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ENERGY STORAGE

In Storage vs. Peaker Study, CAISO's Outdated Cost Estimates Produce Higher Price Tag for Storage

The study found that storage costs 2.7 times more than NRG's contested gas plant—based on battery cost estimates from 2014. More recent numbers tell a different story.

by Julian Spector (https://www.greentechmedia.com/authors/julian-spector)
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Pushback against the proposed Puente natural gas plant in California now hinges on whether energy storage could do the job instead.

The first whack at the question, in a study (http://docketpublic.energy.ca.gov/PublicDocuments/15-AFC-01/TN220813_20170816T165328_Moorpark_SubArea_Local_Capacity_Study.pdf) by the California Independent System Operator, found that storage could provide the needed local reliability, but at 2.7 times the cost.

A GTM analysis of CAISO's calculations, though, found that they rely on lithium-ion cost projections from 2014, which makes them just about ancient history in terms of the fast-moving storage industry. Battery costs keep falling faster than predicted, and in 2014 the industry was barely getting started.

CAISO doesn't have access to proprietary cost data; the grid operator's study makes clear the numbers are more of a ballpark calculation. It's up to the California Energy Commission to decide whether to allow NRG to build its Puente gas plant in Oxnard for 2020, or whether more up-to-date cost data on alternative solutions would be helpful.

"At a minimum, the prices assumed for energy storage and solar in the CAISO study are not reflective of today's market for either technology," said Shayle Kann, head of GTM Research. "It's always hard for regulators to keep up with markets that are adapting as fast as both solar and storage are, but in particular storage costs are falling fast enough that using data from 2014 is like relying on gas prices from before the shale revolution."

Environmentalists have rallied to squash Puente, arguing the plant perpetuates a history of Oxnard as a "sacrifice zone for polluting power plants," (http://earthjustice.org/news/press/2017/california-independent-system-operator-determines-puente-gas-plant-on-california-coast-is-not-needed) even though alternatives now exist. The city itself opposes the plant and called it "expensive, obsolete before it is open" in comments (http://www.caiso.com/Documents/CityOxnardComments_MoorparkSubareaLocalCapacityAlternati on the draft of CAISO's study.

The whole project originated in response to California's policy to phase out old power plants that use ocean water for once-through cooling.

Southern California Edison selected NRG's bid for the project back in 2014. NRG bills it as a flexible asset (http://www.nrg.com/generation/projects/puente-power/) to fire up as needed to balance intermittent renewables. It still needs approval from the CEC; an evidentiary hearing to discuss the CAISO study is set for September 14.

It's not clear that storage will be cost-competitive with the plant. CAISO calls for a mix of short-duration batteries, as well as sizable 9-hour duration systems, a form factor that has not been developed widely.

What is clear is that up-to-date cost projections show storage as cheaper than the CAISO study's analysis, and the actual cost of the gas plant could be different from the generic 2014 cost used in those calculations.

With more accurate cost comparisons, this could become the clearest case yet of storage challenging a gas peaker head-to-head.

The view from 2014

The CAISO study calculates a massive price differential to ensure local reliability in the face of impending plant closures: $299 million for a 262-megawatt combustion turbine, $805 million for a combination of distributed and front-of-the-meter storage.

The grid operator, though, admits that it has constrained insight into battery pricing.

"As the ISO does not conduct resource procurement, the ISO's access to cost information is limited to publicly available sources," the study notes. As such, it developed "very high level estimates" from public documents as a starting point for discussion.

The storage cost estimates come from a July 2016 study (http://www.energy.ca.gov/2016publications/CEC-200-2016-004/CEC-200-2016-004.pdf) conducted by Navigant for the California Energy Commission. The report forecasts the 2024 installed cost of lithium-ion batteries for four-hour peak shifting applications as $1,940 per kilowatt-AC (see Table 21 on page 41 of study).

Navigant arrived at those numbers via its "research publications and internal assumptions." The exact methodology is not disclosed, but the $1,940 per kilowatt number comes from an earlier Navigant study published in Q3 2014.

Accurately forecasting battery price declines has proven notoriously difficult; prices keep falling faster than expected (https://www.greentechmedia.com/articles/read/were-still-underestimating-cost-improvements-for-batteries). Forecasts need to be updated to ensure continued relevance.

Part way through 2014, the storage industry's empirical record looked substantially different than it does today: In the whole previous year, the U.S. deployed only 46 megawatts, compared to an expected 395 megawatts this year, by GTM Research's count. Construction on Tesla's Gigafactory had barely begun. Few utilities were considering storage for large-scale deployment, and long-duration storage was all but unheard of.

The CAISO study converts the outdated $1,940 per kilowatt-hour rate from Navigant's 4-hour duration storage estimate into $485 per kilowatt-hour, and uses that rate to price out storage solutions with 0.5-hour, 2.5-hour, 4-hour and 9-hour durations.

Pricing rates do not necessarily hold constant across different durations. A 0.5-hour battery's design and pricing structure may look entirely different from a 10-hour battery. In fact, it's not clear whether any grid-scale 10-hour batteries have been deployed yet. The economics of such a system could well demand an alternative technology to lithium-ion, like flow batteries.

