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 TO THE RULING OF ASSIGNED ADMINISTRATIVE LAW JUDGE SEEKING COMMENT ON PROPOSED PREFERRED SYSTEM PORTFOLIO AND TRANSMISSION PLANNING PROCESS RECOMMENDATIONS

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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")[1] hereby submits these comments on *Ruling of Assigned Administrative Law Judge Seeking Comment on Proposed Preferred System Portfolio and Transmission Planning Process Recommendation* ("Ruling"), issued by Administrative Law Judge ("ALJ") Julie A. Fitch on January 11, 2019.

[1] 174 Power Global, 8minutenergy Renewables, Able Grid Energy Solutions, Advanced Microgrid Solutions, AltaGas Services, Amber Kinetics, American Honda Motor Company, Inc., Avangrid Renewables, Axiom Exergy, Boston Energy Trading & Marketing, Brenmiller Energy, Bright Energy Storage Technologies, Brookfield Renewables, Carbon Solutions Group, Centrica Business Solutions, Clean Energy Associates, Consolidated Edison Development, Inc., Customized Energy Solutions, Dimension Renewable Energy, Doosan GridTech, Eagle Crest Energy Company, East Penn Manufacturing Company, Ecoult, EDF Renewable Energy, ElectrIQ Power, eMotorWerks, Inc., Enel X North America, Energport, ENGIE, E.ON Climate & Renewables North America, esVolta, Fluence, Form Energy, GAF, General Electric Company, Greensmith Energy, Ingersoll Rand, Innovation Core SEI, Inc. (A Sumitomo Electric Company), Johnson Controls, Lendlease Energy Development, LG Chem Power, Inc., Lockheed Martin Advanced Energy Storage LLC, LS Power Development, LLC, Magnum CAES, Mercedes-Benz Energy, NantEnergy, NEC Energy Solutions, Inc., NextEra Energy Resources, NEXTracker, NGK Insulators, Ltd., NRG Energy, Inc., Parker Hannifin Corporation, Pintail Power, Primus Power, Quidnet Energy, Range Energy Storage Systems, Recurrent Energy, Renewable Energy Systems (RES), SNC-Lavalin, Southwest Generation, Sovereign Energy, Stem, STOREME, Inc., Sunrun, Swell Energy, Tenaska, Inc., True North Venture Partners, Viridity Energy, VRB Energy, WattTime, Wellhead Electric, and Younicos. The views expressed in these Comments are those of CESA, and do not necessarily reflect the views of all of the individual CESA member companies. (http://storagealliance.org).

I. INTRODUCTION.

The focus of our comments and responses to the questions posed in the Ruling is on what CESA recommends that the Commission should do in response to the modeling results in the 2017-2018 Integrated Resource Planning ("IRP"). There will always be improvements to modeling tools, functionalities, and inputs/assumptions that will be identified and needed. The Commission should continue to strive to make these improvements to provide it and stakeholders with the best information to make critical policy decisions, but "perfect should not be the enemy of the good" in making some early policy actions today that hedge against some near-term risks as well as make it economically reasonable to make investment decisions today that benefit our longer-term goals.

With the issuance of the Ruling, the Commission is nearing conclusion of its inaugural 2017-2018 IRP cycle that established the process and modeling tools to support the identification of the optimal resource mix to achieve the state's Renewable Portfolio Standard ("RPS") goals, greenhouse gas ("GHG") emissions reduction goals, disadvantaged community ("DAC") objectives, and other Senate Bill ("SB") 350 requirements, while also seeking to ensure that the resulting Reference System Plan ("RSP") and Preferred System Plan ("PSP") are reasonably reliable and operable. During this process, it has become clear from benchmarking the RESOLVE model with SERVM and other production cost models that modeling calibration and/or enhancements are needed in the next IRP cycle. The various modeling results highlighted key discrepancies in the resulting outputs for the RSP and Hybrid Conforming Portfolio ("HCP") that need to be better understood so that model calibration and/or improvements can be made.

At the same time, however, the Commission issued a Ruling on November 16, 2018 ("Reliability Ruling")[2] that raised questions for stakeholders on whether there are near-term and

[2] *Ruling of Assigned Commissioner and Administrative Law Judge Seeking Comment on Policy Issues and Options Related to Reliability*, R.16-02-007, filed on November 16, 2018.

medium-term reliability issues that the state faces, given the current resource mix, market conditions, and landscape of growing number of load-serving entities ("LSEs"). Many stakeholders, including CESA, shared the view that there were indeed near-term and medium-term reliability challenges facing the grid due to the current state of the grid.[3] The alternative production cost modeling ("PCM") conducted by the California Independent System Operator ("CAISO") validated these reliability concerns, showing insufficient capacity to provide load following and operating reserves, even as the Commission's own PCM found sufficient capacity expected through 2030.

