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# Why California could need 11 GW of CSP by 2030

Posted by Heba Hashem [1] on Mar 7, 2014

California's need for CSP relative to other renewables will be greatly increased under a 50% by 2030 Renewable Portfolio Standard, according to a new study from Energy and Environmental Economics (E3).

***By Susan Kraemer*** [2]

California's big utilities paid for the study, titled 'Investigating a Higher Renewable Portfolio Standard in California [3]', in order to find out what would be the integration challenges if a 40 or a 50% RPS were to be mandated, and to learn the best array of options for solutions.

California utilities have already contracted for the renewables to meet a 33% 2020 Renewable Portfolio Standard (RPS), and last year regulators added a mandate for 1.3 GW of storage by that time.

Given this mandate, if any PV projects were to fail to meet their development milestones and drop out of queue, a CSP project with thermal energy storage would possibly now be more compelling as a replacement, to meet that storage mandate.

But the CSP-favouring market force exerted by the 1.3 GW of storage requirement by 2020 would be dwarfed by the CSP requirement under the most cost-effective of several options for 2030 explored in the E3 study, which found that up to an astonishing 10,913 MW of CSP with storage would be needed to meet the mandate.

The study found that a "diverse" mix of renewables; including CSP and out-of-state wind, along with various load-shifting methodologies would actually have the lowest costs, because the huge rise in behind-the-meter PV will increasingly shift loads from daytime; radically altering future electricity markets.

| | 33% RPS | 40% RPS | 50% RPS Large Solar | 50% RPS Diverse | 50% RPS Small Solar | 50% RPS Rooftop Solar |
|---|---|---|---|---|---|---|
| **Utility RPS Procurement** | | | | | | |
| Biogas | 2,133 | 2,133 | 2,133 | 4,422 | 2,133 | 2,133 |
| Biomass | 7,465 | 7,465 | 7,465 | 9,754 | 7,465 | 7,465 |
| Geothermal | 16,231 | 16,231 | 16,231 | 20,811 | 16,231 | 16,231 |
| Hydro | 4,525 | 4,525 | 4,525 | 4,525 | 4,525 | 4,525 |
| Solar PV - Rooftop | 0 | 943 | 2,290 | 2,290 | 2,290 | 22,898 |
| Solar PV - Small | 6,536 | 9,365 | 13,405 | 13,405 | 31,724 | 11,116 |
| Solar PV - Large | 22,190 | 33,504 | 49,667 | 29,059 | 31,349 | 31,349 |
| Solar Thermal | 4,044 | 4,044 | 4,044 | 10,913 | 4,044 | 4,044 |
| Wind (In State) | 20,789 | 24,561 | 29,948 | 27,659 | 29,948 | 29,948 |
| Wind (Out-of-State) | 4,985 | 4,985 | 4,985 | 11,854 | 4,985 | 4,985 |
| **Subtotal, Utility Gen** | **88,897** | **107,755** | **134,693** | **134,693** | **134,693** | **134,693** |
| **Customer Renewable Generation** | | | | | | |
| Solar PV – Rooftop, net energy metered | 10,467 | 10,467 | 10,467 | 10,467 | 10,467 | 10,467 |
| **Subtotal, Customer Gen** | **10,467** | **10,467** | **10,467** | **10,467** | **10,467** | **10,467** |
| **Total Renewable Generation** | | | | | | |
| **Total, All Sources** | **99,365** | **118,222** | **145,160** | **145,160** | **145,160** | **145,160** |

“The RPS Diverse Scenario meets a 50% RPS by relying on a diverse portfolio of large, utility-scale resources, including some solar thermal with energy storage and some out-of-state wind,” states the study, which uses the term “solar thermal” and implies a routine inclusion of thermal energy storage, throughout the paper.

According to the analysis, the Diverse Scenario would reduce daytime PV over-generation the most, so it would have “a substantially lower rate impact” than the other options considered.

**A wider net**

In addition to including more CSP, and more out-of-state wind, the Diverse Scenario would also require the use of an extended grid to smooth out the effects of high renewable penetration by spreading under- and over-supply out among the neighboring states.

“We have a chance to have a much larger energy market in the makings right now, and also to have a market facilitating the sale of imbalance energy into a short term schedule, say 10 or 15 minutes, that could be dispatched in real time - like on a five-minutes basis - across the western United States,” says Carl Zichella, Director of Western Transmission at the Natural Resource Defense Council.

“This is energy needed for meeting imbalances between generation and load caused by variability of either generation or demand, or both.”

To some extent, this new load-shifting grid, necessary to a 50% RPS, has already begun.

“The California system operator has entered into an energy imbalance market agreement with Pacific Corp, which is owned by Warren Buffet’s Midamerican Holding co, and which operates in six states,” Zichella explains.

“We’ve got other utilities in multiple states that could conceivably join that energy imbalance market as well, and with MidAmerican buying the largest utility in Nevada, NV Energy; most of us expect that they could conceivably come in as well.”

**No legislation yet**

There is not yet any California legislation in place mandating a 40 or a 50% RPS by 2030. As recently as 2012, PG&E spokesman Denny Boyles had told CSP Today: “The Governor has talked about changing the goal, but I haven’t seen anything concrete.”

This week, however, PG&E spokeswoman Lynsey Paulo said that recently there have been discussions about boosting the state’s renewable goals.

She concurs with the findings of the E3 study; that a diverse program would be the most optimal. “The results of the study highlight the value of a diverse portfolio that does not rely too heavily on a single technology or resource location,” she says.

**The value of storage**

“I think there could be a strong opportunity for CSP in the United States, provided the value of storage is included in the RPS mandate,” says Bill Hargett, SkyFuel’s International Business Development Manager.

If California were to legislate a 2030 RPS of 50%, it would seem prudent to first conduct such a study as this one. And next, to compare costs and the value of the various storage options.

A lot of preliminary work would need to be done to determine the value of thermal energy storage, and how it would be paid. Hargett queries whether this might be in the form of a tax incentive or a performance subsidy.

An NREL study published in 2013, Simulating the Value of CSP with TES in a Production Cost Model, ascribed a value of 3-4 cents a kilowatt hour for CSP thermal energy storage.

“The utilities recommend a further study to evaluate the prospects of technically feasible and cost-effective advanced demand response and energy storage as a potential solution to the significant challenge of over generation,” says Paulo.

**State-level RPS: major demand driver**

The fact that this study was commissioned by California’s state regulated utilities certainly suggests that a 50% RPS is now under consideration. Before any major legislative goal such as this gets written in stone, studies like E3’s look at how it might be possible to get there.

And even in the absence of national climate policy like a carbon tax or cap and trade in the US, the fact is, more than half of the states have written renewable energy mandates into law, and for the most part have been achieving these percentage targets.

California’s utilities even have contracts in place to meet the state’s 33% target for 2020, the highest in the US.

“The RPS is a big driver,” SolarReserve CEO Kevin Smith told CSP Today last year. “The ITC and the Loan Guarantee Program help price, but they don’t create demand. The RPS is the only

demand creation vehicle."

Given that the mandates have been the most successful drivers of renewable energy in the US – and only in the states that have adopted them – this much higher one in California, looking ahead to 2030, could be very good news for CSP, with the E3 study finding that it would take nearly 11 gigawatts of CSP (with thermal energy storage) to achieve California's 50% RPS most cost effectively.

*To comment on this article, please write to the author Susan Kraemer [2].*

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