

Memorandum

To: ISO Board of Governors

From: Keith Casey, Vice President, Market & Infrastructure Development

Date: July 17, 2019

Re: Briefing on renewable and energy storage projects in the generator interconnection queue

This memorandum does not require Board action.

EXECUTIVE SUMMARY

This briefing provides the status of renewable generation in the ISO's generator interconnection queue as of July 2019. Key highlights include:

1. The current ISO queue contains approximately 85,600 MW of project capacity actively seeking to interconnect to the ISO controlled grid, measured at the point of delivery to the ISO. Renewables account for 66,716 MW, of which 27,361 MW has completed the study process and 39,355 MW are in various stages of the study process.
2. Changes in renewable project capacity in the queue since the August 2018 update include 813 MW of capacity that reached commercial operation, 9,551 MW of project withdrawals, 32,168 MW that entered in the cluster 12 window that closed April 15, and a net decrease of 677 MW related to project downsizings and various project modifications.
3. The ISO queue also contains a significant number of energy storage projects totaling 45,583 MW. The technologies include battery, pump storage, and rail energy storage.

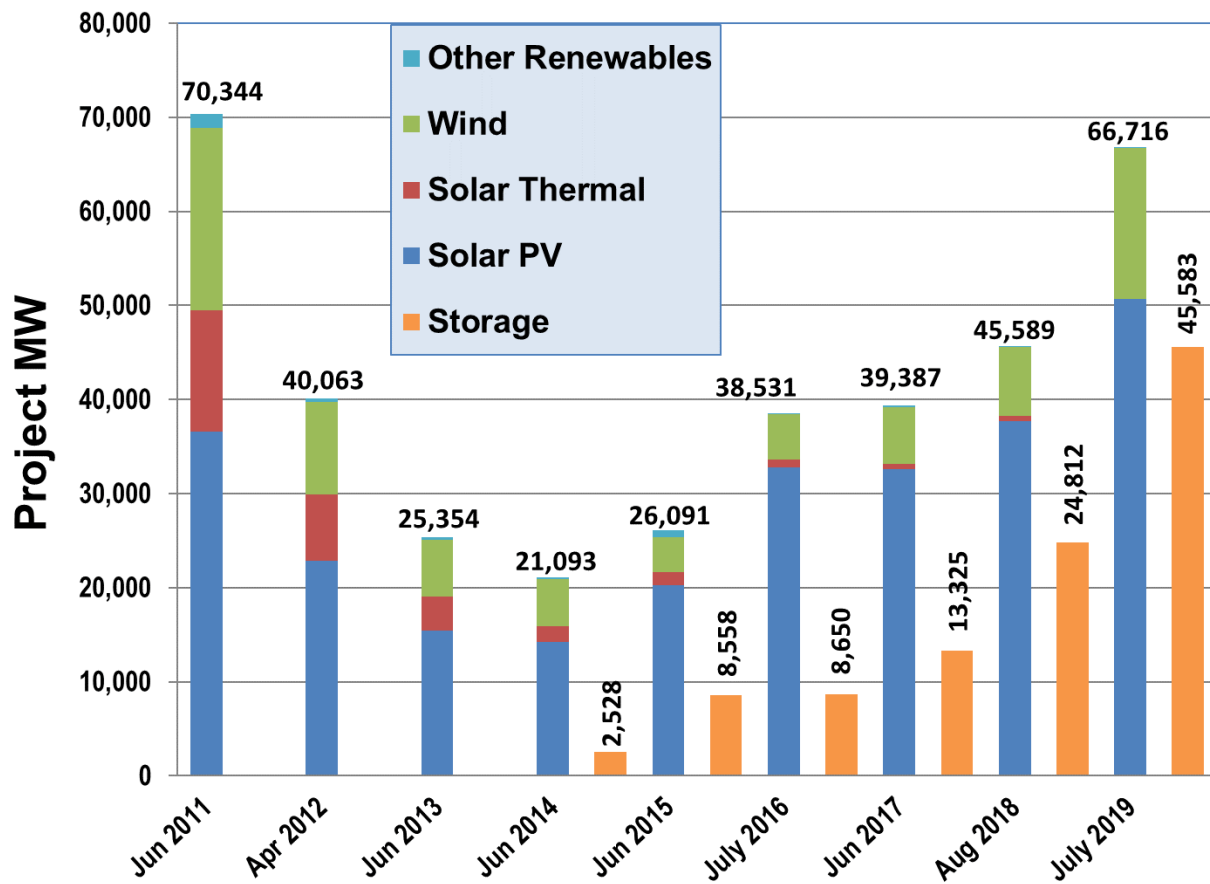
DISCUSSION

The following graphs illustrate the renewables in the ISO queue from several perspectives.

Figure 1 shows the amount of renewable generation and energy storage in the interconnection queue over time and breaks out the types of renewable capacity.