Given these near-term reliability concerns, CESA recommends in these comments several policy actions to mitigate risks which otherwise may be overlooked or not appropriately calibrated in the Commission's own modeling through RESOLVE and SERVM. One of these policy actions should be to direct a targeted level of least-regrets procurement to mitigate these short-term reliability risks. For example, CESA recognizes that certain gas-fired generation facilities at-risk for economic retirement may impose risks for reliability. Strategic additions of energy storage, such as via hybridization of a subset of gas-fired generators may retain the needed fleet in an environmentally workable way while accommodating these economic retirements without posing reliability risks. In addition to some *reliability*-related least-regrets procurement, CESA also recommends that some *economic*-related least-regrets procurement be allowed in response to the RSP's 'optimal' finding to procure solar and wind resources across the 2018-2022 period to take advantage of the Federal tax credits before phase downs. Additionally, CESA also recommends that the Commission take policy actions to develop the tools, processes, and frameworks to prepare

[3] See *Comments of the California Energy Storage Alliance to the Ruling of Assigned Commissioner and Administrative Law Judge Seeking Comment on Policy Issues and Options Related to Reliability*, R.16-02-007, filed on December 20, 2018. See link here.

the state for both near-term reliability challenges as well as longer-term issues that are expected to emerge in a high-renewables future.

CESA does not view the 2017-2018 IRP cycle as just an informational exercise, as certain high-level trends and issues have been identified that could reasonably justify some early policy actions, including some least-regrets procurement. As the 2017-2018 IRP cycle has been framed as a 'trial run' by some stakeholders, CESA recognizes how this first IRP cycle was useful for stakeholders to familiarize themselves with and benchmark the modeling tools, and to establish a regulatory process that solicits input from stakeholders with wide-ranging expertise. However, CESA is concerned that a focus on getting the modeling tools, functionalities, and inputs/assumptions 'right' will imprudently delay critical and timely action that will be needed to mitigate any near-term reliability issues, as identified by the majority of parties that commented on the Reliability Ruling, and to support the state's advancement toward our aggressive GHG emissions targets, especially in light of the 100% zero-carbon electricity goal set by SB 100.

II. RESPONSE TO QUESTIONS.

Below, CESA provides our responses to the extensive list of questions posed by the Commission in the Ruling.

Question 1: Do you support the staff recommendation that the Commission adopt the hybrid conforming portfolio as the basis for the Preferred System Plan for the 2017-2018 IRP cycle? Why or why not?

Yes. No alternative portfolio, to CESA, aligns better with LSE preferences while being preferable from a reliability or GHG emissions perspective. Perhaps some of the portfolios with tighter GHG emissions constraints could be used (*e.g.*, Case B or C) to ensure that the state meets its intended GHG targets, but there may be concern about the lack of stakeholder review and PCM conducted on these alternative portfolios to adopt these as the PSP.

Instead of running more modeling, CESA recommends that the Commission focus on some of the high-level trends in the modeling results for the HCP as it is adopted as the PSP. Despite some modeling improvements and calibration needed, the Commission should still consider taking any reasonable actions to improve and ensure reliability within and outside of the IRP. For example, CESA believes that the RSP and HCP provide sufficient basis to direct some policy actions and least-regrets procurements. CESA provides further detail on the specific policy actions in our response to Question 24.

Question 2: If you do not recommend the hybrid conforming portfolio form the basis for the PSP, what portfolio should the Commission utilize and why?

CESA does not see an alternative portfolio that could be viably and reasonably used as the basis for the PSP. While the 30 MMT sensitivity of the RSP from RESOLVE could be used, these results would omit LSE preferences and would require a re-run of the PCM that will likely show worse reliability results. CESA thus believes the use of the HCP is the best portfolio to utilize at this time.

Question 3: Are there reasons for the Commission to utilize a different portfolio (or portfolios) for transmission infrastructure planning (in the TPP) as distinct from the portfolio describing procurement actions of LSEs? Discuss.

CESA does not see any other alternative to use.

Question 4: Comment on whether or not the hybrid conforming portfolio is likely to result in a reliable system in 2030.

