

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking to
Develop an Electricity Integrated
Resource Planning Framework and to
Coordinate and Refine Long-Term
Procurement Planning Requirements.

Rulemaking 16-02-007
(Filed February 11, 2016)

**COMMENTS OF THE CALIFORNIA ENERGY STORAGE ALLIANCE
ON THE PROPOSED DECISION ON THE 2019-2020 ELECTRIC RESOURCE
PORTFOLIOS TO INFORM INTEGRATED RESOURCE PLANS AND
TRANSMISSION PLANNING**

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In accordance with the Rules of Practice and Procedure of the California Public Utilities Commission (“Commission”), the California Energy Storage Alliance (“CESA”) hereby submits these comments on the *Proposed Decision on the 2019-2020 Electric Resource Portfolios to Inform Integrated Resource Plans and Transmission Planning* (“PD”), issued by Administrative Law Judge (“ALJ”) Julie A. Fitch on February 21, 2020.

I. INTRODUCTION.

CESA appreciates the Commission’s continued and iterative efforts to develop a Reference System Portfolio (“RSP”) that will advance the state’s ambitious energy and environmental targets and inform load serving entities (“LSEs”) on the resource mix that may be optimally suited to decarbonize the electric sector. The general results of this Integrated Resource Planning (“IRP”) process continue to highlight the fundamental role energy storage resources of all types, durations, and configurations will play, providing critical system flexibility and capacity in the coming years. While many improvements can continue to be made, CESA commends the Commission for making modifications to the RSP in the PD relative to the preliminary proposed RSP shared in the

November 6, 2019 Ruling. In particular, CESA recognizes the Commission’s work to allow RESOLVE to optimize for the perceived need of 2 GW of “generic effective capacity” and the inclusion of 2045 as the modeling end year. Nevertheless, CESA continues to find areas of potential improvement within the RSP. Specifically, CESA encourages the Commission to consider the following recommendations:

- Due to the continued preference for imports within SERVVM, the Commission should evaluate using a more stringent greenhouse gas (“GHG”) emissions target to minimize the risk of not meeting the state’s Senate Bill (“SB”) 350 and SB 100 goals. CESA continues to support the use of a 30 million metric ton (“MMT”) case for the RSP.
- The Commission should develop a storage-specific effective load carrying capacity (“ELCC”) methodology that properly reflects the differences in durations and operational characteristics of storage resources under several levels of renewable penetration.
- The Commission should open a new procurement track to address procurement needs in 2024 and beyond, accounting for the procurement and deployment timelines of new resource builds. Specifically, CESA recommends a least-regrets procurement directive or signal of 3,000 MW of energy storage for deliveries in 2024-2026 and an additional 1,000 MW of long-duration storage resources.
- The Commission should open a new procurement track to initiate procurement of pumped hydro storage (“PHS”) or “similar” long-duration storage resources. While RESOLVE identified the need for long-duration storage of twelve hours based on its profile of pumped hydro, due to the modeling limitations in RESOLVE, the definition of “similar” should allow for the procurement of long-duration storage resources that are capable of continuous discharge at its capacity for at least eight hours and be GHG reducing over the planning period.
- RESOLVE should be updated in the next cycle to include multi-day optimization, evaluation of extreme weather events, and further candidate resources.

II. THE COMMISSION SHOULD EVALUATE THE GHG IMPLICATIONS OF IMPORTS AND HIGH ELECTRIFICATION SCENARIOS AND ATTENUATE RELIABILITY AND GHG RISKS BY SELECTING A MORE STRINGENT GHG TARGET, AMONG OTHER ACTIONS.

The Commission should evaluate the impacts and implications of both imports and electrification when establishing a GHG target given reliability risks and the challenges posed in

achieving California’s GHG targets under high electrification scenarios. A lower GHG target would be better suited to minimize such risks.

