

IRP Workshop on Ruling Proposing Need and Process for Centralized Procurement of Specified Long Lead Time Resources

May 7, 2024

Written Q&A Log

1. Perry Servedio CESA: Does the 2800 LDES include the 361 MW forecasted to be online by 6/1/28, or should it be read as 2800+361?
 - a. Perry: I'd read it as the former. Think of the 2800 as the MWs that LSEs said they were *planning for*, and the 361 to represent more real-world actions regarding attempts to procure those resources.
2. Mary Neal: Regarding table 1, can you confirm the procurement data is all as of August 1, 2023, and does not even reflect the December 1, 2023, filings?
 - a. Yes, Table 1 is only reflecting LSE data from the August 1, 2023, filings.
3. Mary Neal: Regarding Table 1, can you confirm the "Generic LDES" row refers to the compressed air storage and flow batteries in the PSP? If so, why not specify those technology types?
 - a. You can find a breakdown of the resource builds by resource type in the "Build" tab in the "Locational Resource Build Detail" section (starting row 202) of the RESOLVE PSP portfolio located in the <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials> link. 200 MW of the plans are compressed air storage, the rest is flow batteries.
4. Mary Neal: Also, regarding Table 1, is the 8-hour battery category Li-ion battery? Does that qualify as requiring a 5-year construction and development lead time?
 - a. Yes, that is for 8-hour Li- ion batteries. The Commission still needs to determine what exactly constitutes the specific criteria for eligible resources. 1373 did say the resource must have a five-year timeline, but Staff does encourage party feedback on these eligibility questions leading up to the development of the PD.
5. Mary Neal: On the topic of confidentiality, can you clarify that if contract volumes are confidential, then LSEs have to wait three years to know how much DWR procured? Or will that be public right away?
 - a. Mary: One can envision a world where the CPUC needs to set volumes (likely in MWs or MWhs) when it requests DWR to take procurement action. If your question is about what would happen after that, we'd be curious about your ideas and any pros/cons in your comments.
6. Neal Reardon: Page 30 of the Ruling contemplates that "most likely, the GHG emissions reduction benefits would not become attributes that can be resold." Do IRP staff have a framework for preventing sales of excess GHG-free energy by LSEs?

- a. Neal: We'd be curious about your ideas on that in the comments.
7. Mary Neal: The Ruling discusses use of the CAM. Has the CAM ever been used to allocate RECs?
 - a. No, the CAM has not been used to allocate RECs to date. Those processes would need to be developed. We encourage party feedback on the exploration of central procurement cost allocation mechanisms.
8. Nancy: Is there a particular reason that you did not consider remote, in-state wind resources for central procurement?
 - a. (Verbal response) We'd be curious if we missed something regarding in-state wind resources, and we'd be very curious to see your responses on that Nancy and for whoever else might have thoughts on where something can be improved.
9. Jerri Strickland: Will the CPUC utilize the affordability metrics to determine if the DWR procurement costs justify the market transformation?
 - a. Jerri: Can you please be more specific? What metrics?
10. Jerri Strickland: Sure! I mean the CPUC's affordability metrics.
<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/affordability#Affordability%20Metrics%20&%20Associated%20Concepts>
<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/affordability#Affordability%20Metrics%20&%20Associated%20Concepts>
That link takes you to the CPUC's website on the Affordability Metrics: Affordability Ratio, Hours at Minimum Wage, and CalEnviroscreen.
11. Good question, Jerri. If you have suggestions on how the CPUC should go about this, we'd be eager to see them in comments. Deborah Behles: How is this slide defining LDES? Does it include all technologies or only a subset?
 - a. Deborah: I'd roughly think about it along the lines of which ~storage technologies are listed in the table from slide 12 (table 1 from the ruling). However, we'll also be curious re: party opinions if that's the right list, so are eager to see reflections on that in comments.
12. Mary Neal: Slide 25 has Pumped Hydro storage as a technology, is that a misprint? Isn't it LDES more generally?
 - a. Yes, Mary, that column should've said "LDES."
13. Sarah Harper: Harper from Fervo Energy: Enhanced Geothermal Systems (EGS) is a nascent technology which is showing major successes in cutting costs and is rapidly scaling. This reality is not adequately represented in the lump geothermal category. Will the CEC consider EGS as an individual technology with unique resource characteristics?
 - a. Please let us know in comments if/how you think that resource type should be parsed out for consideration for procurement through this mechanism. Also, this is the CPUC, not the CEC.
14. Mary Neal: On the carve out for pumped storage in legislation, does this limit the procurement of pumped storage to only pumped storage resources that meet the size