No, CESA does not believe that the HCP results in a reliable system in 2030, as the CAISO found load following and operating reserves shortfalls, such that 1,077 MW of gas generation that would have otherwise retired under the 40-year retirement assumption was 'added back' for

reliability purposes in stochastic simulations.[4] More details on what the 'added-back' gas was used for would be informative for this proceeding, so CESA recommends that the Commission work with the CAISO to understand the underlying cause for this result. Understanding the underlying cause for the add-back gas as well as the specific hours and frequency of capacity or reserve shortfalls will be particularly informative in understanding whether energy storage solutions (*e.g.*, hybridization) could be procured to backfill this reliability need. For example, if specific gas plants were added back primarily due to load following and operating reserve shortfalls,[5] hybridization of those gas facilities with energy storage may be a good-fit solution to allow for the paired energy storage to provide load following and operating reserve services on the front end and keep the gas plant offline unless needed for certain contingencies. Additionally, since load following and operating reserves are system-level issues, the Commission would benefit from looking at hybridization opportunities of a broader set of gas facilities, not just those that are at risk of retirement. Providing these reserve capabilities through hybridization of even gas facilities that are not necessarily at risk may allow a larger portion of the at-risk gas fleet to retire with fewer reliability implications. In sum, greater information on these reliability risks would be helpful in informing the Commission's actions. CESA's reliability concerns also result from the discrepancies in results from the PCM done by the Commission and the CAISO, which appears to arrive at widely different conclusions on the sufficiency of the current fleet of resources.

[4] "Reliability Assessment of the IRP Hybrid Conforming Plan," presentation by Shucheng Liu (CAISO) on January 7, 2019, p. 18.

[5] *Ibid*, p. 23.

Additionally, the HCP lacked an analysis of economic retirement of gas generation and cogeneration that also considers their local capacity value, potentially understanding shortfalls.[6] Shortfalls also could result given that the PCM was conducted on hourly intervals, but sub-hourly reliability issues are not captured. These findings should highlight how best to augment certain gas units or where to procure cleaner replacement resources such as energy storage that could provide intra-hour ramping capabilities. Any conclusions around the reliability of the HCP should thus be caveated on these PCM limitations.

Question 5: Are the adjustments made by staff to the geographic resource allocations proposed by LSEs to develop the hybrid conforming portfolio, as described in Section 2.1 above, warranted? What modifications would you make to these assumptions why?

CESA has no comment at this time.

Question 6: Comment on the implications of the increased reliance on imports represented by the hybrid conforming portfolio.

Fundamentally, CESA has concerns about the potential for lack of firm commitment from imports unless specific out-of-state ("OOS") capacity is identified, contracted for along with necessary transmission, and made available under must-offer obligations ("MOOs") just like other Resource Adequacy ("RA") resource within the state.[7] Moreover, the CAISO has consistently stated their reservations about the feasibility of 5,000 MW as the net export limit – a parameter that it has identified as being a sensitivity factor for renewables curtailment, among others.[8] CESA recommends that the Commission plan as realistically as possible regarding the role of imports in reliability and GHG emissions in the next IRP cycle, in collaboration with the CAISO and

[6] Ruling, pp. 7, 12. Instead, the Commission used the '40-year retirement' assumption to serve as a proxy for some potential gas generation retirement because these units are most likely the most inefficient and less likely to have long-term contracts at the end of their useful life

[7] The CAISO's RA Enhancements Initiative is actively exploring this issue.

[8] "Reliability Assessment of the IRP Hybrid Conforming Plan," presentation by Shucheng Liu (CAISO) on January 7, 2019, p. 14.

stakeholders, especially since they appear to play a big role in all of the Commission's resulting portfolios.

Question 7: Comment on the hydroelectric feasibility analysis conducted by staff. Should the Commission require additional or different approaches to reliance on hydroelectric resources? What are your specific recommendations?

CESA appreciates the Commission's hydro feasibility analysis, but as the Commission recognizes, this is just a start and not yet a complete analysis.[9] As previously noted, for the purposes of ensuring reliability and meeting statewide GHG emissions goals, CESA recommends that the Commission further this analysis to look at contractual feasibility as well as the broader resource shuffling issue – *i.e.*, the resulting generation mix and GHG emissions output of non-California states from California's planned use of Pacific Northwest hydro.

Question 8: Comment on any actions the Commission should take to mitigate drought risk, especially for in-state hydroelectric resources.

CESA has no comment at this time.

Question 9: Comment on the potential for WECC-wide resource shuffling and how the Commission should address it.

CESA does not propose any specific approaches to address the WECC-wide resource shuffling issue at this time but supports the Commission's efforts to evaluate effects of LSE reliance on existing versus new-build OOS resources, which may inform an understanding of WECC-wide GHG emissions impacts.

