May 23, 2023

Email to: docket@energy.ca.gov

Proceeding: 20-MISC-01

Subject: Comments of the California Energy Storage Alliance on the Staff Workshop on Long Duration Energy Storage Analysis

Re: Comments of the California Energy Storage Alliance (CESA) Regarding the California Energy Commission's (CEC) Staff Workshop on Long Duration Energy Storage Analysis.

The California Energy Storage Alliance ("CESA") appreciates the opportunity to provide feedback on Energy & Environmental Economics, Inc.'s ("E3") workshop hosted by the California Energy Commission ("CEC") on May 9th on their Long Duration Energy Storage Analysis. CESA appreciates the commitment of CEC staff to engage with stakeholders on the improvement of modeling tools vital to the achievement of California's energy and environmental goals.

CESA is a 501(c)(6) organization representing over 120 member companies across the energy storage industry. CESA participates in several proceedings and initiatives in which energy storage is positioned to support a more reliable, cleaner, and more efficient electric grid. Moreover, CESA has actively engaged in first-in-class modeling studies to better understand the need and opportunity for energy storage given Senate Bill ("SB") 100 targets. As such, CESA's experience with capacity expansion modeling ("CEM") and energy storage modeling is of substantial pertinence to the CEC's and E3's analyses.

I. INTRODUCTION & SUMMARY

Throughout the current integrated resource planning ("IRP") cycle at the California Public Utilities Commission ("CPUC"), CESA has been advocating for the advancement and proper representation of energy storage within modeling. The CEC's LDES workshop is an exciting step

in the right direction for the valuation of LDES in a heavily intermittent grid facing the realities of climate change and extreme weather. As mentioned in the presentation, the Department of Energy ("DOE") estimates that 225-460 gigawatts ("GW") of LDES could be deployed in the US by 2060 to achieve a net-zero economy.[1] We are happy to see the Commission investing in this research to realize the benefits LDES technologies can bring to the grid. In the absence of a report, CESA's feedback focuses on the materials presented during the Workshop, and clarifying questions that we hope guide the final draft of the LDES analysis report. Our comments can be summarized as follows:

- The CEC should clarify what combinations of storage duration and round-trip efficiencies ("RTEs") were studied and how these relate to the storage technologies the CEC considered.
    - Considering a wider range of duration and efficiency combinations for durations of 8-,10-, 12- and 24-hours would greatly benefit buyers, sellers, and regulators identify the solutions that might be needed and planned for in the years to come.
- The CEC should clarify the technologies that fall under their "Emerging Tech" umbrella term and whether they refer exclusively to emerging generation technologies.
- The CEC should clarify the temporal constraints of the models utilized, their optimization horizons, and their dispatch granularities.
    - Modeling 365 consecutive days across all hours (*i.e.,* 8,760-hr modeling) to identify least-cost portfolios can enable storage balancing decisions to leverage multiple days of energy dispatching from storage assets.
- The CEC and the consulting team should commit to communicating the most up-to-date version of RESOLVE to the CPUC for the purposes of the IRP proceedings.
    - This should include new candidate resources, such as the aforementioned storage archetypes.

[1]Assessing the Value of Long Duration Energy Storage, see here https://efiling.energy.ca.gov/GetDocument.aspx?tn=250157

II. COMMENTS

- **The CEC should clarify what combinations of storage duration and RTEs were studied and how these relate to the storage technologies the CEC considered.**

CESA asks for clarification of what combinations of storage durations and RTEs were studied. Slide 4, "LDES Archetypes Studied", presents a graph with seven different storage technologies: lithium-ion, pumped storage hydropower ("PSH"), zinc-hybrid, adiabatic compressed air, compressed air, thermal, and iron-air. Staff explained that these technologies were merely illustrative, but representative of emerging technologies close to commercialization. The orange points on the graph were explained to be the LDES archetypes with "corresponding" efficiencies studied, implying that only four points within the vast storage solutions range were studied: 12-hr storage with an RTE of 80%, 24-hr storage with an RTE of 60%, 48-hr storage with a 45% RTE, and 100-hr storage with a 40% RTE. Staff also explained that they divided these four LDES technologies into intraday (12- and 24-hour durations) and multiday (48- and 100-hour durations) types.

CESA requests that staff clarify their methodology for the resources selected to be considered in this analysis. As slide 4 indicates, even among mature technologies there is a wide range of durations and efficiencies possible, making it overly restrictive to only look at a subset of the combinations available in the solution space. As such, considering a wider range of duration and efficiency combinations for durations of 8-,10-, 12- and 24-hours would greatly benefit buyers, sellers, and regulators identify the solutions that might be needed and planned for in the years to come. Importantly, the CEC should make sure that at least one of the archetypes studied provides power for a duration of 8 hours. This would fall in line with the California Public Utilities Commission's ("CPUC") definition of LDES as any storage asset "able to deliver at maximum capacity for at least eight hours from a single resource."[2] CESA is also interested in staff clarifying the representation of assets with varying RTEs, and their inflection point with durations studied. Modeling multiple storage assets with RTEs across the 35%-85% range can better represent the diversity and heterogeneity of existing and emerging LDES technologies that

[2] D. 21-06-035, at Page 95

can be utilized to ensure the reliability of the grid. CESA urges the ED staff to expand the LDES archetypes studied to represent storage technologies across the duration and RTE matrix.

