

# Memorandum

**To:** ISO Board of Governors

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

**Date:** February 9, 2017

**Re:** Update on renewables in the generator interconnection queue

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***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 January 9, 2017. Key highlights include:

1. The current ISO queue contains approximately 50,000 MW (36,330 MW renewable) actively seeking to interconnect to the ISO controlled grid.
2. Changes in renewable project capacity in the queue since the August 2016 update include 1,580 MW of capacity that reached commercial operation and 621 MW of project withdrawals.
3. Recent estimates from ISO Load Serving Entities indicate that an additional 3,200 MW of renewable capacity is needed to meet the 2020 33% Renewables Portfolio Standard mandate. The ISO queue contains over eleven times the additional capacity needed. Currently 17,800 MW of the project capacity in the queue has completed the study process. The remaining 18,500 MW are in cluster 9, which has just completed the Phase-I study process.
4. While not considered renewable generation, energy storage projects represent a significant portion of the capacity in the ISO queue, totaling 8,341 MW. The technologies include battery, pump storage, flywheel 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 in the interconnection queue over time and breaks out the types of renewable capacity. During the August 2016 to January 2017 period, the queue experienced a net decrease of 2,201 MW in renewable project capacity due to 1,580 MW of project capacity that reached commercial operation and 621 MW of project withdrawals.