Question 10: Comment on additional hydroelectric analysis that should be conducted in the future

CESA has no comment at this time.

Question 11: Comment on the calibrated LOLE study conducted for 2030. What are the implications or policy actions that should result, if any?

[9] Ruling, p. 10.

A closer examination is needed on the discrepancy of reliability results between SERVM and PLEXOS. The calibrated LOLE study may be creating a misleading picture of excess capacity through 2030, given the vastly different picture presented by the CAISO's modeling using PLEXOS. At the January 7, 2019 workshop, the CAISO commented about how some discrepancies may link to the lack of hourly load, generation, and import data used in the Commission's modeling. CESA recommends conduct this examination of the validity of the calibrated LOLE study via the Modeling Advisory Group ("MAG"). CESA also recommends that the Commission focus on how economic retirements can be modeled in RESOLVE and SERVM. The Commission already appears to intend to take these policy actions based on a previous Ruling,[10] which CESA supported.[11]

Question 12: Comment on the differences between the hybrid conforming portfolio and the portfolio associated with the RSP calibrated to the 2017 IEPR assumptions. What are the implications of these differences?

CESA understands that the HCP includes significantly less geothermal by 1,400 MW, more in-state solar, more in-state wind by 900 MW, and more New Mexico and Wyoming wind by 900 MW relative to the calibrated RSP, in addition to almost all four-hour battery storage as opposed to mostly one-hour battery storage. These underlying LSE preferences appear to drive differences in effective RPS percentage and reliability results, but CESA has overarching concerns that both portfolios may underestimate reliability issues (*e.g.*, insufficient load following and operating reserves) and inaccurately represent at-risk economic retirements. The role of energy storage should be more closely examined and further explored in the MAG.

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[10] *Administrative Law Judge's Ruling Seeking Comments on Inputs and Assumptions for Development of the 2019-2020 Reference System Plan*, R.16-02-007, filed on November 29, 2018. http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M243/K617/243617668.PDF

[11] *Comments of the California Energy Storage Alliance to the Administrative Law Judge's Ruling Seeking Comments on Inputs and Assumptions for Development of the 2019-2020 Reference System Plan*, R.16-02-007, filed on January 4, 2019, pp. 11-13. See link here.

Question 13: Comment on the criteria pollutant emissions results for the hybrid conforming portfolio. Is there further analysis that staff should conduct on criteria pollutant emissions for these high-level portfolio purposes? Explain.

CESA supports further analysis on criteria pollutant emissions for the HCP, but such an analysis should be expanded to approaches and methodologies for evaluating criteria pollutant emissions at a WECC-wide level given that the HCP was found to rely more heavily on imports.

Question 14: Comment on the GHG emissions results from the hybrid conforming portfolio analysis in SERVM. What are the implications and what should the Commission change as a result? (presuming that new RSP will be analyzed in 2019-2020 already).

To account for the discrepancies between RESOLVE and SERVM, CESA recommends that the Commission set aggressive GHG emissions reduction targets within RESOLVE to get the desired GHG emissions level – *i.e.*, by accounting for a potential 'bias' in the capacity expansion modeling – since the PCM will result in relatively higher GHG emissions. Furthermore, with the potential for increased reliance on imports, CESA recommends that the Commission explore whether the unspecified import rate should continue to be used, or whether alternative approximation approaches could be explored. Without more accurately accounting for the GHG emissions impact of imports, the Commission may not achieve the targeted statewide GHG emissions level as required by SB 350.

Question 15: Comment on the curtailment results of analyzing the hybrid conforming portfolio.

Similar to our response to Question 14, the higher curtailment results from the HCP analysis in SERVM should be reconciled with the CAISO study results, as the CAISO found that the curtailment results are sensitive to the net export constraint. CESA concludes that curtailment results may be underestimated and thus the Commission should assess whether the, for example, import assumptions, are feasible based on historical levels, from a physical perspective, and from

a GHG emissions and criteria pollutant impact perspective. If import assumptions are not feasible or undesirable in any of those regards, curtailment may be significantly higher, which would impact operational costs and likely lead the Commission to pursue a different resource mix to avoid these outcomes.

Question 16: Should the Commission place additional or tighter requirements on LSEs filing IRPs in the next IRP cycle? Suggest specific requirements and explain your rationale.

Rather than setting additional or tighter requirements on LSEs *per se*, CESA recommends that the Commission establish clearer and more detailed guidance for filing IRPs that promote more consistency and standardization in the IRPs, which allows for easier review by stakeholders, fewer adjustments needed in aggregating plans, etc.