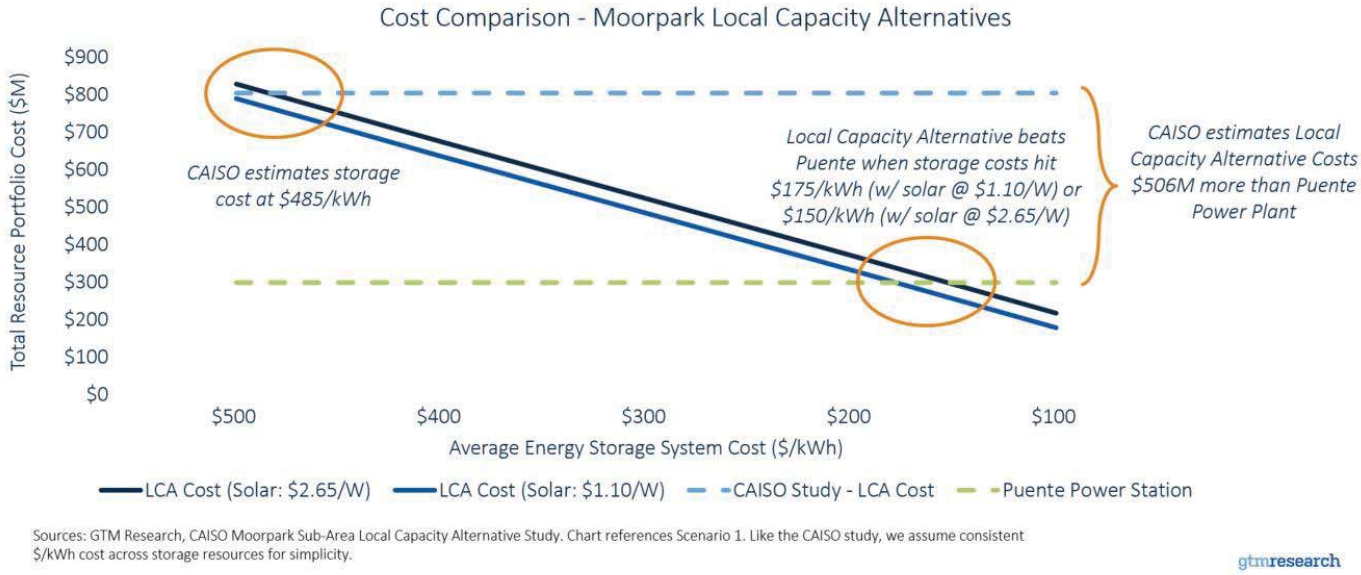
The study also assumes a capital cost for solar at $2.65 per watt in 2020, when California prices are below $1.50 per watt today. That inflates the expense of solar-plus-storage included in the roster of alternatives to the gas plant.

More current estimates predict cheaper storage pricing than the 2014 estimations used in the CAISO study. That still leaves the question of whether storage, even with more accurate price forecasts, can compete with the gas plant.

Can storage compete?

A preliminary analysis of the CAISO study by GTM Research suggests that storage would need aggressive cost declines in order to match the gas peaker, but not so aggressive as to be out of the range of possibility.

"By our calculation, the energy storage would have to come in around $175 per kilowatt-hour on average in order to beat the estimated cost of Puente," Kann said. "Factoring in its status as a preferred resource and additional values, storage may only have to come within range in order to be considered."



The black line represents local capacity alternative costs using the CAISO study's anachronistically high cost of solar; the solid blue line represents those costs using a conservative estimate of all-in solar costs in California in 2020.

GTM contacted the developers of the largest Aliso Canyon storage facilities to see if they felt capable of competing at this cost threshold. AES Energy storage declined to comment on its internal pricing trajectory. Tesla and Greensmith did not respond in time for publication.

GTM Research predicts an average $277 per kilowatt-hour cost for 4-hour storage systems in 2020. If SCE pursues the storage alternative laid out by CAISO, which totals a whopping 260 megawatts/1,522 megawatt-hours, it would likely come in lower than the average price.

"This would be a big procurement," Kann said. "You would expect developers to bid aggressively, and so I would anticipate costs would come in below what we expect benchmark pricing to be. Similar to Aliso Canyon (https://www.greentechmedia.com/articles/read/aliso-canyon-emergency-batteries-officially-up-and-running-from-tesla-green) and South Australia (https://www.greentechmedia.com/articles/read/power-play-tesla-nabs-south-australia-contract-for-worlds-biggest-battery), this would be a landmark procurement."

Additional savings could come through scale.

"As you scale up the duration, there are some economies of scale that you can derive with respect to the balance of plant," said Kiran Kumaraswamy, market development director at AES Energy Storage.

Storage would be able to perform other valuable services when it isn't managing local capacity needs, Kumaraswamy added. CAISO looked at capacity value, but accounting for revenue streams like ancillary services and soaking up solar overgeneration, and social values like air pollution and greenhouse gas emission avoidance, could close the cost gap with Puente.

"You need to factor in all those benefits when you do the comparison between the two resources," he said.

Unknowns remain

Several factors make it hard to draw firm conclusions at this stage.

For one thing, the gas plant cost that CAISO uses, and that GTM used in the preliminary analysis, is not specific to Puente.

It's from a 2014 CEC report (http://www.energy.ca.gov/2014publications/CEC-200-2014-003/CEC-200-2014-003-SD.pdf) on estimates of energy system pricing. It's entirely possible that the "state-of-the-art LEED-certified facility" NRG wants to build would cost more than the generic cost cited from that report (Table 51, page 138). A deeper analysis would need to consider labor and construction costs specific to the Oxnard location as well.

The 9-hour storage raises another uncertainty. Grid storage today encompasses half-hour through 4- and sometimes 5-hour storage, with a limited number of longer-duration projects popping up. There is simply no database of 9-hour storage development costs from which to extrapolate.

The CAISO study could kick off more research into these topics. Simply running the feasibility comparison with storage deserves praise, Kumaraswamy said. The exercise of comparing gas generation resources with storage technology is still pretty novel and sets a good precedent for future grid decisions.

"I personally haven't seen a similar study that considered other types of resources in manner as detailed as what the ISO has done here," he said.

With storage deemed a feasible alternative, the next battleground will be appropriately defining its cost.

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