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

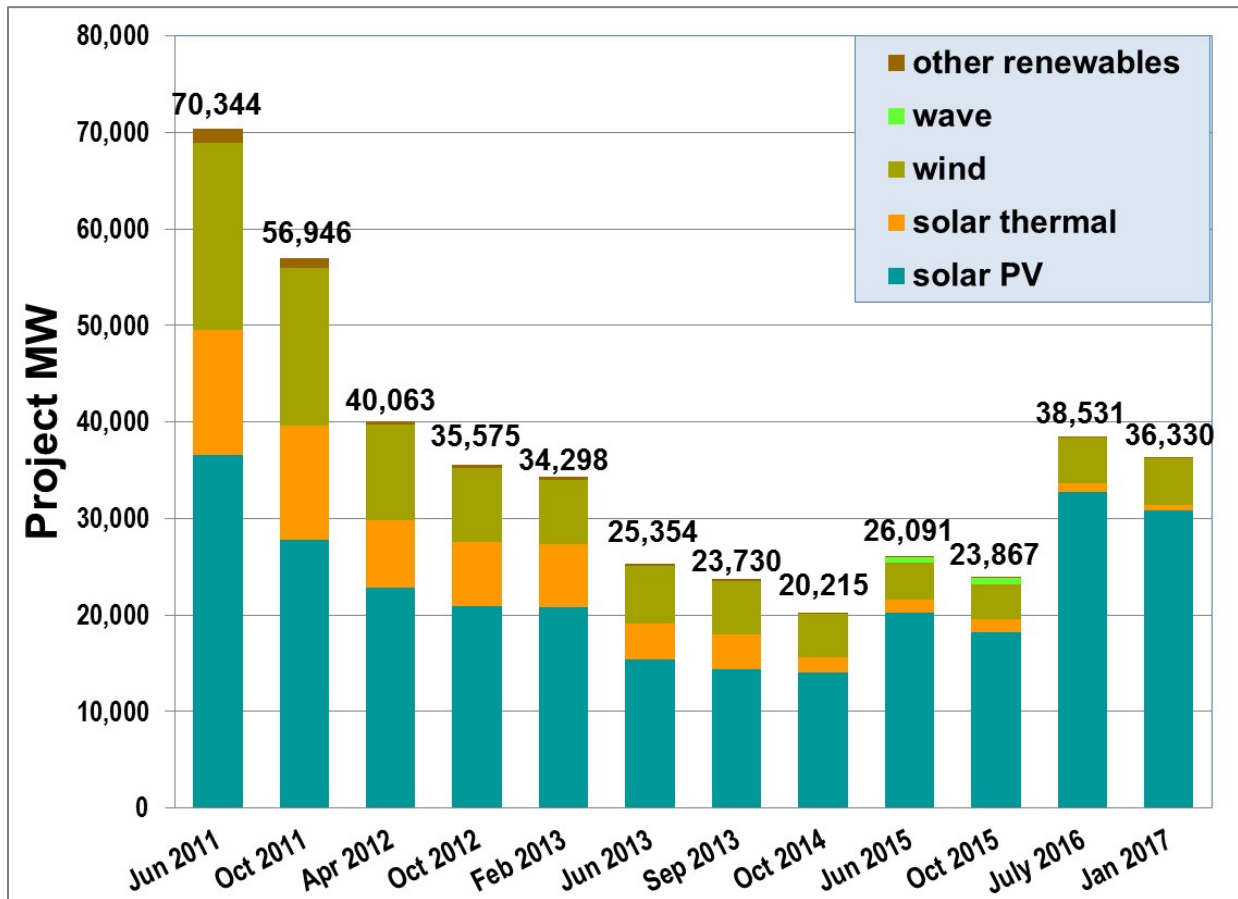


Figure 2 displays the amount of renewable capacity in the queue by study group and shows the capacity reductions within each study group. The active project portion of each bar, shown in blue, represents the January 2017 capacity that remains in each study group. Significant capacity (1,580 MW) from each of the cluster study groups, from the transition cluster through cluster 6, have reached commercial operation since last August's update. However, no pre-cluster renewable projects have reached commercial operation since the last Board briefing.

**Figure 2**  
**Renewable generation capacity in the ISO queue by study group**  
**(changes by study group since the August 2016 update)**

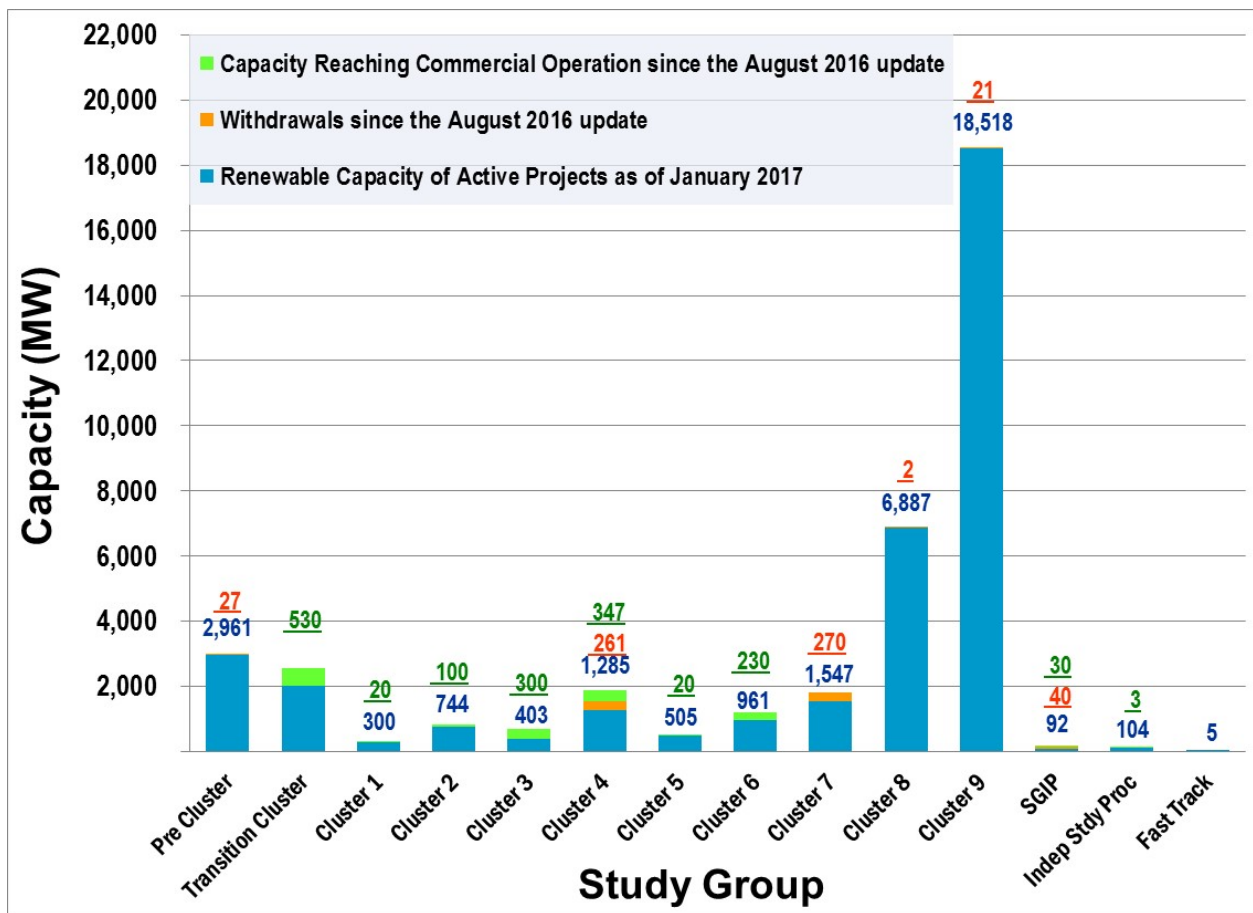


Figure 3 provides insight into the amount of active generator project capacity in the ISO queue by project size and type. Solar PV is the dominant generator technology for all size ranges. Figure 3 also provides a breakdown of the capacity in the ISO queue by the number of projects for each project size category. Projects in the 100 to 500 MW category make up 76% of project capacity.

