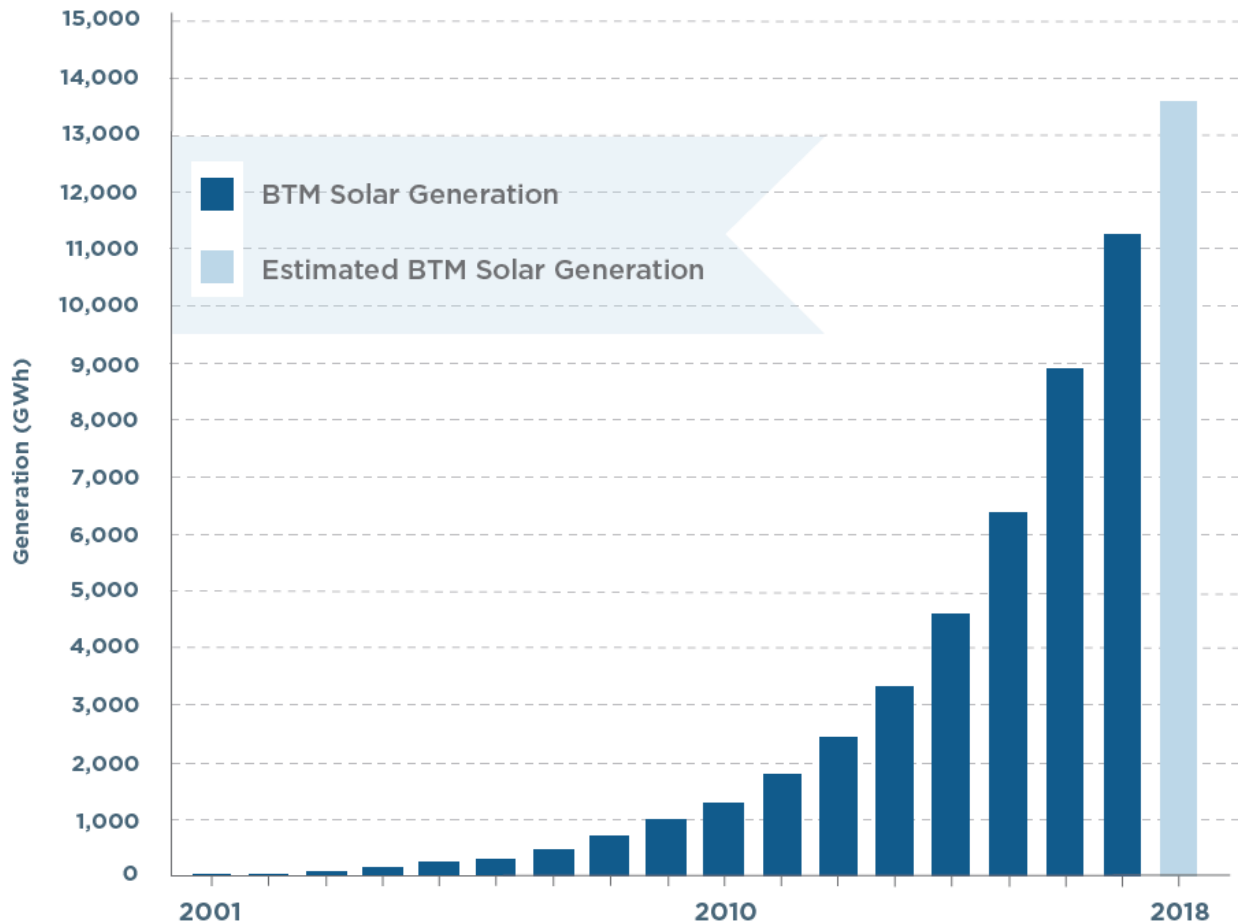
Appendix Figure 3. Total and Incremental Behind-the-Meter Solar Capacity by Year



Source: California Energy Commission staff analysis, December 2018

Appendix Figure 4 shows estimated generation from the behind-the-meter systems represented in **Appendix Figure 4**. 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 13,618 GWh in 2018. In the most recent years, estimated generation from these resources more than quadrupled, increasing from 3,000 GWh in 2013 to an estimated 13,618 GWh in 2018.

