

**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 WIND ENERGY ASSOCIATION
ON PROPOSED REFERENCE SYSTEM PORTFOLIO
AND RELATED POLICY ACTIONS**

Nancy Rader
Executive Director
California Wind Energy Association
1700 Shattuck Ave., #17
Berkeley, CA 94709
Telephone: 510-845-5077 x1
E-mail: nrader@calwea.org

Dariush Shirmohammadi
Technical Director
California Wind Energy Association
1700 Shattuck Ave., #17
Berkeley, CA 94709
Telephone: (310) 858-1174
E-mail: dariush@gridbright.com

*On behalf of the California Wind
Energy Association*

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I. INTRODUCTION AND SUMMARY

Pursuant to the November 6, 2019, Ruling of Administrative Law Judge (“ALJ”) Julie Fitch, and ALJ Fitch’s email ruling of November 19, 2019, extending the comment deadline, the California Wind Energy Association (“CalWEA”) submits these responses to the questions posed in the Ruling regarding the proposed Reference System Portfolio (“RSP”) and related policy actions for the 2019-2020 cycle of the Integrated Resource Planning (“IRP”) process.

We encapsulate the main points of our comments as follows:

- CalWEA supports the proposed greenhouse gas (“GHG”) emissions target of 46 million metric tons (“MMT”) for 2030 for the electric sector, as set by the California Air Resources Board, while recommending that the Commission undertake, with all deliberate speed, an evaluation of resource-diversity options for the mid-2020s-to-2030 timeframe.
- CalWEA supports the deployment limit of 2 gigawatts (“GW”) per year for utility-scale solar resources through 2023 in the Proposed RSP, which is a more realistic pace of development than the 46 MMT Default Scenario, given the lack of capability of many load-serving entities (“LSEs”) to undertake procurement on this scale in this timeframe, the difficulty that transmission providers would have in completing the needed system upgrades, and other factors.
- CalWEA recommends that the Commission immediately re-run the RESOLVE model to identify an optimal, reliable portfolio without the 2,000 MW of generic capacity that staff added *post hoc* to the 46 MMT Alternate Scenario, and without the assumed availability of once-thru-cooling (“OTC”) resources after 2020 (both of which are included in the RSP), and with modified resource adequacy (“RA”) import assumptions. The results will

better-inform the need for RA resources, the type of RA resources needed, and the timeline for that need.

- If this additional RESOLVE modeling suggests, as indicated by the results of SERVM modeling performed for the Proposed RSP, that the RSP significantly exceeds reliability requirements, the Commission should perform further SERVM modeling to determine whether an adjustment of its Procurement Track decision schedule for the addition of 3,300 MW of RA resources in the 2021-23 timeframe is warranted, particularly if OTC resources are available as a backstop.
- To the extent possible, sensitivities should be conducted in the additional RESOLVE modeling to explore the diversity premium that would be associated with substituting more diverse resource options to meet identified capacity and RPS needs. The results of modeling efforts so far, however, do not provide sufficient information to justify mandating one resource type over another for the purpose of adding diversity to the 46 MMT Alternate portfolio.
- Diversity premiums should be considered along with the premium associated with the assumed level of behind-the-meter (“BTM”) solar resources in the RSP baseline. Various levels of BTM solar were included in the RESOLVE model, but the associated results were not reported in the Ruling or its attachments. CalWEA ran RESOLVE with a more moderate (though still substantial) increase in BTM solar capacity, which produced savings of \$278 million annually. Total BTM-solar costs would be substantially higher, based on an estimate of the subsidy associated with net metering rates, if continued at current levels. IRP (and related policy) decisions should be made based on a fully transparent accounting of the costs of all resource options.
- A more comprehensive analysis of resource-diversity options should be conducted as soon as possible for consideration at the outset of the 2021-22 IRP cycle, possibly in another expedited Procurement Track. CalWEA shows, through an example model run, that a more diverse portfolio can, in fact, come at a lower cost. Advancing, in the near-term, those resource-diversity options that can be obtained at a reasonable cost premium to address the various risks associated with a portfolio that would otherwise be over-reliant on a narrow set of resources will help build the momentum necessary to exceed the 46 MMT target in 2030, or sooner, with a more-diverse and lower-cost portfolio.
- Meanwhile, in order to secure the limited diversity that is reflected in the Proposed RSP (both additional wind resources and maintenance of existing diverse resources that are at risk), it is critical that the Commission allocate integration-resource requirements or costs to LSEs based on their individual contribution to the need for integration resources. Absent these cost signals, procurement decisions will not take into account the indirect costs that are factored into the IRP analysis, and thus will not collectively produce results similar to the RSP. Integration costs include flexible-RA resources as well as any integration resources that are identified and mandated in the IRP process.

II. RESPONSES TO QUESTIONS

A. Questions Regarding Section 2.2

1. Please provide any comments on the use of the RESOLVE model

It is cause for concern that the RESOLVE model did not produce a portfolio that meets reliability requirements, requiring Energy Division staff to manually and arbitrarily add 2,000 MW of generic effective capacity to achieve a sufficient level of reliability for the 46 MMT Alternate Scenario.¹ While running the model with different assumptions (as we propose in response to Question 7) is sufficient to get through this IRP cycle, for the next IRP cycle, the Commission should seek to calibrate the RESOLVE model so that it better addresses the RA capacity requirement based on an acceptable level of reliability.

2. Provide any comments on the use of SERVM

No comments at this time.

