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LDESAC comments on Draft 2022 SSS

Additional submitted attachment is included below.

LONG DURATION ENERGY STORAGE
ASSOCIATION OF CALIFORNIA

Thank you for the opportunity to provide these September 7, 2021 comments on the Midterm Reliability Assessment August 30 workshop.

The Long Duration Energy Storage Association of California (LDESAC) is a 501(c)4 organization fully focused on promoting the development of long duration energy storage to complement short duration storage technologies, renewables and advancing California's climate and clean energy goals. Long duration energy storage (LDES) provides support to operate a safe and reliable energy grid. Our organization works closely with other renewable, clean energy, storage, and allied organizations to advance our shared priorities.

LDESAC storage technologies currently include pumped storage, compressed air, liquid air, zinc-air batteries, thermal storage, flow batteries, flywheels, molten salt, electrolytic hydrogen, and repurposed gravity wells. These technologies can be deployed in projects ranging from a few hundred kilowatts to several gigawatts. Some involve site-specific applications, while others can be deployed almost anywhere. Some, such as pumped storage and concentrating solar thermal, are fully mature and have been deployed around the world for decades, while others are now becoming commercially available with strong public support to advance their deployment.

In the table below, LDESAC illustrates these diverse technologies and their grid attributes:

Long Duration Energy Storage

All types promote renewable energy generation and manage surplus energy (change loss is less than 1%)

Technology Type	Capacity	Avg. Duration	Avg. Life Cycle	Ancillary Services	Resource Attributes	Avg. Deployment Stage
Thermal Battery	200kWe & up	6-20hrs	30 yrs	Grid stabilization, ESS incl. frequency control, spinning reserves, rate arbitrage	No georgraphical constraints, scalable, close load following, no degradation	Market ready
Gravity	40kW-8MW	5-24hrs	30 yrs	Resource adequacy, spinning reserve, sub-second response time (but not well suited for freqency response)	Scableable, distributed, reuse infrastructure, zero self-discharge	Pilot
Zinc Batteries	1-10MW	10 hrs	30 yrs	Frequency control	High energy density, 2% discharge rate	Pilot
Flow Battery	1-25MW	10-24hrs	25 yrs	Frequency control	Scalable, power and duration can be sized independently	Deployed in market
Flywheel	5-25MW	10-24hrs	35 yrs	Rotational energy, fast response time	Instant start and load following	Deployed in market
Green Hydrogen	1-100MW	10-100hrs	20 yrs	Discharge time, response time	Refuel and recharge	Commerical
Liquid Air	25-150MW	8 - 24 hrs	30 yrs	Synchronous inertia, frequency control, reserves, voltage support, black start capability	No georgraphical constraints, high energy density, no degradtion	Commerical
Concentrating Solar Thermal	50-250MW	10-24 hrs	75 yrs	Synchronous generation thus provides spinning reserve, frequency regulation, fast ramping and other ancillary services	High conversion efficiencies	Commerical, deployed in market
Compressed Air	100-500MW	8+ hrs	50 yrs	Regulation service-up, regulation service-down, responsive reserve service, non-spinning reserve service	Efficiency at max generation, Emissions free, unimpacted by temperature, future scalability in size and duration, no degradation, flexible siting locations	Commerical
Pumped Storage	10-2400MW	8 hrs- 36 hours, can be seasonal, and lose no charge over time	100 yrs	Black start, frequency regulation, voltage support, spinning reserves and operating reserves, synchronous condensers, fault ride thru add all services available in charging and discharging mode	Secure power supply, scalable, synchronous machines with large Inertia, high cycle efficiency, ultra fast ramp rates and response times, high proven reliability	Commerical, deployed in market and150,000 MW in operation globally

Long duration energy storage is the failsafe component to ensure grid reliability and meet California's climate goals. As the state increases its deployment of variable energy resources, such as solar and wind, and fossil generation is retired, overall system reliability can become jeopardized. With the deployment of long duration energy storage, the system reliability we are accustomed to with today's grid will be maintained. Long duration energy storage stores excess solar, on shore and offshore wind generation to power the grid as these resources fluctuate or become unavailable, and to smooth out all inconsistencies in grid operations that arise from these variable resources.   LDES ensures the lights can stay on for hours, days and even to address seasonal needs.

Thank you for your continued support of long duration energy storage as an essential solution to mitigating climate disasters and ensuring resiliency, reliability, and security in California.

We look forward to working with you now and in the years ahead to ensure Californians have an equitable and reliable clean energy future.

Sincerely,

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<u>LDESAC Specific Recommendations on Slides Presented:</u>

The presentation uses inconsistent terminology for Long Duration Energy Storage (LDES). Some slides mention pumped storage hydro, while other slides reference long duration energy storage. As you know, long duration energy storage has many different types of technologies including pumped hydro storage, which has been an effective and reliable tool, but does not speak for all the diverse types and attributes of other LDES technologies. Battery storage can also mean many different things and LDESAC recommends the labeling become clear and consistent.