**Figure 3**  
**MW of renewable projects in ISO queue**  
**As of January 2017 by size and type**

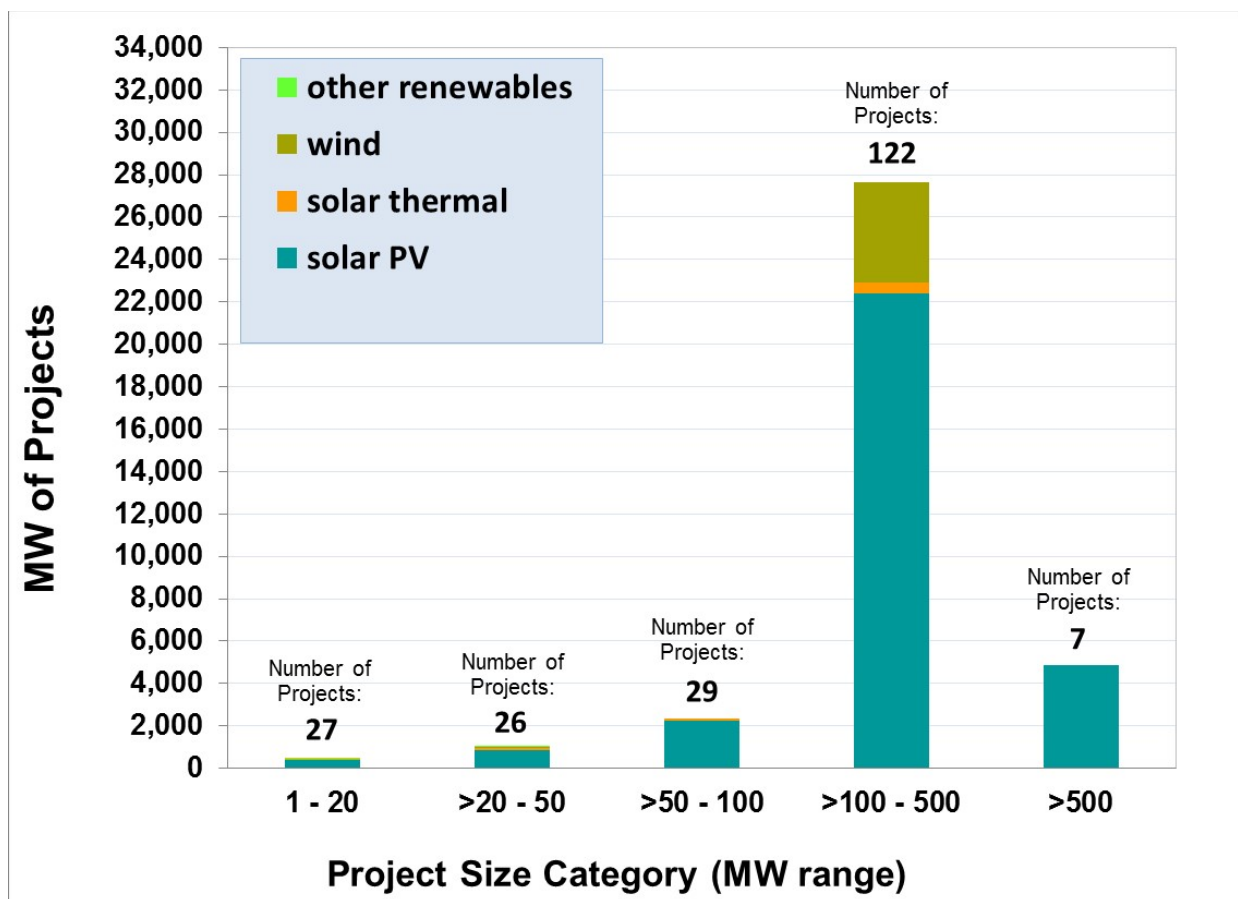


Figure 4 shows the historical and projected year 2020 build-out of renewable capacity by technology type based on projections from the investor owned utilities. The projected ISO connected renewable generation to be in operation in 2020 is 22,800 MW. The ISO currently has approximately 19,600 MW of operating renewable generation within its footprint, which leaves approximately 3,200 MW remaining to reach commercial operation between now and 2020. The majority of this amount is presently under contract with the three California IOUs.