Appendix Figure 4. Total Behind-the-Meter Solar Generation by Year



Source: California Energy Commission, staff analysis November 2018

New Solar Homes Partnership (NSHP) Program

The Energy Commission administered 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 encumbered through the issuance of reservations no later than June 1, 2018, and disbursed no later than December 31, 2021.

As of December 10, 2018, about 138 MW of solar capacity had been installed, and incentive funding for an additional 285 MW had been reserved, for a total of 423 MW. As shown with the combined paid and pending projects, the NSHP program anticipates meeting or exceeding the 360 MW goal.

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 12.69 MW of capacity on affordable housing developments, with paid incentives totaling more than \$30 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.

Community Choice Aggregation

Legislation in 2002 authorized the formation of Community Choice Aggregation (CCA).²¹ 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, 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.²² 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 to meet peak demand for the coming year.²³ In addition, 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.²⁴ CalCCA recently reported that 7 of the current CCAs procured over 2,100 MW of renewable energy, of which over 94 percent of the procured capacity were long-term contracts²⁵ and 91 percent of the procured capacity were in-state resources.²⁶ The capacity weighted average of the reported term of the contracts was over 17 years. The reported data procurement indicates CCAs have been able to procure significant amounts of long-term renewable resources. These resources are well distributed across the state.

Storage

The Self-Generation Incentive Program (SGIP) was established legislatively in 2001 to help address peak electricity problems in California, specifically for the investor-owned utilities. In

21 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)

22 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.

"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."

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

24 <http://www.cpuc.ca.gov/PCIA/>

25 Power purchase agreements with contract terms of 10 years or greater.

26 Cal CCA Map accessed November 26, 2018, <https://cal-cca.org/wp-content/uploads/2018/11/CalCCA-Renewable-Energy-Map-11.15.18-Final.pdf>.

September 2018, the CPUC released the 2017 SGIP Storage Impact Evaluation²⁷ which concluded that, in general, while successful at reducing system peak demand, there is still a net increase in GHG emissions from SGIP storage projects with no material change from the 2016 evaluation. The report's other findings are that storage has the potential to provide significant benefits when dispatched in response to granular signals about grid needs, and that storage participating in demand response programs such as Capacity Bidding Program, which are linked to the California ISO market, can provide customer, environmental, and system-level benefits simultaneously. If storage is operated strictly as a load-modifier (under business-as-usual projections), it is forecasted to produce a slight increase in overall system costs from 2018-2030. Residential storage dispatched in response to new time-of-use periods may still lead to net increases in GHG emissions when operated to optimize customer bill savings.

To improve the GHG emission performance of SGIP storage projects, CPUC held a workshop in October 2018 about the Staff Proposal that recommends operational requirements and verification and enforcement mechanisms for energy storage systems in the SGIP.²⁸ If approved in early 2019, the new requirements would take effect in mid-2019. For more information from the Energy Commission on this topic, see the Tracking Progress – Energy Storage.²⁹

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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.

27 Itron, *2017 SGIP Advanced Energy Storage Impact Evaluation*, September 7, 2018, http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/Customer_Gen_and_Storage/2017_SGIP_AES_Impact_Evaluation.pdf

28 California Public Utilities Commission, *Self-Generation Incentive Program Greenhouse Gas Staff Proposal*, Distributed Generation Rulemaking 12-11-005 September 6, 2018, Pages 4-5. http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/Customer_Gen_and_Storage/SGIP%20GHG%20Staff%20Proposal_final_corrected.pdf

29 https://www.energy.ca.gov/renewables/tracking_progress/documents/energy_storage.pdf

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/.

For further information on all (renewable and nonrenewable) Energy Commission-jurisdictional power plants, see 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/>