The Commission uses the SERVVM model to validate the reliability of the portfolios selected through RESOLVE’s capacity expansion model. CESA believes this check is a good measure as it enables regulators and LSEs to verify the loss of load expectation (“LOLE”) associated with the RSP in future years. Nonetheless, CESA believes that SERVVM has several core differences in its dispatch relative to RESOLVE, particularly considering its reliance on imports. As it was acknowledged by the Commission in the PD, one of the key assumptions driving results in the models in this round was the characterization of imports within SERVVM.¹ In the preliminary RSP shared in the November 6, 2019 Ruling, SERVVM was equipped with a 5 GW import limit for all hours – a measure implemented to simulate homologous restrictions in RESOLVE. Such a limitation could very well have been the main factor determining the need to add 2 GW of “effective generic capacity” – a need that was only discovered when the RESOLVE-selected portfolio failed to meet the reliability checks in SERVVM. In this round of modeling, that import limit was relaxed to 6.5 GW and was only applied to the evening hours of the summer months (5-10 pm in July through September).² This modification directly impacted the LOLE reported by SERVVM, signaling, as it has been highlighted before, SERVVM’s consistent reliance on imports in its dispatch.

Reliance on imports may pose risks to achieving our SB 100 goals and requires further vetting in the IRP process, especially given the stated objective in SB 100 that the state “shall not increase carbon emissions elsewhere in the western grid and shall not allow resource shuffling.”³

¹ PD at 10

² PD at 32.

³ Public Utilities Code Section 454.53(a).

Considering the rise of 100% clean or renewable energy targets across the West, it is probable that fewer clean resources will be able to export energy to California systematically.⁴ Due to increased Western states' demand for clean or renewable generation, imports into California could be associated with net positive GHG emissions. This, in fact, may be validated in some way by SERVUM. In the PD, the Commission shows that while RESOLVE estimates emissions around 37.9 MMT, SERVUM modeling results in emissions around 41.4 MMT.⁵ This 3.5 MMT discrepancy could be directly related to the preference that SERVUM shows toward imports.

Transportation and building electrification also pose risks to achieve the GHG targets California has set for herself. The unprecedented rise of load from the state's and cities' transportation and building electrification goals could lead to further reliance on economically retained gas capacity if incremental and substantial investments in renewable generation and energy storage in all its forms are not done in a timely manner. The Commission recognizes that these electrification initiatives pose risks; however, the PD finds a 46 MMT target is more suitable at this time even in the face of expected increase in load.⁶ CESA believes this logic is flawed, as it would create a mismatch between the expected load and the zero-carbon resources available in the state. This risk, paired with the previously mentioned potentially decreasing availability of zero-carbon imports, could result in California not meeting its GHG targets.

Given the aforementioned issues, CESA urges the Commission to thoroughly consider a lower GHG target for the future IRP cycle. As the Commission has noted, the 2030 GHG targets

⁴ Consider the following: SB 5116 in Washington mandates 100% clean energy by 2045, SB 489 in New Mexico mandates 100% clean energy by 2045, and SB 358 in Nevada mandates 100% clean energy by 2050.

⁵ PD at 38.

⁶ PD at 25.

are revised with each IRP process and could be modified later on.⁷ In addition, the Commission should, in consultation with the California Independent System Operator (“CAISO”) and other relevant stakeholders, prepare an analysis of different West-wide resource availability and demand cases. Such study would shed light on whether there may be potential limitations for imports due to increased demand in neighboring states. CESA believes this is a long-term issue; thus, it need may not need to be addressed directly in this proceeding and could be done in the SB 100 Joint Agency Report and modeling efforts. Nevertheless, it is fundamental to perform this study as it would better inform how imports should be limited in SERVVM or assessed from a GHG perspective. Currently, the Commission has defined its treatment of imports in SERVVM by analyzing historic import trends. While this information is valuable to verify the volume of imports relative to the 11 GW maximum import capability (“MIC”), it does not help assessing the GHG emissions of imports, an essential component of the IRP process and SB 100 mandate.

Furthermore, regardless of whether the Commission adopts our recommended 30 MMT target by 2030, the Commission should take some least-regrets action today to direct or provide strong guidance on orderly IRP-related procurement to hedge against these risks, considering the lead times required for new resource development. An effective near-term risk-hedging strategy would also involve identifying opportunities for the retrofitting of natural gas generators with energy storage. Considering the Commission has identified that there is an increase in average emissions due to more frequent starts of peaker plants,⁸ CESA believes that the hybridization of gas plants could help minimize natural gas use and GHG emissions by improving the operating

⁷ PD at 26.

⁸ PD, at 39.

characteristics of these assets and lowering their capacity factors. CESA elaborates on these procurement-related issues in Section IV of our comments.

