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 ADMINISTRATIVE LAW JUDGE'S RULING SEEKING COMMENT ON PROPOSED SCENARIOS FOR 2019-2020 REFERENCE SYSTEM PORTFOLIO

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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 *Administrative Law Judge's Ruling Seeking Comment on Proposed Scenarios for 2019-2020 Reference System Portfolio* ("Ruling"), issued by Administrative Law Judge ("ALJ") Julie A. Fitch on February 11, 2019.

[1] 174 Power Global, 8minutenergy Renewables, Able Grid Energy Solutions, Advanced Microgrid Solutions, Alligant Scientific, LLC, AltaGas Services, Amber Kinetics, Ameresco, American Honda Motor Company, Inc., Avangrid Renewables, Axiom Exergy, Better Energies, Boston Energy Trading & Marketing, Brenmiller Energy, Bright Energy Storage Technologies, Brookfield Renewables, Carbon Solutions Group, Clean Energy Associates, ConEd Battery Development, Customized Energy Solutions, Dimension Renewable Energy, Doosan GridTech, Eagle Crest Energy Company, East Penn Manufacturing Company, EDF Renewable Energy, ElectrIQ Power, eMotorWerks, Inc., Enel X North America, Energport, Engie Storage, E.ON Climate & Renewables North America, esVolta, Fluence, Form Energy, GAF, General Electric Company, Greensmith Energy, Gridwiz Inc., Hecate Grid LLC, 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 Energy Solutions, LS Power Development, LLC, Magnum CAES, Mercedes-Benz Energy, NantEnergy, National Grid, NEC Energy Solutions, Inc., NextEra Energy Resources, NEXTracker, NGK Insulators, Ltd., Nuvve, Pattern Energy, Pintail Power, Primus Power, Polyjoule, 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., Tesla, 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 Integrated Resource Planning ("IRP") process is now entering its second cycle and presents a number of opportunities to incorporate improvements that ensures achievement of the various Senate Bill ("SB") 100 and SB 350 goals while also maintaining grid reliability. CESA supports the continued efforts by Commission staff to improve the modeling tools and framework, as outlined in the Ruling and the associated attachments. CESA generally supports the Commission's proposed scenarios and thermal generation analysis but offers the following key areas of recommendations in our responses to the questions:

- The 38 million metric tons ("MMT") and 30 MMT targets should be modeled while the 46 MMT target should be replaced with a more aggressive target as the greenhouse gas ("GHG") emissions constraints for 2030.
- Clarity is requested on how the High Electrification Scenario will be used within RESOLVE given that the High Electrification Scenario already includes some "optimization" in its assumptions.
- The inclusion of the High Hydrogen Scenario is important, but this scenario may not consider the full potential of high hydrogen storage usage.
- Two additional sensitivities should be added to the modeling scope where certain assumptions within the RESOLVE model are adjusted to identify the proxy benefits and costs of hybrid gas-plus-storage resources and compressed air energy storage ("CAES") resources.
- An additional sensitivity for a study year between 2030 and 2045 may be informative to long lead-time resource procurement and policy actions.
- Clarity is needed on how the thermal generation analysis and the IRP planning process will translate to potential procurement of replacement resources.
- Clarity is needed on the energy sufficiency approach in the thermal generation analysis.

II. RESPONSES TO QUESTIONS ON PROPOSED 2019-2020 REFERENCE SYSTEM PLAN SCENARIOS.

Based on the outcomes of the 2017-2018 IRP cycle, CESA recommends that the Commission set GHG emissions constraints for 2030 at lower levels to account for discrepancies between the capacity expansion modeling and production cost modeling. The Commission proposes to model three policy cases for GHG emissions targets for the electric sector in 2030 of 46 MMT, 38 MMT, and 30 MMT, along with associated sensitivities around core state policies, expected resource cost, availability, and procurement, and different futures for load forecast and demand-side adoption. However, the previous round of modeling showed that the GHG emissions target set in the capacity expansion modeling tended to overestimate comparable GHG emissions reductions – *i.e.,* the GHG metrics were not achieved by the less conservative model.[2] While this discrepancy was not as large in the Hybrid Conforming Portfolio ("HCP"), the IRP 2.0 should factor this discrepancy risk in by using a more aggressive base case. For the purposes of reducing model runs or more appropriately conducting runs on pathways that the state must pursue to achieve SB 100 goals, CESA recommends the modeling of the 38 MMT and 30 MMT targets, and replacing the 46 MMT case with a more aggressive case (*e.g.*, 24-28 MMT).