Question 17: Comment on any other aspects of the hybrid conforming portfolio analysis.

CESA has no further comment at this time.

Question 18: Should the hybrid conforming portfolio be analyzed as the reliability base case in the 2019-20 TPP? Why or why not? What changes would you recommend?

As noted in our response to Question 4, CESA has concerns about whether the HCP is reasonably reliable, but there does not appear to be a better alternative to run a reliability case in the 2019-2020 TPP.

Question 19: Should the hybrid conforming portfolio be analyzed as the policy-driven base case in the TPP? Why or why not? What changes would you recommend?

CESA recommends the use of Cases B and C for the policy-driven base case in the TPP given the lower GHG emissions resulting from these cases.

Question 20: What are the potential implications if the CAISO analyzes the hybrid conforming portfolio and takes transmission investments to the CAISO Governing Board, if the resource procurement by LSEs between now and 2030 turns out to be significantly different than the

hybrid conforming portfolio suggests? If this is a concern, suggest potential remedies or other analysis or actions that could be taken.

CESA has no comment at this time.

Question 21: Do you support the staff recommendation to transmit two policy-driven sensitivity scenarios (Case B and Case C) to the CAISO for further analysis as policy-driven sensitivity scenarios? Why or why not? What changes would you make?

Given the resulting higher GHG emissions from the HCP, CESA recommends the use of Case B, which focuses on resources utilizing existing transmission but establishes a tighter GHG emissions constraint (*i.e.*, 32 MMT), as the reliability base case. Case C, which looks at potential new transmission investments, is more reasonably the policy-driven sensitivity scenario.

Question 22: Do you agree with the Commission staff assumptions used to development policy-driven sensitives, with respect to electric vehicle load, GHG emissions constraints in 2030, etc.? Explain in detail.

CESA supports the higher GHG emissions constraints in 2030 (*i.e.*, 32 MMT) that could help identify potential transmission investment opportunities to drive more GHG-free resource development. CESA also supports the use of the "high" transportation electrification case of the Integrated Energy Policy Report ("IEPR") demand forecast, which corresponds to about 3.9 million light-duty electric vehicles ("EVs") statewide. While lower than what is required under Executive Order B-48-18, CESA supports the use of this EV case as a sufficient proxy for high EV load by 2030 for the purposes of the 2019-2020 TPP studies but recommends that future portfolios submitted to the TPP use assumptions that align where reasonable with current policy objectives.

Question 23: Comment on any other aspects of the Commission's recommendations to the CAISO for TPP purposes.

CESA has no further comment at this time.

<u>Question 24</u>: What further policy or procurement actions should the Commission take us a result of the analysis presented in this ruling? Explain your recommendations in detail.

A key outcome of the 2017-2018 IRP process should be to direct certain least-regrets policy and procurement actions to mitigate *near-term reliability* risks and allow some level of least-regrets procurement (if desired by the LSEs) to hedge against *longer-term economic* risks, even as the modeling tools and process are improved. There are certain key high-level findings from the Commission's and the CAISO's modeling that provide sufficient basis to hedge against different futures and scenarios that could jeopardize the state's achievement of its GHG emissions and reliability objectives. CESA thus recommends the following policy and procurement actions:

- **Refine and adopt a Reliability Threshold Mechanism ("RTM"):** Pending discussion and refinement, an RTM as previously proposed by Southern California Edison Company ("SCE") is a prudent mechanism to have in place to avoid costly, above-market backstop procurement, insure against any gaps in modeling tools and planning processes, and allow for the timely and more cost-effective procurement of preferred resources that allow the state to continue to maintain reliability while advancing the state's GHG emission reduction and criteria pollutant reduction goals.

- **Identify hybridization opportunities and direct energy storage procurement to pair with best-fit gas units:** The Commission should consider solutions in which a small subset of the gas fleet is hybridized, which in turn enable economic retirement of other gas units. Meanwhile, gas units with paired energy storage can reduce the GHG emissions and criteria pollutant impacts of the gas unit from reduced starts/stops and operations, yet to also maintain reliability from the paired storage providing load following, reserves, and the 'runway' on the front end to start a gas unit for rare contingency events. CESA has completed Phase 2 of its hybrid modeling study, which examined hybridization of both peakers and CCGT units, as well as retirements of a remaining portion of the gas fleet, and demonstrated positive results in reliability, GHG emissions, and unit starts. See Attachment 1 for more detail.