Energy storage has been added to the chart, demonstrating the significant increase for energy storage projects in the queue. During the August 2018 to July 2019 period, the queue experienced a net increase of 21,127 MW in renewable project capacity. The change is a result of 813 MW of capacity that reached commercial operation, 9,551 MW of project withdrawals, 32,168 MW of new cluster 12 projects, and a net decrease of 677 MW related to project downsizings and various project modifications. Cluster 12 includes an additional 29,756 MW of energy storage projects comprised of 11,413 MW of stand-alone energy storage and 18,343 combined with a renewable technology in a hybrid configuration.¹

Figure 1
Change in renewable capacity in the ISO queue since June 2011



¹ The capacity values of hybrid renewable-storage projects are shown separately in Figure 1. However, the majority of hybrid projects are configured such that the capacity at the point of interconnection does not exceed the rating of the renewable portion of the facility. Therefore, the renewable capacity and the energy storage capacity in Figure 1 are not additive at the point of interconnection/point of delivery for purposes of determining the total MW in the queue.

Figure 2 provides insight into the amount of active generator project capacity in the ISO queue by project size and type. Solar PV accounts for the greatest amount of renewable technology, however, with the addition of cluster 12 the queue now contains approximately 10,000 MW of offshore wind capacity. Figure 2 also provides a breakdown of the capacity in the ISO queue by the number of projects for each project size category. Projects in the 100 to 500 MW category make up 59% of project capacity. The queue has nine (9) projects with a renewable component over 1,000 MW, totaling over 15,000 MW (three solar and six offshore wind projects).