- and state funding requirements (basically only the San Vicente Reservoir project) or is the Ruling inviting comment on pumped storage as a resource type more generally?
- a. Mary: There are some criteria in the legislation that certainly narrow the playing field for those resources, so to speak, but we'd be curious about your thoughts in comments on exactly what you believe that does for the list of resources that could actually be considered here.
15. Nancy: Flagging my Q above: is there a reason why in-state remote wind was not considered for CP?
 - a. Nancy: In short, we weren't sure they met all the criteria-- whether those stated in the legislation and the ones in Figure 1 of the ruling. If you think that the in-state resource you're referencing should be considered, please make that case in comments.
 16. Mary Neal: Of the 361 MW of LD batteries are forecasted to be online by 2028, and this reflects executed contracts, then why does the Ruling state LSEs have not procured LDES?
 - a. Mary: This might be getting into the semantics that we're using, specifically "contracted" or "procured" vs. "forecasted to be online". If after considering that you think we've made an error, please let us know in comments.
 17. Mary Neal: I saw a reference to SunZia. When the Ruling states that "Transmission lines are currently in the process of being developed to support, at least in part, the OOS wind resource development." What other transmission lines is this passage referring to, if any?
 - a. Another example could be the 732-mile TransWest Express transmission project, currently under development with a commercial operation target in 2027, could potentially enable California LSEs to contract for significant amounts output from wind resources in Wyoming. The TransWest project is being developed outside of the CAISO's Transmission Planning Process; the project will recover costs through its subscription-based model, which is allowed under a fairly new CAISO tariff provision. The Sunzia project also has applied for approval to utilize this subscription model. Both of these projects could support significant Out-of-State wind resources for California load.
 18. Molly Croll: Since OSW costs include transmission costs, how is the model applying transmission costs to other resources (solar, batteries, OOS wind) in the avoided cost consideration?
 - a. All candidate resources are mapped to the transmission system in RESOLVE. Incremental transmission costs are therefore included for OSW, solar, batteries, OOS wind, geothermal, etc., based on the CAISO's whitepaper detailing the deliverability headroom on existing/planned transmission and costs to upgrade.
 - b. All resources are assigned to transmission constraint zones. The costs of transmission upgrades in those constraint zones are separate from the resource

costs. For offshore wind resources, the transmission constraint zones they are assigned to do not contain any other resources.

19. Nancy: Regarding the build-out scenarios: Is it possible that you could run the Slide 35 scenarios for 10 GW of OSW, assuming maximum capacity from the existing two lease areas?
 - a. Based on the current assumptions for offshore wind density (5 MW per square kilometer), the maximum capacity in the existing lease areas is 7.6 GW, which was used in our analysis.
20. Nancy: Can you provide more details on the scenarios – e.g., how much higher are the costs? what is “low competing resource availability”? Can you supply stakeholders with the results in a spreadsheet so that we can see the specific numbers?
 - a. Additional details on the costs used in each scenario are included in the RESOLVE Scenario Tool that is being released publicly.

Low competing resource availability refers to reduced amounts of resource potential for land-based wind (in-state and out-of-state), geothermal, biomass, and pumped hydro resources. Updated resource potential values for these scenarios are also included in the RESOLVE Scenario Tool.
21. Nancy: Last one! Am I correct in reading Slide 35, for example the “High Bookend” scenario, as meaning that 3 GW of OSW avoids about 9 GW in other types of resources? Did you generate the same results for greater amounts of OSW and, if so, can you share those?
 - a. Slide 35 shows that 3 GW offshore wind avoids 2-9 GW of other resource types, depending on the case. At higher levels of offshore wind buildout, we see declining amounts of other resources avoided with each incremental GW of offshore wind added. These results are calculated and displayed in a Cost-Benefit Workbook. This workbook will be provided on the [AB 1373 Centralized Procurement of Specified Long Lead-time Resources \(ca.gov\)](#) website.
22. Molly Croll: Are the E3 created cost curves simply a function of % decline in price over time or are there associated deployment quantities driving the declines?
 - a. The PSP Mid/Low/High resource costs are based on NREL ATB costs and transmission costs are based on an NREL Floating Offshore Wind Report (<https://www.boem.gov/sites/default/files/documents/regions/pacific-ocs-region/environmental-analysis/BOEM-2022-072.pdf>). The Conservative costs apply the NREL ATB cost trajectory to current floating offshore wind pilot costs. Optimistic costs align with the 2035 DOE Earthshot target and apply a high (11.5%) learning curve to current floating offshore wind pilot project costs, assuming 16.5 GW global procurement by 2030. Slide 17 of the Ruling deck and the Resources and Transmission Cost workbook provide more detail on how cost curves are derived.
23. Ryan Saraie: Are the avoided investment and operating costs comprising the benefits of the analysis present in the Results Viewer of the current RESOLVE model? Perhaps

within the Total Resource Cost or Revenue Requirement components of the model's Results Viewer?

a. Avoided costs are calculated and displayed in the Cost-Benefit Analysis workbook. This workbook was designed to process and display outputs from multiple cases at once.