- **Adopt a streamlined approval process for energy storage:** To support the timely and streamlined procurement of energy storage resources, CESA recommends that the Commission direct action for LSEs and stakeholders to develop a more streamlined advice letter process for energy storage contract approvals. The energy storage industry has matured and is ready for standardized contracts that support the timely approval and deployment of energy storage systems. Additionally, with energy storage as an important option under a potential RTM, CESA believes it is

important to begin the process for developing and establishing such an expedited approval process.

- **Develop an emerging energy storage technology procurement framework:** Most of the energy storage that has been procured to date within the Assembly Bill ("AB") 2514 framework has been for four-hour energy storage systems. However, as seen from the 30 MMT scenario in the RSP, there is significant value in pumped storage systems with 12+ hours of energy storage duration. CESA views this as a proxy for the value of longer-duration energy storage systems (*i.e.*, 4+ hours) that will be needed in the longer-term future to support renewables integration. In the RA Enhancements Initiative, the CAISO has also discussed the role of availability-limited resources in meeting local capacity needs, which may highlight the role of longer-duration energy storage resources to fully meet certain local capacity deficiencies. However, some long-duration energy storage solutions are still 'emerging', though commercially available, technologies that could benefit from an understanding of the barriers to wide-scale deployment and market transformation. Such technologies include lithium-ion batteries with certain different chemistries, flow batteries, hydrogen storage, modular compressed air energy storage ("CAES"), among others. Thus, as noted in our comments in R.15-03-011, CESA recommends that the Commission direct a successor Energy Storage proceeding to develop market transformation frameworks for emerging and/or longer-duration energy storage technologies. As the Commission works through modeling and process improvements, CESA believes it is prudent for the state to begin the work of transforming the market for other energy storage tools and capabilities to prepare the state for future challenges.

- **Direct the development of a multiple-LSE procurement framework:** Similarly, due to longer-duration energy storage needs in a high renewables future, 'infrastructure-like' resources that provide bulk long-duration capabilities may be needed. However, such long lead time resources likely need policy actions today to be able to be solicited, procured, constructed, and operational by the needed date. PHS, CAES, and liquid air energy storage ("LAES") are some of the technologies that fall into this category where multiple off-takers may be needed to contract for a large system resource that provides system benefits. Such a framework does not exist today, so policy action is needed today in the IRP proceeding to begin discussions and development of a multiple-LSE procurement framework to be able to bring such resources online in time if the modeling identifies and confirms a need for them.

- **Refine current planning models for economic retirement:** Much of this work is already planned in the 2019-2020 IRP cycle, but it should be reaffirmed in the decision adopting a PSP. CESA believes it is important to incorporate a feedback loop between parallel capacity expansion modeling (RESOLVE) and PCM (SERVM, PLEXOS) that more accurately models local capacity constraints, individual unit dispatch, and criteria pollutant impacts. Due to RESOLVE's limitations, the results from the PCM need to feed into RESOLVE to support the identification of the appropriate resource mix.

- **Direct the exploration of multi-day and seasonal storage models:** While less urgent at this time, CESA believes that the discussions to identify multi-day and seasonal storage models or to develop such modeling functionalities within existing models need to begin now so that future IRP cycles will be able to utilize these tools and capture these values. CESA has previously noted the limitation of RESOLVE in conducting only intra-day optimization, which may miss critical opportunities to invest in resources that are able to economically shift load across multiple days and months. This will likely involve multiple technical discussions, likely in the MAG, that need to begin in 2019 to have off-the-shelf readiness in time for the next IRP cycle, as current and future models may also need time to incorporate and develop such multi-day and multi-season functionalities.

CESA recommends that the Commission direct policy actions for each of the above. Many of these recommendations can occur in the IRP proceeding, while others may benefit from having the IRP provide guidance to the other proceedings, considering the IRP is positioned as an 'umbrella' proceeding for all Commission proceedings.

Question 25: Is an increase in the RPS compliance requirement, beyond 60 percent RPS in 2030, warranted? Why or why not?

CESA does not believe an increase in the Renewable Portfolio Standard ("RPS") compliance requirement beyond 60% by 2030 is needed at this time. However, some early procurement of renewables to continue to strive toward our 2030 RPS goals seems prudent at this time as a least-regrets investment based on the Reference System Plan results. The phase down of the Federal tax credits represents a time-sensitive opportunity to take advantage of some least-regrets amount of cost-effective renewables, which accelerates the state's RPS trajectory to some degree, but CESA does not find that an increase in the RPS is needed at this time to achieve that end goal. CESA understands that Senate Bill ("SB") 100 goals and objectives will be incorporated in the next IRP process, where the Commission may analyze and discuss whether and how RPS targets and requirements could be leveraged as zero-carbon resources.