III. THE COMMISSION SHOULD REFINE THE ELCC CURVE FOR ENERGY STORAGE RESOURCES TO REFLECT THE CAPACITY CONTRIBUTIONS OF STORAGE AT DIFFERENT DURATIONS AND UNDER DIFFERENT PENETRATIONS OF RENEWABLE RESOURCES.

Incorporating an ELCC curve for storage may be helpful for long-term planning, as research has shown that peaking capacity contributions of these resources are a function of penetration of storage and renewable availability. Nevertheless, the current application of the ELCC curve is flawed, as the curve reflects the impact of a static renewables penetration level and does not evaluate the dynamic capacity value of storage assets with durations other than four hours.

These omissions are serious and are bound to unduly skew the capacity expansion results. The storage ELCC curve should thus be reevaluated and further developed to reflect capacity values that are differentiated based on storage duration and multiple scenarios of renewable penetration.⁹ Serving as a potential benchmark to the storage ELCC curve used in the current IRP modeling process, a recent study by the National Renewable Energy Laboratory (“NREL”) showed that California could have between 2 GW and 8 GW of four-hour battery energy storage providing 100% of its capacity, which depended on the renewable energy mix.¹⁰ It is worth noting that the upper bound of this estimate, 8 GW, occurs in a scenario that is heavily dependent on solar PV generation – a scenario that is likely to occur given the RSP results.¹¹

⁹ Ideally, storage capacity contributions would be modeled exogenously within RESOLVE, but, as CESA understands it, RESOLVE can only model capacity contributions exogenously through predetermined capacity counts toward the planning reserve margin (“PRM”).

¹⁰ NREL, *The Potential for Battery Energy Storage to Provide Peaking Capacity in the United States*, 2019, at 20. Available at <https://www.nrel.gov/docs/fy19osti/74184.pdf>

¹¹ *Ibid.*

For the purposes of capturing ELCC differences related to duration, CESA suggests that the Commission evaluate the use of models and estimations similar to the ones being used by the New York Independent System Operator (“NYISO”), which assessed the tipping points of the storage ELCC with different durations. Given the similarities in the questions posed by regulators here and in New York, leveraging their learnings and applying their methods, where reasonable and comparable, would be substantially beneficial. Furthermore, CESA believes that it is essential to have an ELCC estimation for lithium-ion resources of durations above four hours since they can be economically selected within RESOLVE through its additive duration module capability. Not including duration as a determining factor in ELCC calculation could result in unwarranted capacity shortfalls if lithium-ion assets with durations higher than four hours are economically selected by RESOLVE, or could result in bias against longer-duration storage assets if they are not selected at all when they otherwise would have due to their capacity contributions.

IV. THE COMMISSION SHOULD OPEN A NEW PROCUREMENT TRACK TO ADDRESS PROCUREMENT NEEDS IN 2024 AND BEYOND.

As directed in Decision (“D.”) 19-11-016, incremental procurement to address forecasted System Resource Adequacy (“RA”) shortfalls in 2021-2023 is underway by all LSEs in the CAISO balancing authority area. A substantial amount of procurement, up to 3,300 MW, will occur. While not all of this procurement may come from new resources, the burden, risks, and costs of this expedited procurement have been substantial, leading CESA and many other parties to seek a more orderly process that leverage the IRP modeling results to inform and potentially direct new resource procurement. Overall, the RSP shows that significant new resource procurement is needed to address the state’s GHG and reliability goals, not to mention how such procurement could also provide relief in mitigating System and Local RA market power issues and support more orderly retirement or hybridization of certain strategic gas facilities. Instead of rushed

procurement activities, CESA believes a more advanced procurement signal or directive is needed from the Commission to recognize new resource development lead times and to enable the widest competition in resource solicitations that deliver more cost-effective outcomes to ratepayers.