24. Nancy: (Clarification: Qs above refer to Slide 35 in the larger analysis deck)

a. Does not require response, was answered previously.

25. Mary Neal: For the offshore wind analysis, what is the source of the transmission costs assumed?

a. For PSP Mid/Low/High-cost scenarios, transmission costs for Morro Bay and Humboldt Bay are derived from the CAISO 21-22 Transmission Plan with an update reflected in the 2023 I&A doc for the offshore wind area density factor. This update increased the assumed resource potential at Humboldt from 1.6 GW to 2.7 GW and the transmission costs in the 21-22 Transmission Plan were scaled linearly to account for additional resource potential available. For PSP Mid/Low/High-cost scenarios, transmission costs for Del Norte and Cape Mendocino are sourced from a study conducted by the Schatz Energy Research Center (<http://schatzcenter.org/pubs/2023-OSW-R2.pdf>).

For the Conservative/Optimistic cost scenarios, transmission was inclusive in the pilot project costs which were referenced to derive cost trajectories.

More detail on transmission costs is included in the Resource and Transmission Cost workbook that is being released.

26. Christian Lambert: Re: the offshore wind cost-benefit analysis, could E3 please specify how OSW transmission cost estimates were assessed?

a. For PSP Mid/Low/High-cost scenarios, transmission costs for Morro Bay and Humboldt Bay are derived from the CAISO 21-22 Transmission Plan with an update reflected in the 2023 I&A doc for the offshore wind area density factor. This update increased the assumed resource potential at Humboldt from 1.6 GW to 2.7 GW and the transmission costs in the 21-22 Transmission Plan were scaled linearly to account for additional resource potential available. For PSP Mid/Low/High-cost scenarios, transmission costs for Del Norte and Cape Mendocino are sourced from a study conducted by the Schatz Energy Research Center (<http://schatzcenter.org/pubs/2023-OSW-R2.pdf>).

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27. Nick Pappas: Could you please elaborate on the process for portfolio adjustments with the added resources? Is it determined in RESOLVE based primarily on equivalent total ELCC?
 - a. Portfolios are optimized with 0 GW of offshore wind and then w/ X GW of offshore wind forced in (varying by scenario). RESOLVE then optimizes the system for least cost to meet GHGs, reliability, etc. The resource build avoided by OSW is the difference between the 0 GW case build and the X GW case build. It's driven by the avoidance of the various values offshore wind provides (RA capacity, energy/GHG reduction value, etc.).
28. George: Will the RESOLVE packages or workbooks with the alternative capacity mixes be made available on the CPUC page?
 - a. George: Yes, we will be posting more materials on the website. Included among those are the Results Viewer workbooks and other materials specific to the OSW cost benefits analysis.
29. Matthew Kawatani: In 2035 and generally, why is there less resource capacity off-set relative to the amount of OSW added + the incremental solar and battery storage added?
 - a. There are differences in the amount of capacity and timing of energy that each resource provides, which makes it so that there is not necessarily an even one-for-one offset of new resources added to resources displaced.
30. Mary Neal: Nathan, to follow up on the issue of the 361 MW of LD batteries, it would be helpful if Staff walked through how that number was determined because I don't understand what it means. Is it a summation of certain resources reported in the 8/1/2023 MTR compliance filings?
 - a. Mary, I will need to follow up with the modeling analysts in the procurement track to get the details. I can get back to you. We will attempt to provide these answers in the transcript that will be available tomorrow.
 - b. 361 MW is the total sum of LDES resources contracted as of the 8/1/2023 filings. IRP staff can confirm the 361 MW comes from only 8-hour batteries. This number was validated by checking the contracted storage depth (MWh) divided by the contracted storage mw and confirming the value equaled 8 for the storage duration.
31. Molly Croll: In the low resource availability scenarios, you are only constraining OOS, geothermal and LDES, correct? Are there any constraints in solar and battery availability in any of the scenarios?
 - a. In the low resource availability scenarios, land-based wind (in-state and out-of-state), geothermal, biomass, and pumped hydro were constrained. There are no constraints included for solar and battery storage given high resource potentials.
32. Hillary Hebert: On slide 42, should we read that to mean that if 3 GW of offshore wind is procured by 2035, there is no geothermal procured? The presenter mentioned that

offshore wind procurement promotes diversity, but it looks like it might also eliminate procurement of other LLT types. I want to make sure I'm reading this slide correctly.