Question 26: Acknowledging that near- and mid-term reliability issues have been addressed in comments in response to a separate ruling this proceeding, should the Commission order any resource procurement

in the context of the IRP proceeding at this time? How much? Explain your rationale.

Yes, CESA recommends that an evaluation be directed upon adopting the PSP to identify and mitigate any near-term and mid-term reliability risks. Rather than specifying a specific amount or location for procurement, CESA recommends that the Commission first evaluate and identify specific at-risk units and determine the capacity and reliability (*e.g.*, load following, operating reserve) shortfalls that result from their potential retirement. The actual amount of resource procurement needed will then depend on the capacity and characteristics of replacement or retrofit resources needed to ensure reliability while advancing the state's GHG emissions and criteria pollutant reduction objectives. Depending on the imminence of the retirement and the urgency of the reliability issues, the appropriate level of needed procurement may depend on the specific units that are identified as being likely to retire. LSEs should be given the opportunity to self-procure to meet any identified needs and the Commission could direct procurement if reliability-related deficiencies persist. There is likely going to be some lag between the incorporation of modeling improvements and the timeline of actual early retirements, so CESA finds there to be a significant benefit in pursuing some amount of least-regrets procurement of hybridized energy storage, standalone energy storage, transmission, etc.

In addition to directing procurement to address retirements, CESA finds it prudent to allow LSEs to pursue some level of least-regrets early procurement of tax-credit-eligible renewables resources. The decision adopting the RSP, Decision ("D.") 18-02-018, highlighted several areas of uncertainty in the future that would make it prudent to wait on early RPS procurement, but some of these uncertainties have been clarified (*e.g.*, the PCIA decision, D.18-10-019). At the same time, despite some of these future uncertainties, one thing that is certain is that these Federal tax credits are expiring and represent an opportunity for ratepayers to benefit from some certain level

of cost savings by taking advantage of the procurement of tax-credit-eligible renewables. As a result, CESA recommends that the Commission allow for and encourage LSEs to pursue some least-regrets amount of early procurement for tax-credit-eligible renewables. CESA understands that LSEs filed their IRPs prior to the adoption of SB 100, so their plans may not reflect their intent to comply with the new statutory requirements, which may involve some early procurement as part of their plans through 2030. Rather than waiting for the next round of modeling to incorporate SB 100, some level of early procurement should be allowed and encouraged to ensure that LSEs are on the path to SB 100 compliance. Importantly, energy storage resources paired with eligible renewables also face a limited time window to take advantage of these tax credits, so the Commission should allow for paired energy storage procurements as well in this near-term policy directive.

III. CONCLUSION.

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

Respectfully submitted,

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Date: January 31, 2019

Attachment 1:

Blue Marble Capacity Expansion Modeling Results & Methodology (Phase 2)

OVERVIEW OF PHASE 2 HYBRID MODELING RESULTS IN GRIDPATH

CESA commissioned Blue Marble to conduct an analysis of hybridizing generators in the CAISO system using its GridPath model. The model's capacity-expansion functionality was used to co-optimize power system operations and investments through 2030 under several scenarios. While similar to RESOLVE, the model allows for a more granular, plant-specific analysis of capacity expansion and production costs. Modeling was conducted in two phases. Phase 1 solely examined the effects of hybridizing of a subset of gas peakers. Results from Phase 1 were reported in Attachment 1 of CESA's comments submitted on December 20, 2018. Phase 2 examined hybridization of both peakers and combined-cycle gas turbine ("CCGT") units, as well as retirements of a remaining portion of the gas fleet. The results of the Phase 2 analysis are reported here. For the Phase 2 analysis, a candidate list of 23 gas peaker plants (1,110 MW total), which were located in local capacity requirement ("LCR") areas and in DACs, was made eligible for hybridization with energy storage. Additionally, six CCGT plants (3,682 MW total) were made eligible for hybridization.

Phase 2 Scenarios:

The model ran three scenarios for the CAISO power system under a 42 MMT California carbon cap by 2030.

1. *"Business As Usual"*: The default assumptions mirrored those in the 2017-2018 IRP but were modified to include the current energy storage mandate of 1,825 MW. No hybridization was allowed.