Question 1: Do you agree with the proposed 2045 framing study scenarios? What modifications should be made to better characterize the role of the electricity sector in meeting California's GHG reduction goals in 2030 and beyond, given the zero-carbon goals outlined in SB 100 and imperfect information regarding future GHG reductions in other sectors of the economy? Provide detailed data sources which may be used in order to construct your recommended scenarios.

CESA supports the Commission staff's proposed 2045 framing study scenarios, especially with the inclusion of the High Electrification Scenario based on the PATHWAYS Base Mitigation

[2] This can occur from modeling dispatch differences, scenario 'days' or sampling of days, treatment of imports, or other factors.

case. However, one unclear aspect of using the PATHWAYS case for this scenario is how RESOLVE's candidate resource optimization will work if the High Electrification Scenario may exogenously optimize the electrification strategy. For example, the High Electrification Scenario by 2030 appears to assume 6 GW of additional storage beyond the Assembly Bill ("AB") 2514 mandate as well as to assume 50% of light-duty vehicle ("LDV") electric vehicle ("EV") charging is flexible.[3] Similar assumptions but at higher levels are assumed in this scenario for 2050.[4] As CESA understands it, energy storage additions and flexible EV charging should be optimized as candidate resources within RESOLVE, but this 2045 study scenario appears to make an exogenous assumption around their incremental additions and operations for grid benefit. Clarity is requested on how the PATHWAYS scenarios will be used within RESOLVE.

Question 2: **Based on the various technology deployments assumed in the framing study scenarios, what implementation or feasibility assessments may be needed to better understand the costs and risks associated with the technologies that contribute to GHG reductions? How should the results of those assessments be used to evaluate which economy-wide GHG mitigation policy pathways to pursue and/or account for in statewide planning?**

CESA supports the inclusion of the High Hydrogen Scenario from the PATHWAYS model that incorporates flexible hydrogen production and assumes higher levels of hydrogen fuel-cell electric vehicles ("FCEVs") into the deep decarbonization strategies for 2045. However, the High Hydrogen Scenario from the PATHWAYS model is limited to looking at how an increased level of FCEVs and fewer battery electric vehicles can support carbon mitigation.[5] Without including

[3] *Deep Decarbonization in a High Renewables Future: Updated Results from the California PATHWAYS Model*, CEC Energy Research and Development Division Final Project Report prepared by E3, CEC-500-2018-012, June 2018, p. 18. https://www.ethree.com/wp-content/uploads/2018/06/Deep_Decarbonization_in_a_High_Renewables_Future_CEC-500-2018-012-1.pdf

[4] *Ibid*, p. 19.

[5] *Ibid*, p. 20.

hydrogen *storage* capabilities, this scenario may overlook the potential for greater renewables integration from leveraging the hydrogen production and related storage infrastructure. Hydrogen is one of the few energy storage resources that can be economic for both long duration and seasonal time shifting. At the same time, CESA recognizes that hydrogen storage potential may not be sufficiently captured using RESOLVE's 24-hour optimization, so there may be limited utility in looking at hydrogen storage potential at this time. CESA thus recommends that the results from the High Hydrogen Scenario should be carefully viewed within the context that flexible hydrogen electrolysis as a carbon mitigation strategy is being limited in this case to just end-use FCEV use, and that the broader potential of hydrogen as a grid storage resource is not considered. As noted in our previous comments, potential improvements to models will be needed in future IRP cycles to incorporate multi-day and seasonal storage capabilities.

<u>Question 3</u>: Do you recommend alternative scenarios or sensitivities for the 2030 timeframe that should be studied? If so, provide detailed rationale and data sources for the proposed additional scenarios.

CESA generally believes that the alternative scenarios and sensitivities as proposed in Attachment A of the Ruling to be reasonable. Previously, in comments, CESA recommended the addition of several new candidate resources, including hybrid solar-plus-storage, hybrid gas-plus-storage, and CAES. CESA appreciates the Commission's modifications to model hybrid solar-plus-storage systems in the low battery storage cost sensitivity, but it does not appear that the Commission will add hybrid gas-plus-storage and compressed air energy storage as candidate resources since modeling documentation to date has yet to indicate as such. Absent this change, CESA instead recommends that the Commission conduct two additional sensitivities to adjust certain assumptions within the RESOLVE model to identify the proxy benefits and costs of these commercially viable and potentially beneficial resources.