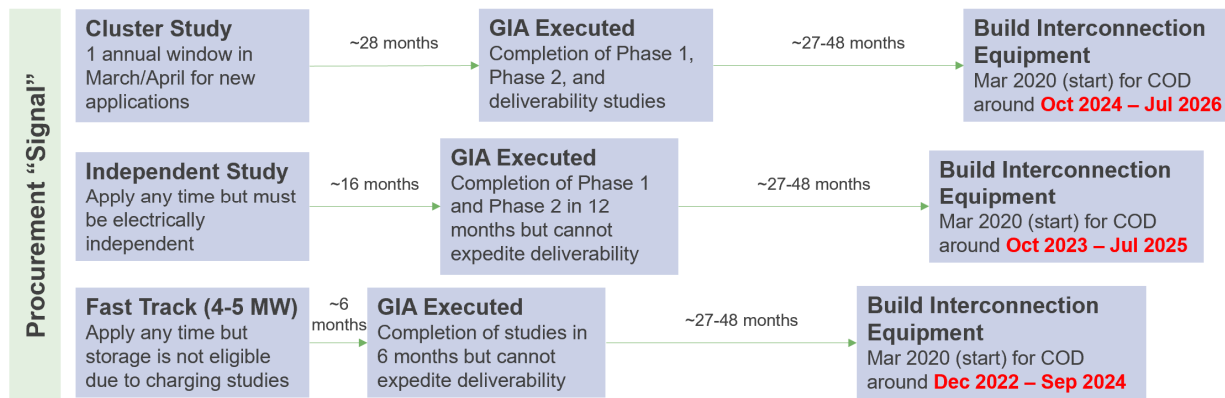
However, despite the modeling results, the PD concludes that no new resource procurement directive is warranted in this decision.¹² Although the RESOLVE model has certain limitations and flaws, the Commission would be short-sighted and overly cautious in not translating the high-level insights from the RSP into some level of least-regrets procurement today. Otherwise, CESA fears that the IRP modeling becomes a paper exercise that is constantly trapped in “analysis paralysis” and only leads to a repeat cycle of expedited procurement as needs become dire and urgent.

A major reason for procurement signals or directives to be issued in this PD, or not too long thereafter, is the realities of new resource procurement and development timelines. For a 2026 online date for new resources, a four- to five-year lead time is necessary for resources to conduct competitive solicitations, enter the CAISO cluster study process, seek Commission approval (where applicable),¹³ and build interconnection equipment. This makes it necessary to direct or signal procurement in 2020 to address future resource needs. Otherwise, with short lead-time procurement, many resource developers would be taking significant risks in entering the interconnection process with hopes that they would be well-positioned for future grid needs and solicitations, based on directional IRP results and CAISO technical studies, among others.

To illustrate, CESA provides an example project milestone timeline below:

¹² PD at 45

¹³ For storage resources, which represent a significant share of the resource mix going forward, a more streamlined approval process will likely need to be developed. Given the procurement and contracting experience with storage and the increased standardization of storage contracts, the time is ripe to consider more streamlined approval processes (*e.g.*, advice letter filings) for utility-procured storage.



The above milestones and timeline are focused on in-front-of-the-meter (“IFOM”) resources, yet CESA adds that lead times are also needed for behind-the-meter (“BTM”) resources as well that could be positioned to address grid needs. Customer acquisition timelines and interconnection processes, especially as customers increasingly seek to add islanding capabilities for resiliency, create a need for lead time in responding to procurement directives or signals. While timelines may be shorter for such BTM resources, advanced directives or signals are still needed.¹⁴

As such, as a least-regrets action, CESA recommends that the Commission open a new procurement track and consider the adoption of a procurement directive or signal for 3,000 MW of energy storage for deliveries in 2024-2026, in addition to 1,000 MW of long-duration storage (*i.e.*, greater than eight hours) and some portion of the utility-scale wind and solar identified in the RSP. Considering the RSP selected 6,127 MW of battery storage by 2026,¹⁵ this represents a least-regrets amount to initiate procurement in 2020 or, at the latest, 2021 to accommodate the realities of procurement and development timelines. To the degree possible, these identified system needs

¹⁴ With modifications to the current incrementality framework, however, CESA believes that lead times for BTM resources could be reduced if existing resources or resources being partially “sourced” through other mechanisms and channels can qualify for incremental procurement needs.

¹⁵ PD at 35.

should also be coordinated closely with Local RA needs to more cost-effectively procure resources to address both system and local needs, thereby avoiding over-procurement, where possible.

V. THE COMMISSION SHOULD OPEN A NEW PROCUREMENT TRACK TO INITIATE PROCUREMENT OF PHS OR “SIMILAR” LONG-DURATION STORAGE RESOURCES.