**Figure 4**  
**Projected RPS capacity build-out through 2020**  
**(IOU projections)**

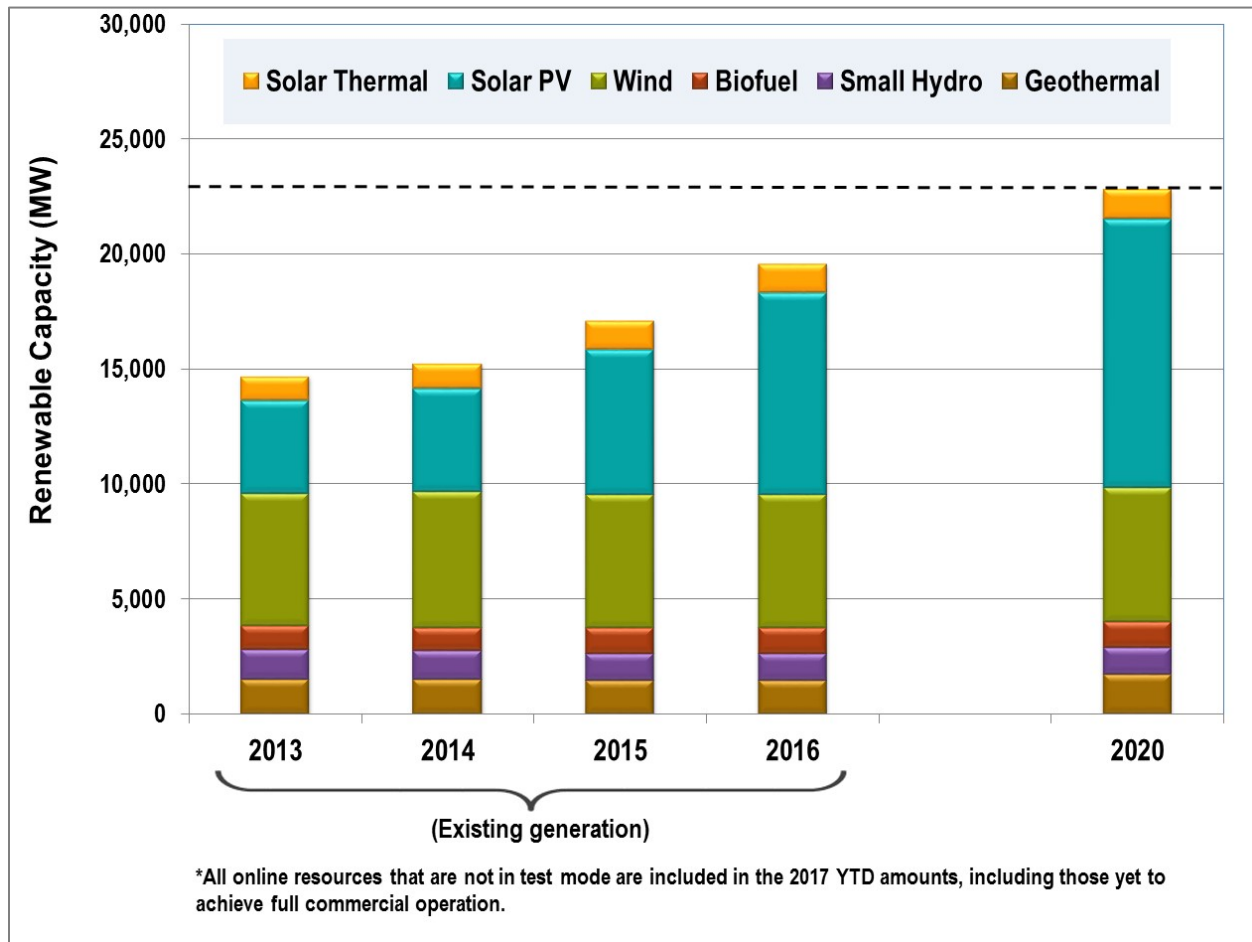


Figure 5 is a map of all projects in the generation interconnection queue as of January 9, 2017 and shows the general location and capacity by project type, including conventional generation and storage project capacity. Some storage capacity is associated with other generation technologies within a single project, typically solar PV. In a number of these cases, the total project output is designed to not exceed the capacity of the solar portion of the project. However, in this table 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 PV capacity and the storage capacity are shown separately even though the combined project cannot exceed the output of the solar PV 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 5**  
**ISO Queue Map – Conventional & Renewables**  
**As of January 9, 2017**