For hybrid gas-plus-storage resources, CESA recommends that the Commission make certain changes to the operational assumptions for natural gas candidate resources under an additional sensitivity approximate the benefits and costs of hybridizing a gas unit with energy storage. CESA finds this additional sensitivity to be justified given our previous comments that attached our self-initiated modeling results on how hybrid gas-plus-storage resources had the desired impact of reducing gas starts as well as reducing GHG emissions without reducing reliability. Given the previous round of comments expressing the Commission's potential concerns around near-term reliability issues, CESA believes that this additional sensitivity is needed to inform a potential no-regrets solution in IRP planning and procurement. For gas resources that are identified as needing to retire, this sensitivity could look at the comparative benefits and costs of replacing this resource with other alternatives or with a "gas resource" with the operational characteristics outlined previously in our comments.[6] Similarly, this sensitivity analysis could be extended to other gas units that are not imminently at risk of economic retirement but may yield important benefits to, for example, reduce criteria pollutants in disadvantaged communities. To implement this proxy analysis, CESA recommends that this sensitivity adjust the operational assumptions of candidate natural gas plants to simulate the characteristics and capabilities of hybrid gas-plus-storage resources. The Commission should include this sensitivity also as a way of evaluating how local needs can be met through non-emitting hybrid resources. This may greatly support smart transitions off of the gas fleet while allowing competition by energy storage.

[6] *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*, filed on January 4, 2019, pp. 18-19.
http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M254/K771/254771723.PDF

For CAES resources, CESA has previously noted the differences in input values related to the size, duration, and cost of these resources relative to pumped hydro storage ("PHS"). While PHS resources are modeled with constant prices through 2030 and with a minimum 12-hour duration, CAES is different in its minimum size, duration, and cost. A reasonably efficient and easy way to approximate the potential value of CAES as a grid resource in the IRP modeling would be to conduct an additional sensitivity where the minimum size of the CAES resource is set between 160 MW,[7] the duration is set between 6 to 8 hours, and the costs are sourced from Lazard's *Levelized Cost of Storage Version 2.0. – i.e.*, with the levelized cost of storage between $116/kWh to $140/kWh and the initial installed capital cost between $146/kWh to $210/kWh. Ideally, CAES would be modeled separately as a candidate resource to assess how it would compete with all other resources, but in the absence of those changes, CESA believes this proxy approach under an additional sensitivity is reasonable and would provide the Commission with valuable information on the tools needed and the steps that must be taken to initiate the procurement of such long lead-time CAES resources.

Finally, CESA appreciates that the Commission conducted sensitivity runs for early procurement of PHS resources in 2022 and 2026 during the 2017-2018 IRP process and for several post-2030 scenarios, which found some significant benefit to PHS procurement. For example, the RESOLVE model economically selected approximately 1,200 MW of PHS as being optimal in the 30 MMT scenario and economically selected significant levels of PHS in 2034 to achieve the 2038 GHG emissions target in the limited post-2030 sensitivity for the 42 MMT scenario.[8] While there

[7] CAES is modular and one compressor-generator train is 160 MW, while a two-train system is 320 MW, etc. There may be adiabatic CAES that may have modular size increments that are smaller than 160 MW.

[8] CESA also highlights the continuing special study by the California Independent System Operator ("CAISO") on bulk energy storage in the 2018-2019 Transmission Planning Process ("TPP") that found significant benefit of new pumped storage resources to the system in lower carbon emissions, renewable

may be no major need to 'force in' PHS in a sensitivity scenario, especially as CESA imagines that we may see more pronounced and earlier needs for PHS in the 30 MMT scenario in the 2019-2020 IRP modeling, there may be some key takeaways that may be lost by only modeling one post-2030 scenario (*i.e.*, the 2045 scenario). The past cycle's modeling showed, under a much less carbon-constrained scenario, major benefit to bulk storage resources such as PHS just a few years after 2030, so there may be benefit to modeling one study year between 2030 and 2045 to inform the Commission on how policy action may be needed in the near term to ensure progress is being made to bring such long lead-time resources online in a timely manner, to the extent a need for PHS is not already evident before 2030. There may be other resource additions between 2030 and 2045 that could be informative for Commission policy or procurement actions as well.

III. RESPONSES TO QUESTIONS ON RECOMMENDED ANALYSIS OF EXISTING THERMAL GENERATION.

The analysis of the existing thermal generation fleet will be important to inform the Commission and stakeholders on how to create a viable pathway to the state's zero-carbon future without jeopardizing reliability. However, in reviewing the Commission staff's proposed analysis methodology, CESA is unclear on how this "illustrative" or "indicative" analysis would link to procurement and forward-looking planning without looking at specific units for retirement. The Commission staff proposal outlined three different actions that it could take in response to the results of the analysis, including taking action to hasten the retirement of some plants or taking action to retain some plants needed for long-term reliability,[9] but with an analysis done at a class

curtailment, and production costs, while also providing improved flexibility of the resource fleet to follow load and provide reserves – a key reliability gap found in the production cost modeling of the HCP. See *Draft 2018-2019 Transmission Plan* on pp. 467-470 here: http://www.caiso.com/Documents/Draft2018-2019_Transmission_Plan-Feb42019.pdf

[9] Ruling Attachment B, p. 7.

level for thermal units,[10] it is unclear on how the determination could be made on any specific unit, given the potential unique operational characteristics of any individual unit.