Figure 2
MW of renewable projects in ISO queue
As of July 2019 by size and type

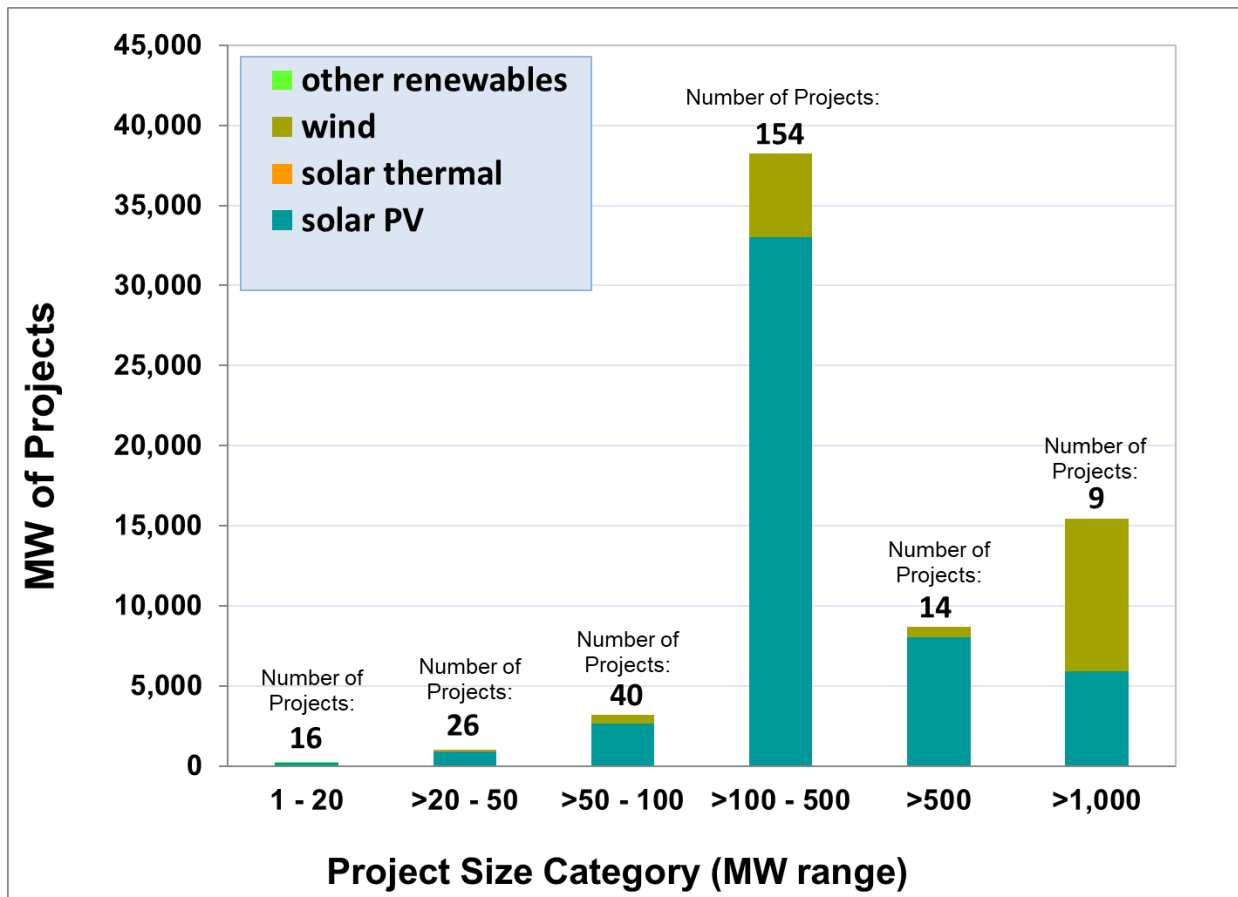
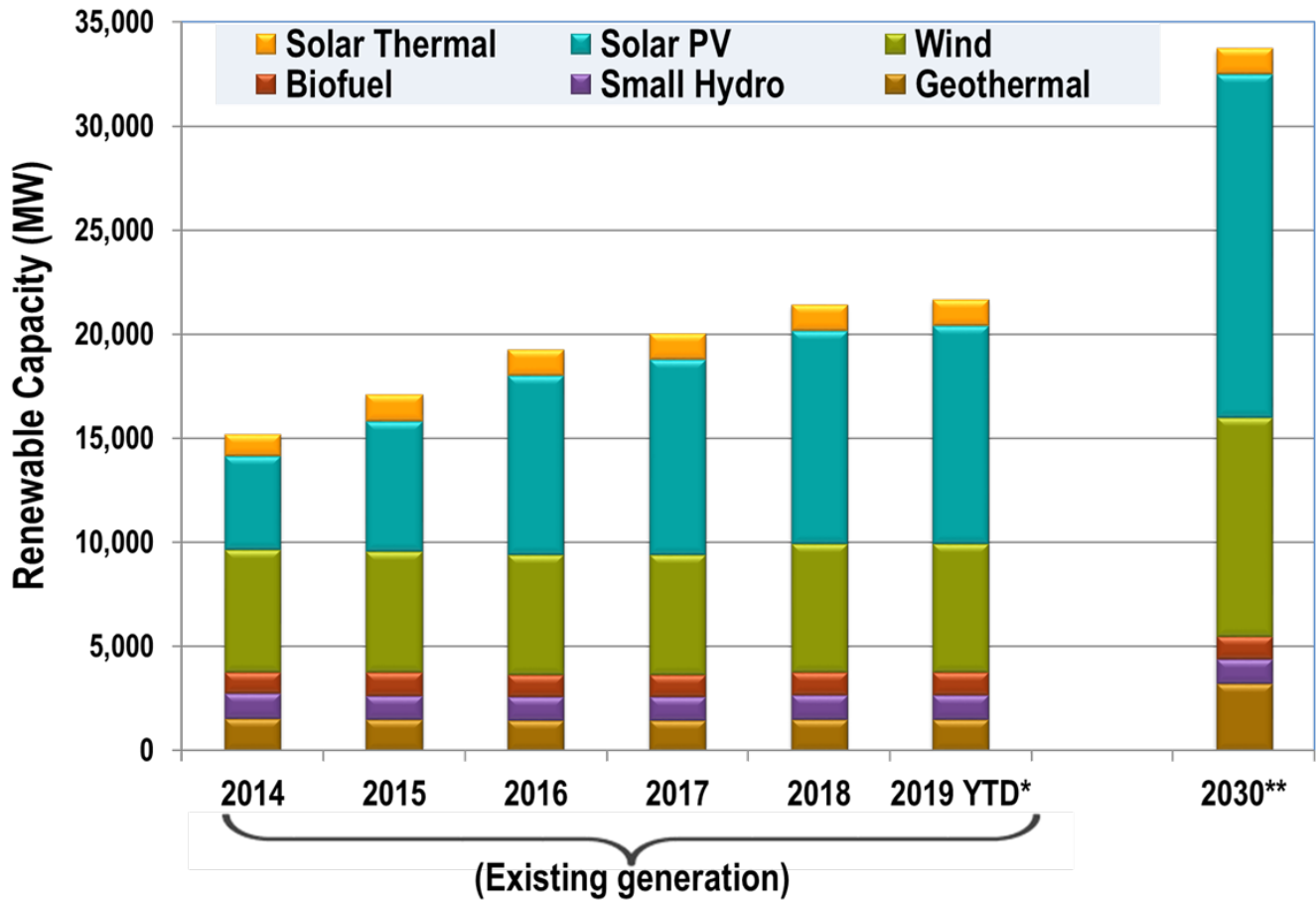