We recommend referring to duration, rather than technology, unless there is a discrete attribute of that particular technology is being discussed. We recognize, however, that this requires creating a demarcation by duration and LDESAC recommends using 8-hours, consistent with the CPUC's mid-term reliability procurement order.

Also, LDESAC recommends the CEC use LDES as a category for the over 8-hour technologies and not pumped storage and simply note if pumped storage is being used as the proxy for that category given the ample data for this technology type.

The more inclusive the data set the better the modeling which then makes better policy.

LDESAC is requesting further clarification of the data and material regarding a comment made that "Modeling is showing there is not a need for long duration resources in 2026 to meet reliability." Since there are many models and studies that demonstrate it is critical to procure long duration energy storage to meet CA's climate and decarbonization goals in 2026 and beyond, we find this statement contrary and confusing to stakeholders.

In addition to fixing the terminology and adding consistency, the LDESAC recommends the following regarding specific slides:

As noted in slide 14, the study states it “Is not Designed to: • Model actual dispatch of the system. • Analyze actual system reliability from all available power plants. • Consider energy demands outside of the CAISO. • Incorporate RPS, GHG, or other policy and environmental impacts or limits on system operations. • Study November – April. • Incorporate recently observed extreme weather events. • Qualitative concerns related to resource deployment. The LDESAC recommends the CEC state what it will do to ensure all of these critical factors are considered.

On slide 20, there was no mention of LDES. As noted in previous work by the CEC and the CPUC, ELCC can encompass LDES technologies and projects. “ELCC and Technology Factors: Made use of the marginal ELCC values and technology factors from the CPUC’s Reliability Needs Assessment.” The LDESAC recommends the CEC revisit the data and incorporate the ELCC metrics for LDES (we note this again regarding slide 43).

On slide 22 omits values for LDES, and they should be included since data is available. The LDESAC likes the delineation noted in the table regarding energy storage and pumped hydro storage, but there is data missing. The LDESAC is more than happy to work with the CEC to provide more information for this table.

Technology	Forced Outage Rate (%)	Mean Time to Repair (h)	Standard Unit Size (MW)	Test Unit Size (MW)	CAISO Median Unit Size (MW)	CAISO Mean Unit Size (MW)
Combined Cycle	3.69	24	100	600	583	619.0
Gas Turbine	11.66	24	100	125	49.8	125.4
Cogen	13.84	24	100	50	49.8	125.4
Gas-Other	13.84	24	100	40	9.9	40.1
Nuclear	1.92	24	1140	1140	N/A	N/A
Geothermal	7.2	24	25	25	N/A	N/A
Biomass	8	24	10	10	N/A	N/A
Imports - Specified	3.69	24	100	100	N/A	N/A
Energy Storage 4 h	5	24	10	10	N/A	N/A
Energy Storage 8 h	5	24	10	10	N/A	N/A
Pumped Hydro Storage	5.77	24	100	100	N/A	N/A

And for the next table where 250 MW was identified was this for an invite 1/20? The 250MW is less than the 1000MW of LDES identified. The LDESAC recommends consistency and continuity and would like to work with the CEC and help fill in the gaps.

Where is the LDES on slide 28? Only 4-hour storage is identified and this seems inconsistent with other storage labels on graphs. The LDESAC would like to work with the agencies on consistent terms and modeling.

Also, did the CEC consider looking at a 1-5 event? It is a useful data point since California is experiencing more dire events compounded by climate change every year and not just once every decade.

For Slide 38, is this summer or winter peak? LDESAC recommends adding more clarity to the labels.

The LDESAC supports the statement, “There is a large capacity need without the resources envisioned in D.19-11-016, D.21-06-035, and/or the proposed PSP.” On slide

40 is this power sector only or economy wide decarbonization? This is another critical point for consistent labeling.

Regarding Next steps identified on slide 43, the LDESAC would like to work with the agencies to include more model data and attributes of LDES in each of these areas noted: “Test capacity additions for 2022 to determine what is necessary to reduce unserved energy to acceptable levels. • Run additional scenarios with the new ELCC values when available to determine if any results change. • Prepare an inputs and assumptions document, with detailed results, to accompany the MTR white paper.” And why is LDSE missing in the ELCC values?

ELCC Values

ELCC values used in this study are duplicated below. The CPUC is in the process of adopting NQC values for D.21-06-035, so these are rough estimates.