CESA seeks clarity on how this modeling and planning process will translate to potential procurement of replacement resources. In particular, as the state continues to face local reliability challenges, the IRP modeling process will need to address how it will model, identify, and then procure for the resource mix to eventually replace gas units in specific local areas, as multi-year Resource Adequacy ("RA") frameworks should address some of the near-term retention issues. While RESOLVE is a system-level planning tool, specific units need to be identified and modeled to support procurement directives.

Question 4: Should the default assumption for core scenarios rely on the economic retention functionality in RESOLVE? Why or why not?

CESA supports this default assumption as it is an important improvement over the 2017-2018 IRP process. Information on economic retirements and unviable operating economics is useful information that should be ascertained by the modeling effort.

Question 5: Is it reasonable to implement staff's suggested minimum local capacity requirement constraint as an interim approach for dealing with local reliability issues? Or if you prefer a different approach, explain in detail.

CESA supports the implementation of Option 2 to allow gas retirement in local areas that must then be replaced with new capacity or transmission. CESA understands the Commission's questions around the uncertain effectiveness of replacement solutions to meet local requirements, but a similar feedback loop between RESOLVE and SERVM may be implemented to gauge the effectiveness of different replacement portfolios, as is being done to surface energy sufficiency

[10] Ruling, p. 4.

issues in Step 2 of the analysis. Option 1 to retain gas plants serving LCR needs may be limiting the scope of the gas retirement issue but understands that it may be a reasonable interim approach.

Question 6: Comment on staff's suggested "energy sufficiency" approach as described in Step 2 of Attachment B.

CESA still seeks to further understand the energy sufficiency approach. As we understand it, the approach would identify the upper limits of potential forced retirements that would cross a number of reliability thresholds to determine the timing and duration of LCR deficiencies. CESA requests clarification on whether this approach considers opportunities for retirement of some thermal units in an LCR area (*i.e.*, below the energy sufficiency constraint) and whether this approach considers the differences in how any given thermal unit contributes to the timing and duration of LCR needs in a local area (*i.e.*, some thermal units may be needed for low capacity factor, high peak needs whereas other units may be needed for more baseload-like peaking power). Detailed modeling and methodology documentation beyond presentation materials would be helpful to gain clarity. The Commission also may consider how local-reliability study findings can be conducted separately and in greater detail, with those inputs then fed into a larger model run. This way, the model findings will ensure that *ad hoc* and situation-specific local area needs are accurately reflected and honored in any final modeling outcomes.

Question 7: Are there other reliability checks that you would recommend? Describe in detail.

CESA has no additional specific reliability checks but believes that it is important for the Commission to coordinate with the CAISO to ensure alignment with this reliability analysis, as the two entities landed at differing conclusions on the production cost modeling of the HCP in the 2017-2018 IRP cycle, such as the CAISO finding a shortage of load following and operating reserves that was not identified in the Commission analysis.

Question 8: **Staff would like to apply the economic retention functionality to all thermal generators; however, cogeneration facilities raise a particular challenge due to the need to consider the value of heat to industrial processes. This value may be substantial, and lead to resource retention in reality, even if the model demonstrates no need for the resource for electric system reliability. What specific data can be used and what interim study approach could be performed to approximate the application of economic retention functionality to cogeneration?**

CESA has no comment at this time.

Question 9: **Should staff study any additional intermediate years in addition to the four IRP resource planning years (2020, 2022, 2026, and 2030) in order to better understand near- and medium-term reliability issues, or would the additional granularity result in false precision considering that RESOLVE is a capacity expansion model designed to study long-term economics? Explain.**

While beneficial, CESA finds the studying of additional intermediate years may lead to added modeling runs that would not provide value-add information on how to manage reliability issues. The current planning year approach may be sufficient to help determine whether the Commission must act in the near term or medium term on any identified future reliability issues.

Question 10: **Are there other specific data sources you recommend for any component of the thermal generation analysis described in Attachment B.**

CESA has no comment at this time.

Question 11: **Comment on staff's proposed improvements to the local air pollutant emissions analysis.**

CESA has no comment at this time.

IV. 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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