2. *"Hybrids Only"*: Each of the candidate peaker and CCGT resources were fully hybridized in the first model year (2018).
3. *"Hybrids + Retirements"*: This scenario is the same as Scenario 2 above, but 5,485 MW of gas units were retired (*i.e.*, 2,850 Class 2 CCGTs and 2,635 Class 2 Peakers). This represents approximately 23% of the existing CAISO gas fleet.[12] A portion of the retirements (337 MW) include units that were hybridized in the *Hybrids Only* case.

Summary Results

At a high level, the modeling results showed that near-term hybridization (*i.e.*, within a few years) of the candidate peaker and CCGT plants was able to achieve the following:

- An immediate reduction in annual GHG emissions ranging from 121,812 (hybrid only case in 2018) to 220,037 MT (hybrid + retirement case in 2018).[13]
- An immediate reduction in the number of unit starts by 61% (hybrid only case in 2018), leading to lower NOx emissions in DACs.
- A substantial reduction in the number of unit starts, ranging from 46-51% less than business as usual, even when a significant number of gas units are retired (hybrid + retirement case)
- Reliable system operations under a scenario with >5,000 MW of gas retirements at a comparable cost to business as usual.
- A 12-37% reduction in the amount downward load-following reserves being provided by renewable energy (hybrid + retirement case), which could lead to curtailment.

[12] This is approximately equal to the 25% of gas capacity identified in the Union of Concerned Scientists ("UCS") *Turning Down the Gas in California* study that could be economically retired immediately.

[13] This is based on a comparison of Scenario 3 to Scenario 1.

Cost Impacts

Under the *Hybrids Only* scenario, hybridization resulted in an annual cost increase ranging from $52 million to $82 million, or 0.3% to 0.7% of the total. This reflects the cost of hybridization, which is partially offset by operational cost savings. The *Hybrid + Retirements* scenario showed a similar cost differential ranging from $64 million to $85 million, but this does not reflect additional fixed operations and maintenance ("O&M") cost savings that would be realized due to retired plants. CESA estimates that this could reduce the incremental cost by approximately $41 million annually, yielding a net cost increase of about $23 million to $44 million, or 0.1% to 0.4% of the total.[14] Notably, none of the hybrid resources in either scenario were assumed to count towards the energy storage mandate, which was shown in the Phase 1 analysis to be a significant factor for reducing overall costs.

Use and Value of Hybridized Resources

As in Phase 1, the hybrid peakers are generally used to provide spinning reserves and frequency response. For example, the spinning reserve "capacity factors"[15] of the hybridized candidate plants in ranging between 15% and 39% (*Hybrid + Retirement* case). By taking on the provision of reserves, the hybrid resources make it possible to remove constraints on other more efficient resources and thus increase the overall efficiency of the system dispatch. The hybrid CCGTs still primarily provide energy in similar amounts to the *Business As Usual* case, with the average change in capacity factor after hybridization ranging from a 3.8% decrease to a 0.3%

[14] Assumes a weighted average fixed O&M cost of $7.50/kW-year for the retired plants.

[15] This is calculated similarly to a capacity factor – *i.e.*, the total spinning reserve provision over a year divided the maximum possible provision (assuming the entire plant capacity is dedicated to spinning reserves in every hour of the year).

increase (*Hybrid + Retirement* case). Additionally, the hybridized CCGTs are used less frequently for spinning reserves and more frequently for load following. The number of starts of the hybrid units are generally reduced, with total reductions ranging from 1% to 15%, depending on the year. However, the reduction in unit starts across the gas fleet (including non-hybrid units) is even more significant, with total starts ranging from 46% fewer to 51% fewer under the *Hybrid + Retirement* case than under the *Business As Usual* case. Total energy fleetwide from CCGTs is also down, with reductions ranging from 0.3% to 1.6%.

Comparative Modeling in RESOLVE

CESA compared the results of the *Hybrid + Retirement* case to a similar case modeled in RESOLVE by Gridwell Consulting on behalf of Wellhead Electric. In this case, approximately 5,639 MW of gas resources were retired, both with and without hybridization. In the case without hybridization, the results indicate that 756 MW of additional standalone battery storage of at least two-hour duration would be needed to ensure reliable operations with enough operating reserves. This is significantly greater than the 464 MW of less-than-one-hour duration storage installed on hybrid units under the *Hybrid + Retirement* case, which also operated reliably and had the added benefit of reducing starts from the remaining CCGT and Peakers. It should also be noted that the hybrid case reduces the CAISO's energy neutrality burden by 756 MW. Thus, while it may be possible to address certain system-wide reliability needs through the addition of standalone storage, this solution could be more costly and significantly more complex to operate than a solution that includes a small amount of hybrid resources.