The RSP shared in the PD economically selects 973 MW of PHS or long-duration storage by 2026.¹⁶ This selection, paired with the fact that over a dozen parties supported the Commission taking concrete steps to enable the development of at least one pumped hydro storage project in the State,¹⁷ shows that further action by the Commission is warranted and essential.

CESA supports the Commission in its interpretation regarding the way to comply with the selection of PHS in the RSP, where this need could be fulfilled with resources with similar operating characteristics,¹⁸ such as compressed air energy storage (“CAES”), long-duration flow batteries, storage via green hydrogen, liquid air energy storage (“LAES”), among others. Like conventional battery storage, lead times are an important factor, but some technologies or project types may have relatively longer lead times to guarantee the successful procurement and deployment of these long-duration projects.

Thus, CESA urges the Commission to take immediate action and launch a procurement directive for the selection of least-cost, best-fit assets that can reasonably address the needs covered by the PHS facility selected in RESOLVE, which could be a PHS facility or some other similar long-duration storage resource. In doing so, CESA recommends that the Commission seek long-duration storage resources in a technology-neutral fashion that considers resources with the charge

¹⁶ PD at 35.

¹⁷ PD at 39.

¹⁸ PD at 3.

and discharge at or in excess of eight hours, taking into account their ability to reduce GHG emissions in their operations over the planning period. While the definition of “similar” to PHS would suggest long-duration storage resources should be capable of storage durations at or above 12 hours based on its selection in RESOLVE, the Commission should not narrowly apply this definition of “similar” given that RESOLVE was limited in its ability to model other candidate long-duration storage resources with durations at or above, for example, six or eight hours, combined with the inability to count RA capacity contributions of storage resources with durations greater than four hours. A study from GTM Research, for instance, found that eight-hour energy storage could meet 90% of the peaks supplied by four gas combustion turbines over a year, highlighting how storage technologies with 8- to 12-hour durations also could provide value.¹⁹ Similarly, due to the limitations in RESOLVE modeling multi-day needs, extreme weather years, transmission outages, or low solar irradiance days, the value of multi-day or seasonal storage is not captured. Considering this, the definition of “similar” to PHS should be more liberally applied to long-duration storage needs beyond 12 hours.

In order to ensure the system-wide benefits of long duration storage are realized in a timely manner and allows for true technological neutrality, the Commission should consider whether the current procurement paradigm is sufficient or whether certain barriers exist that must be overcome. Many long-duration storage technologies are amenable to procurement by a single LSE or by pooling resources across LSEs. Pooling, however, may be the only option for certain highly capital-intensive alternatives. As such, the Commission should assess means of monitoring activities toward evaluating such an outcome so institutional barriers do not themselves foreclose

¹⁹ *Energy Storage for Peaker Plant Replacement: Economics and Opportunity in the U.S.* GTM Research Market Report. 20 March 2018. <https://www.woodmac.com/reports/power-markets-energy-storage-for-peaker-plant-replacement-economics-and-opportunity-in-the-u-s-58117948#gs.tjH5Q3Y>

procurement of any particular long-duration storage technology. CESA believes this careful assessment of options is reflective of the system-wide value such resources would provide, and, additionally, it could minimize the costs perceived by LSEs in this procurement, benefiting ratepayers across the CAISO footprint.

In sum, CESA considers this directive would be a no-regrets decision, as it facilitates the timely adoption of technologies that are known to be required for the compliance of SB 100.

VI. THE COMMISSION SHOULD CONTINUE TO UPDATE RESOLVE IN ORDER TO BOLSTER THE RELIABILITY OF ITS SELECTED PORTFOLIO.

Currently, the Commission relies on RESOLVE to perform the IRP capacity expansion modeling while incorporating policy and operational constraints. RESOLVE is able to select an optimal resource portfolio given California’s energy and environmental targets. But it is worth noting that the use of RESOLVE in the State’s planning activities is not limited to the IRP proceeding: RESOLVE is also being used within the SB 100 Joint Agency Report process. Through our continued interaction with RESOLVE in this and other regulatory forums, CESA has identified several design limitations within this model that could misrepresent or overlook future capacity needs. Specifically, CESA is concerned of RESOLVE’s ability to plan against multi-day energy and capacity needs, especially in a system that is heavily reliant on variable energy resources (“VERs”).