Figure 3 shows the historical and projected year 2030 build-out of renewable capacity by technology type based on the California Public Utilities Commission’s projected renewable portfolio for 2030. The ISO currently has approximately 21,700 MW of ISO connected renewable generation in operation. The projected ISO connected renewable generation needed to meet the 60% renewable requirement by 2030 is approximately 33,800 MW.

Figure 3
Projected RPS capacity build-out through 2030
(CPUC Renewable Portfolio)

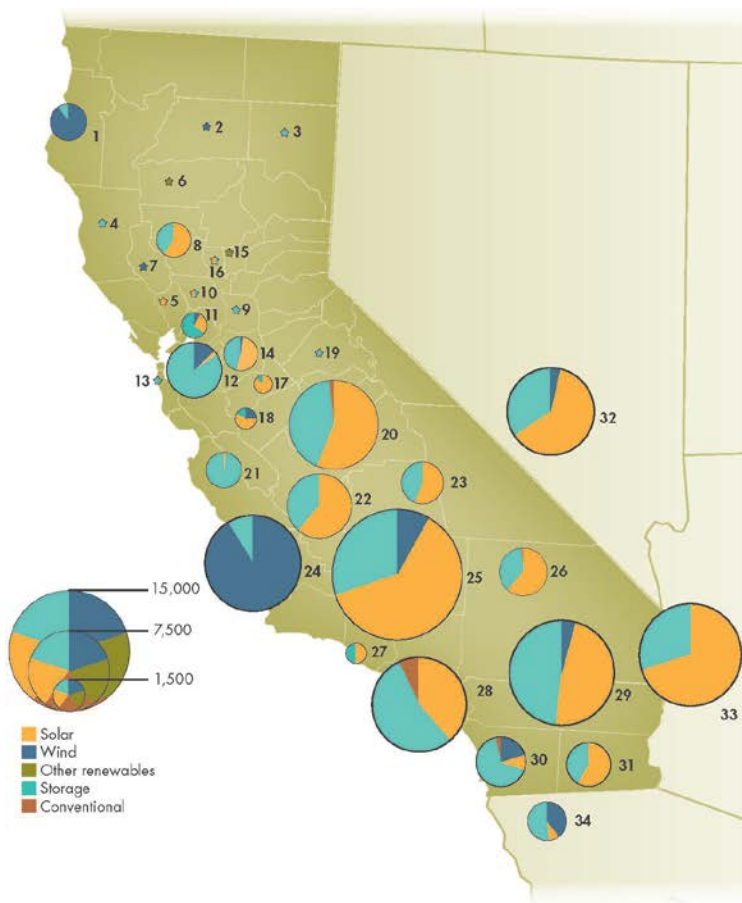


* All online resources that are not in test mode, including those yet to achieve full commercial operation.

** Estimate of renewable capacity build-out to meet the 2030 60% RPS requirement (based on CPUC Base Case Portfolio from the Revised 2019 Unified Resource Adequacy and Integrated Resource Plan)

Figure 4 is a map of all projects in the generation interconnection queue as of July 2019 and shows the general location and capacity by project type, including conventional generation and storage project capacity. Some storage capacity is associated with other generation technologies within a single project. In a number of these cases, the total project output is designed to not exceed the capacity or the project's primary generation technology. However, in this figure all technology types are provided at their full capability on a stand-alone basis (e.g. for a combined solar / storage project, both the solar capacity and the storage capacity are shown separately even though in the majority of hybrid projects the output of the facility to the point of delivery is configured to not exceed the rating of the solar portion of the facility). As a result, the total capacity of all projects shown here is greater than the total project capacity in the ISO generation interconnection queue.

Figure 4
ISO Queue Map – Conventional & Renewables
As of July 2019



Interconnection queue by county		Megawatts			Total
County	# of Projects	Renewables	Storage	Conventional	
1 Humboldt	6	1910	201		2,110
2 Shasta	1	200			200
3 Lassen	2	21	27		48
4 Mendocino	1		31		31
5 Napa	1	30			30
6 Tehama	2	6			6
7 Lake	3	145	39		184
8 Colusa	9	1,198	825		2,023
9 Sacramento	1		59		59
10 Yolo	2	12	12		24
11 Solano	5	454	821		1,275
12 Alameda-Contra Costa-Santa Clara	24	634	3,510		4,144
13 San Francisco	1		250		250
14 San Joaquin	14	994	862		1,857
15 Yuba	1	6			6
16 Sutter	2	100	100		200
17 Stanislaus	7	657	108		765
18 Merced	12	833	200		1,033
19 Tuolumne	1		10		10
20 Fresno-Madera	45	4,734	3,562	123	8,419
21 San Benito/Monterey	6	30	1,867		1,898
22 Kings	24	3,443	2,176		5,619
23 Tulare-Kern	13	1,285	1,014		2,299
24 San Luis Obispo	11	8,994	856		9,850
25 Kern	81	11,633	5,022		16,655
26 San Bernardino	24	2,035	1,232	38	3,306
27 Ventura	2	500	500		1,000
28 Los Angeles-Orange	28	3,893	5,469	700	10,062
29 Riverside	38	6,223	5,761		11,984
30 San Diego	35	1,233	2,709	141	4,082
31 Imperial	13	1,837	1,337		3,175
In-state Totals	415	53,041	38,560	1,002	92,604
32 Nevada	28	5,235	2,738		7,973
33 Arizona	24	7,383	3,157		10,540
34 Mexico	6	1,057	1,128		2,185
Out-of-state Totals	58	13,675	7,023		20,698
TOTAL ALL PROJECTS	473	66,716	45,583	1,002	113,301