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Guest Juice: Evening Out Renewables – Act 2

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By Edward Cazalet

As we approach the major private utilities' December 2014 energy storage procurements under state law passed in 2010, we should reflect how this procurement standard arose and what our future storage needs now are.

A year before the storage procurement law, AB 2414, passed, in an April 17, 2009, Guest Juice titled Evening Out Renewables, I wrote "I advocate a standard of 5 percent of peak demand for fast, clean, deep and distributed new storage by 2020. This would provide about 4 GW of storage, which is a modest fraction of the variable renewables that will be in place in 2020. One GW might be installed in the San Francisco area, 2 GW in the Los Angeles area, and 1 GW in the San Diego area. Starting in about 2011, we would need to install about 500 MW per year of storage to support the 33 percent Renewable Portfolio Standard for 2020. At this battery demand level, manufacturers would locate battery manufacturing facilities in California and create jobs. Setting the storage goal at this level would create competition among manufacturers to lower costs and encourage new technology development."

I further advocated in 2009 that the Legislature establish a portfolio standard for storage to complement the standards they set for renewables and demand-response.

Months later, on February 25, 2010, then-Attorney General Jerry Brown and Assemblymember Nancy Skinner introduced AB 2514 "to enable California to become a leader in clean, cost-effective energy storage."

AB 2514 was passed by the Legislature and signed by Gov. Arnold Schwarzenegger on Sept. 29, 2010.

Three years later, the California Public Utilities Commission approved a 1.325 GW storage procurement standard by 2020 (operational by 2024) for the three investor-owned utilities.

That was less than the original 4 GW I advocated in 2009, but still a significant amount. The municipal utilities have not yet published their storage procurement plans.

Requests for offers for the first investor-owned utilities' AB 2514 procurements are to be issued by them this coming December.

Additionally, 50 MW of storage was solicited by Southern California Edison last year prior to the finalization of the commission target. Edison's procurement contracts for the 50 MW have not yet been announced.

Unfortunately, the commission order does not require Pacific Gas & Electric, San Diego Gas & Electric, and Edison, to procure deep, long-duration storage.

I recommend the commission define the storage standard to be six-hour duration (storage that can both charge and discharge at its rated capacity for six hours).

Here's why: Current studies by the respected consulting firm Energy & Environmental Economics (E3) and the California Independent System Operator point to substantial mid-day curtailment of solar energy, especially on sunny spring and fall days. This mid-day curtailment will greatly increase with a 40 to 50 percent renewables standard now being considered for post 2020. In any case, customers will continue to install rooftop solar not counted in the state renewables mandate.

Instead of curtailing and thereby wasting this clean energy, it should be stored to displace fossil fuel use in the evenings and other times. If we waste this solar energy, we will have to buy more solar capacity to meet our renewables and greenhouse gas reduction mandates.

The grid operator has identified needs for 13 GW of flexibility by 2022 and more in later years. Each GW of storage provides 2 GW of flexibility—4 GW of battery storage would provide 8 GW of flexibility, but only if it can charge and discharge for about six hours/day to flatten the net load "duck" curve. The duck curve shows net load (total customer load less total solar and wind generation) for each hour of typical days. With large amounts of solar, the curve can have a belly in the middle of the day when solar generation is highest and a head (peak) in the evening when there is no solar generation.

Long-duration battery storage will also provide the few hundred MWs of frequency regulation that renewables require, so there is no need for short-duration 15-minute batteries for frequency regulation.

Resource adequacy standards require a minimum of four hours of storage to avoid building new fossil fuel plants, transmission lines and distribution lines to replace 2.2 GW of retired San Onofre nuclear generation and many GW of retiring, once-through cooled generators.

However, in replacing fossil generators, six-hour storage will provide more tools to system operators to deal with operational uncertainties than the current minimum four-hour adequacy standard (no one can imagine the future uncertainties that grid operators will need to deal with).

Short, one- to two-hour duration storage will not support the state's greenhouse gas and renewables integration policies and AB 2514 because it cannot flatten the grid operator's net load "duck" curve and avoid high greenhouse gas emissions from cycling of fossil fuel plants trying to ramp and flatten this curve. Buying more fossil fuel plants will provide far less flexibility and will further increase solar over supply and greenhouse emissions because of fossil minimum generation requirements.

Deep, distributed storage will best support the Governor's goal of 12 GW of distributed generation.

Standardizing on six-hours simplifies the evaluation of offers from many vendors and promotes more competition.

Initial results show that the AB 2514 storage mandate is succeeding with its objectives of encouraging storage opportunity and expanding manufacturing capacity.

The grid operator was surprised in April 2014 when about 2,400 MW of storage applied for interconnection as generators. And the Edison 50 MW storage solicitation had hundreds of offers.

This shows there is vigorous competition among vendors and developers. The CAISO is now scrambling to figure out how to do the interconnection studies and operate the storage.

Battery vendors that secure a large stream of firm orders are eager to manufacture in California and thereby provide the local jobs that are a promised benefit of our greenhouse gas emission and renewables policies.

California can lead the world in storage manufacturing if we enact the right policies now. However, the current pace of the procurement process is too slow to build the storage manufacturing base we need from multiple manufacturers.

AB 2514 established a goal for California to become a leader in cost-effective storage. Manufacturing scale drives down costs.

A number of vendors are projecting quality long-life battery storage system prices below $250/kWh by 2020 and further price reductions after that, but only with manufacturing scale from firm orders.

Since California's grid need is for long-duration storage we need to encourage $/kWh cost-reductions of all storage technologies. I believe Li-ion, sulfur, flow and other technologies can compete for a six-hour product.

I advocate that the commission clarify that 1.325 GW of six-hour storage means 8 GWH of storage deployment over the eight years from 2016 to 2024 (1 GWH/year).

I also urge the CPUC to raise the portfolio standard for storage deployment to 4 GW – 24 GWH by 2024. This requires an average of 3 GWH per year of storage deployments from 2016. Current annual Li-ion battery global production is about 35 GWH so this goal is clearly feasible. The Tesla Gigafactory would double Li-ion production.

Sodium-type battery production capacity for the grid is at least 2 GWH per year and additional capacity may be built in California with sufficient orders. There are many storage startups in California using flow battery and other long duration technologies.

We should not put all of California's storage eggs in one technology basket. We should establish battery manufacturing and deployment of several six-hour commercial battery technologies.

Fast, clean, deep (six-hour) and distributed storage manufactured at scale in California will provide California jobs and support clean low carbon, renewable, and reliable electricity to Californians.

The CPUC should make this happen.

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