Technology	Tranche	2022	2023	2024	2025	2026	Min Capacity (MW)	Max Capacity (MW)
Wind		28.5%	28.5%	28.6%	28.6%	28.6%	N/A	N/A
Solar		2.3%	2.3%	1.9%	1.9%	1.9%	N/A	N/A
4 h Battery	1	100.0%	100.0%	100.0%	100.0%	100.0%	-	5,265
4 h Battery	2	88.8%	89.1%	89.5%	89.8%	90.1%	5,265	7,674
4 h Battery	3	76.2%	76.7%	77.1%	77.6%	78.0%	7,674	10,530
4 h Battery	4	66.4%	67.1%	67.8%	68.5%	69.3%	10,530	13,034
4 h Battery	5	54.2%	55.6%	57.0%	58.4%	59.9%	13,034	15,795

Source: CPUC’s Reliability Needs Assessment

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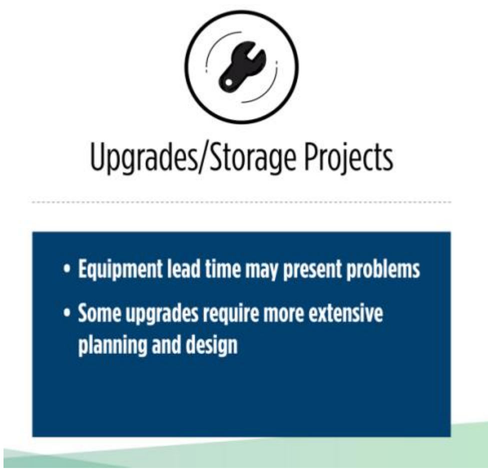
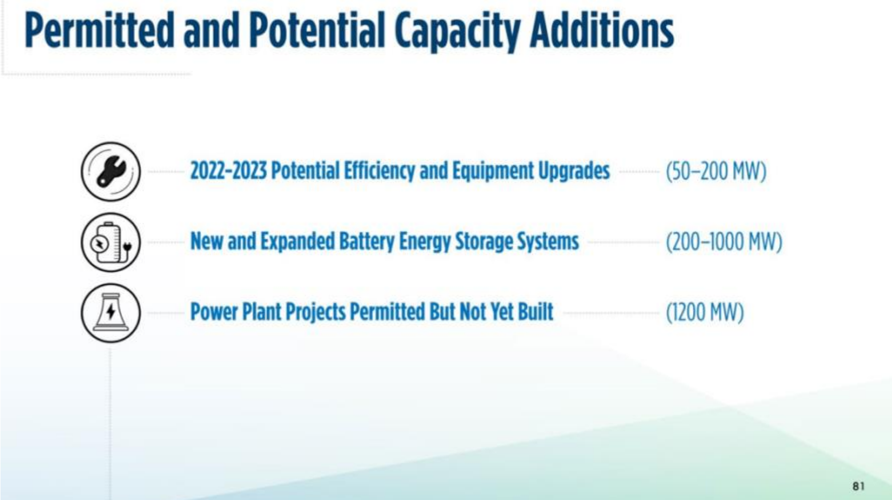
In the storage section on page 46, the CEC should clearly state what type of battery this is since there are different types of batteries and durations such as zinc batteries and thermal storage batteries that operate over 8 hours.

On slide 69 there is a reference to the 1-10 events, but there is a disconnect with the data here and what is presented earlier. We will continue to have extreme events every summer as well as droughts and natural disasters. This is not factored into the studies and should be.

On slide 71, LDESAC is glad to see storage acknowledged, yet this is a huge oversimplification of the issues at hand, and we need to call out the difference in long duration energy storage as well. Just like we delineate on-shore wind and off-shore wind, LDES has many benefits and grid services that are different than four-hour batteries.



On page 81, there is acknowledgement of the need for expanded storage, and it is confusing whether LDES is included. It should be.



Lastly, on slide 100, why is the scenario where LDES 1000MW not included in the ppt? This seems like a glaring omission and the LDESAC recommends including this critical component of the 11.5 GW requested by the CPUC.

Procurement Scenario Additions

- Procurement builds are based on remaining NQC procurement in D.19-11-016 (1,505 MW NQC) and D.21-06-035 (9,500 to 11,500 MW NQC)
- Resources were built consistent with the 2026 resource ratio in the PSP, but only up to the needed NQC value for each year.

Nameplate (MW)	2022	2023	2024	2025	2026	2026a
Geothermal	8	25	77	92	92	1,241
Biomass	7	23	71	85	85	85
Shed DR	34	111	340	408	408	408
Wind	242	794	2,427	2,908	2,908	2,908
Solar	780	2,554	7,811	9,356	9,356	9,356
Energy Storage 4 h	936	3,066	9,378	11,233	11,233	11,233
Energy Storage 8 h	-	-	-	-	-	1,000
Total	2,007	6,573	20,105	24,082	24,082	26,231
NQC	1,070	3,505	9,505	11,005	11,005	13,005

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We appreciate all the work CEC has done and working with the other agencies, and the process to elicit stakeholder input.

The LDESAC appreciates the opportunity to comment and again offers our assistance to the CEC and CA agencies.

Thank you!

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