- a. The graphic shows the change in resource capacity, relative to the case with no offshore wind. It shows resources with higher capacity in the resource portfolio (including offshore wind) on the positive axis, and resources with less capacity on the negative axis. Therefore, any geothermal on the negative axis indicates less geothermal, but not necessarily none, was selected in the case with 3 GW offshore wind.
33. Mary Neal: For the cost scenarios for the OSW analysis, is this intended to capture uncertainty in port development costs or was that excluded?
 - a. None of the non-transmission related infrastructure costs were included in the OSW analysis.
 34. Nick Pappas: Thanks for the discussion of the methodology. Is there any consideration of pressure testing these results with SERVIM to gauge whether they have equivalent reliability / GHG performance?
 - a. The scenario analysis for this work led to >100 RESOLVE scenarios, each run over multiple years, so fully studying in SERVIM would mean hundreds of LOLP runs, which is generally not feasible. Past calibration work between the models has been performed to minimize differences in reliability and GHG emissions.
 35. George: Thank you for the response- much appreciated!
 36. Molly Croll: How is "high market transformation" defined or assessed in this analysis? Why are you assuming that happens at low levels of procurement?
 - a. High market transformation refers to technological advancements and cost declines with increases in deployment (in this case, of floating offshore wind). As seen for fixed-bottom offshore wind as well as other emerging technologies, the first several projects incur the highest learning costs and have the fewest technological advancements. It is anticipated that the incremental learnings and technological advancements are greatest when the technology is the newest (i.e. for the first several GW installed), but as more and more offshore wind is installed, the per GW incremental learnings, technological advancements, and cost declines gets lower.
 37. Maren Wenzel SVCE: Similar to George's question, will staff be providing more clarity on the assumptions behind each scenario and how they were defined? It would be helpful to understand exactly what is being modelled in the "competing resource challenges" scenario, for example.
 - a. Yes, additional details are provided in the Resources and Cost workbook, RESOLVE package including Results Viewer, and Cost-Benefit Analysis workbook that are being released.
 38. Mike Hagerty Brattle: Can you please point me to the assumed costs for OOS wind transmission?

- a. "The most recent Inputs and Assumptions document for the 2022-2023 IRP, which was posted in October 2023, explains transmission cost assumptions for out-of-state wind resources, Specific upgrades needed for out-of-state and offshore wind resources are discussed in Sections 5.5.4 and 5.5.5.
 - b. The document can be found here: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2023-irp-cycle-events-and-materials/inputs-assumptions-2022-2023_final_document_10052023.pdf"
39. Molly Croll: The E3 OSW analysis seems to imply that the marginal value of OSW at higher quantities decreases because infrastructure costs increase. Does this mean the assessment isn't considering economies of scale benefits (e.g., the cost of transmission increases with larger quantities of a resources interconnecting, but generally larger upgrades are more economically efficient on a \$/MW basis)? (And thank you for allowing me to ask so many questions- I appreciate the presentation)
- a. The cost assumptions do incorporate a learning rate that yields reductions in offshore wind over time. The drivers for reduced value of OSW at higher procurement amounts are the higher transmission costs associated with North Coast resources as well as the declining marginal value that OSW is able to provide to the system (i.e. OSW is able to offset more resources for the first several GW installed but is able to offset incrementally less OSW per GW added once at higher levels of procurement).
40. Andy: has there been any discussion with CEC and CAISO on how the coordination / consultation will work?
- a. (Verbal response) I think what Andy is referencing is the "in consultation" language in AB 1373 itself, which specifies the CPUC needs to make need determinations in consultation with the CEC and CAISO. We've chatted with both and them throughout the run up to this workshop. We started a couple of months ago, and we'd expect before we get to the proposed decision stage this year that we'd be doing even more of that.
41. Mike Hagerty Brattle: Does RESOLVE account for transmission constraints between southern and northern CA and the differences in energy market prices that would result from congestion on those constraints?
- a. No, Resolve does not currently model separate zones within CAISO.
42. Nancy: Thank you!