- **The CEC should clarify the technologies that fall under their "Emerging Technologies" umbrella term and whether they refer exclusively to emerging generation technologies**.

In Slide 8 of the materials presented at the Workshop CEC staff notes that there is a "limited role for emerging tech under SB 100 at the system level." This statement confuses CESA given (1) the results that underscore a significant amount of LDES can be deployed to attain SB 100 goals, and (2) the finding of the LDES analysis is that achieving a 0 MMT grid without emerging technologies is extremely expensive and requires a lot of solar PV land use. In this context, CESA seeks clarification of what the CEC staff meant by "emerging tech" within Slide 8. One possible interpretation is that "emerging tech" in slide 8 refers exclusively to generation emerging tech, like the technologies considered under the "Carbon Capture Storage (CCS) and Advanced Nuclear" sensitivity.

Given the aforementioned lack of clarity regarding the use of the term "emerging tech" and whether it applies to LDE or not, CESA requests clarity on its usage throughout the materials. All the above considered, CESA hopes that the final report of this LDES analysis will provide clarity over how the Commission handled the issue of modeling emerging technologies, in a time that would greatly benefit from the diversity of storage solutions available (both mature and those nearing commercialization). CESA appreciates and urges the Commission to make do with its commitment to further research and track the progress of emerging technologies (e.g., seasonal storage and those eligible for IRA tax credits).

- **The CEC should clarify the temporal constraints of the model utilized, its optimization horizon, and its dispatch granularity.**

Staff explained on Slide 16 ("LDES can enable cost-effective in-state gas retirement") that their methodology optimized across all 8,760 hours of the year and across 8 weather years. On Slide 24 ("LDES makes portfolios more robust to weather uncertainty") staff explained that a least-cost portfolio for 2045 was optimized across 8 *individual* weather years and co-optimized across all eight years. CESA asks for clarification regarding the optimization horizon of each of

these analyses. First, CESA requests clarification that each of the cases that was optimized for an individual weather year made building and balancing decisions across all 8,760 hours. Second, we request clarification that the cases co-optimized across all eight years did so by allowing the model to perform building and balancing decisions across all hours of eight consecutive years (meaning across 70,080 hours). If this is not the case, we request CEC staff clarify what is to be understood by the fact that these cases were "co-optimized across all eight years". CESA also requests clarification regarding the dispatch granularity of the models used, a factor that was not discussed in the materials presented at the Workshop. CESA is aware that most CEMs use an hourly granularity, but explicit clarification would be welcome. For this reason, CESA would like for ED staff to clarify the temporal constraints of the model utilized, its optimization horizon, and its dispatch granularity as it seems to be inconsistent across the analysis.

Overall, CESA is excited to see ED staff utilize 8,760 optimization horizons as it is crucial to the valuation of energy storage. This study is unique, given that RESOLVE's current architecture in other planning venues basis capacity additions on a simplistic dispatch schedule with no intra-hour or multi-day optimization. The IRP proceeding sees RESOVLE co-optimize new resource investment and dispatch for 37 *independent* days over a multi-year horizon. This has severely limited the potential benefits to the grid that would be provided by energy storage technologies, as it excludes the intrinsic benefits of LDES that sets it apart from other clean, firm resources.

In a concentrated effort to support LDES and take advantage of its energy arbitrage, CEC staff should commit to standardizing this approach in all of its analyses, as well as working with other relevant agencies and regulators like the CPUC to make sure 8,760-hr modeling is the standard across planning venues. Modeling 365 *consecutive* days across all hours to identify least-cost portfolios can enable storage balancing decisions to leverage multiple days of energy dispatching from storage assets.

- **The CEC and the consulting team should commit to communicating the most up-to-date version of RESOLVE to the CPUC for the purposes of the IRP proceedings.**

CESA urges the CEC and E3 to commit to communicating the most up-to-date version of RESOLVE to the CPUC for the purposes of the IRP proceeding in order to assure all modeling efforts done to support California's grid planning are on equal footing. Specifically, CESA requests that staff transfer updates regarding (1) new candidate resources and the consideration

of storage assets across the RTE and duration matrix and (2) new 8,760 modeling capabilities across multiple, consecutive weather years. Sharing across all planning venues the updates and enhancements that have been funded by one of the State's energy agencies is aligned with California's goals of advancing decarbonization while preserving the affordability of the electric grid. As such, we urge the CEC staff and E3 to collaborate with the CPUC and all other relevant agencies to ensure modeling process pertaining to the CPUC's IRP proceeding, Rulemaking ("R.") 20-05-003 are done using the updated RESOLVE model derived from this effort., Communicating these tools and materials will ensure the timely development of the new Preferred System Plan ("PSP") this summer.

III. CONCLUSION.

CESA appreciates the opportunity to provide these comments and feedback on the LDES Analysis workshop. We look forward to collaborating with the CEC and other stakeholders in this docket.

Respectfully submitted,

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