As it has been pointed out previously by CESA, RESOLVE is set up to optimize investment in new resources and dispatch of the overall fleet in a multi-year horizon by modeling each of the selected years as a collection 37 representative days that portray different weather conditions.²⁰ CESA believes this approach is flawed as it will systematically understate the capacity needs of

²⁰ Inputs and Assumptions Document at 69.

the system by not taking into account sequences of continuous challenging days (*e.g.*, a cloudy week or a multi-day extreme weather event). RESOLVE, due to its design, focuses on satisfying daily arbitrage needs – an emphasis that can explain its continued selection of battery storage with durations between 2 and 4 hours, even when longer durations are available for selection through RESOLVE’s modular additive mechanism for energy storage assets. Similarly, RESOLVE’s inability to estimate the risks of multi-day arbitrage may also explain its failure to select candidate resources that can fulfill these needs. Furthermore, although this RSP does include pumped hydro within its optimally selected portfolio, this selection was more likely driven by the declining ELCC of battery storage and the increased need for energy in light of import constraints, not by the recognition of multi-day arbitrage needs.

These concerns have been echoed by other parties in the context of the SB 100 Joint Agency Report. In fact, during the SB 100 Technical Workshop, E3 noted that a projected 2045 system could face reliability challenges during winter months and other periods of low solar irradiation due to its reliance on VER generation. Thus, the need for long-duration storage resources as a complementary resource class to both VERs and battery energy storage is well known; nevertheless, the primary capacity expansion model used for the state’s planning processes remains unchanged in its design. CESA believes this is a suboptimal result, as it hinders the reliability of RESOLVE’s selections and, more importantly, it inhibits the Commission and the LSEs from expeditiously procuring the resources needed to achieve California’s SB 100 targets.

Considering the aforementioned limitations of RESOLVE, CESA urges the Commission to instruct E3 to perform two key modifications. First, RESOLVE must be updated to consider multi-day arbitrage needs. CESA believes this could be done by either expanding the optimization horizon within the model or, if less computationally intensive, run, in addition to the 37-day

optimization, a window of 72 hours of low solar irradiance each year. These modifications, while imperfect as they do not model a full year of variance, are preferable over the status quo.

Secondly, CESA urges E3 to include a wider array of candidate resources in RESOLVE. As part of the SB 100 Joint Agency Report, E3 has included several new candidate resources, like hydrogen fuel cells and the ability to model hydrogen as a drop in fuel for thermal generators. CESA asks E3 to apply the same modifications for the RESOLVE model used in this proceeding. In addition to the consideration of hydrogen technologies, CESA believes further work is needed to incorporate hybrid resources in the candidate resource pool. As of July 3, 2019, the CAISO Interconnection Queue included over 35,000 MW of hybrid and/or co-located projects.²¹ CESA considers that the magnitude of interest in the deployment of these resources warrants their inclusion in any capacity expansion model used for long-term planning within the State. While the Commission has tried to approximate the financial benefits of these assets through the Paired Battery Cost scenario,²² this approach does not capture the operational advantages of hybrid assets, such as the firming of output or the ability to minimize losses via a direct current (“DC”) pairing between the generating asset and the storage resource.²³ Other resources that are available for immediate deployment in California such as CAES should also be considered for inclusion in RESOLVE. Hence, CESA urges the Commission to work with E3 in order to broaden the pool of candidate resources.

In sum, we believe the Commission and E3 have improved RESOLVE in the last two IRP cycles; nevertheless, further efforts are warranted. CESA considers that by performing these two

²¹ See CAISO, *Hybrid Resources Revised Straw Proposal*, December 2019, at 5. Available at: <http://www.aiso.com/InitiativeDocuments/RevisedStrawProposal-HybridResources.pdf>

²² CPUC, *Ruling Seeking Comment on Proposed Reference System Portfolio and Related policy Actions, Attachment A 2019-20 IRP: Proposed Reference System Plan* (“PRSP Presentation”), filed under R. 16-02-007, at 94.

²³ *Ibid.*

key changes RESOLVE will be better equipped to provide a viable, realistic, and reliable portfolio that will enable all of the State's stakeholders to make timely and safe investments.

VII. CONCLUSION.

CESA appreciates the opportunity to submit these comments to the PD and looks forward to working with the Commission and stakeholders in this proceeding.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read "Alex J. Morris".

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CALIFORNIA ENERGY STORAGE ALLIANCE

Date: March 12, 2020