3. Provide any comments on baseline assumptions

a. Baseline assumption re existing OTC units

The 46 MMT Alternate Scenario assumed that approximately half of the OTC units scheduled to retire at the end of 2020 are instead extended for three years (*i.e.*, through the end of 2023).² CalWEA agrees with the view that has been expressed by the CAISO that OTC units should only be relied upon as a backstop, and that this assumption prevents us from “understand[ing] the quantity and characteristics of new resources needed to supplant the OTC units and serve load reliably.”³

As discussed in response to Question 7, CalWEA joins the CAISO in calling for Energy Division Staff to re-run the RESOLVE model, modifying this assumption and making other changes.

¹ Ruling at 17-18.

² Ruling at 12.

³ Notice of *Ex Parte* Communication by the California Independent System Operator Corporation at 5, November 27, 2019). CalWEA anticipates that these concerns will be reflected in the CAISO’s opening comments on the Ruling.

b. Baseline assumption re: existing renewable energy projects

CalWEA remains concerned that the baseline assumptions continue to assume the indefinite continued operation of approximately 3,000 megawatts (“MW”) of existing renewable resources that are without long-term contracts, or whose contracts will soon be expiring.⁴ Many of these resources, which include biomass, geothermal and wind resources – are or will be at risk of retirement for lack of sufficient revenues. The CAISO has noted that “[m]aintaining or replacing baseline [RA] resources is as critical as incremental [RA] procurement given the significant shortfall and compressed procurement timeline”⁵ associated with the Procurement Track procurement order.

The Commission’s assumption that existing diverse resources will persist, even without a contract, could, or already has, led to a number of problems:

- Total resources under the proposed RSP could prove to be significantly less diverse than is being portrayed⁶ if these resources retire and are replaced with solar and battery resources;
- The assumption could lead to double-counting RPS resources to the extent that these resources are included in the existing or planned portfolios of Community Choice Aggregators (“CCAs”) and Energy Service Providers (“ESPs”); and
- The assumption has already led to an order, in the IRP Procurement Track, that excludes these baseline resources, even those whose contracts are expiring, from the market created by the order. The consequence will be to further increase the risk of their retirements and to produce an inefficient, bifurcated market in which existing resources with expiring contracts are not allowed to compete against new resources to fulfill RA needs.

If it is not possible to re-run the model during the current IRP cycle, treating existing renewables in the same way that existing thermal generation is now being treated (*i.e.*, allowing

⁴ CalWEA estimates that approximately 1,800 MW of geothermal resources, 650 MW of biomass resources, and approximately 1,000 MW of existing, un-repowered, wind facilities are operating without long-term contracts. In addition to these in-state resources, contracts totaling 578 MW of out-of-state wind energy contracts will expire by 2024, and contracts totaling at least an additional 1,764 MW of such contracts will expire by 2030. [Out-of-state figures derived from Ruling, Attachment C, Table 21 (“Renewable plants outside of CAISO attributed to CAISO loads”) and IRP modeling inputs file “RPSDatabasePublicSept2019”.]

⁵ Comments of the CAISO on the Commission’s baseline list of resources (Dec. 9, 2019).

⁶ See Ruling, Attachment A, Slide 139. This slide is based on capacity; the diversity shown would be substantially greater if shown on an energy basis.

RESOLVE to select thermal generation if economic as part of an optimal overall solution⁷), then the Commission should at least consider, qualitatively, the fact that some or all of the existing resource diversity that is being counted upon may not, in fact, persist. (See also our responses to Questions 7 and 10, and our comments under Section III.)

4. Provide any comments on any other assumptions

a. BTM solar

CalWEA strongly opposes the fixed assumption that behind-the-meter (“BTM”) solar installations will materialize as projected in the CEC’s 2018 Integrated Energy Policy Report (“IEPR”) Update, rather than being selected by the model as part of an optimal solution.⁸ This assumption is, in turn, based on the flawed assumption that the current Net Energy Metering (“NEM”) rates will continue indefinitely, despite the Commission’s commitment to review those rates with better information in the near-term.⁹ As a result of this flawed assumption, the estimated installed capacity of 7.3 GW of BTM solar in 2020 nearly triples to 20 GW by 2030 in the proposed RSP.¹⁰

While these assumed levels of BTM solar are included in the baseline resources, different levels of BTM solar are, in fact, included in the RESOLVE model. Therefore, CalWEA was able simply to “turn on” those scenarios to discover the incremental cost associated with the assumed baseline level of 20 GW of BTM solar. We found that reducing BTM solar by 4.5 GW in 2030 – *i.e.*, moving from the “Mid BTM PV” case of 20 GW in 2030 (which is reflected in the proposed RSP) to the “Low BTM PV” case of 15.6 GW in 2030 (a 4.5-GW reduction) – would save about \$278 million per year. Further moderating the growth of BTM PV would bring greater cost savings. Moreover, the \$278 million annual savings figure reflects only the

⁷ Ruling at 5.

⁸ Ruling at 8-9.

⁹ D.16-01-044 (January 28, 2016). (“[T]he quantitative analysis in our decision about the successor tariff is necessarily incomplete, and...a plan for reviewing the NEM successor tariff in 2019 is reasonable and realistic.”) This decision requires the CPUC to consider adjustments to the NEM 2.0 tariff in the future, and that evaluation is now underway (*see https://www.cpuc.ca.gov/General.aspx?id=6442463430*).

¹⁰ The No DER case in RESOLVE shows 7.3 GW of BTM solar in 2020.

installation costs associated with the 4.5-GW reduction of BTM solar; on the order of \$900 million would be saved based on a CPUC estimate of the subsidy associated with NEM tariffs.¹¹

Note that the moderated level of BTM PV (15.6 GW) still more than doubles capacity in 2030 compared to today's capacity; the assumed level of BTM solar in the proposed RSP is nearly three times today's capacity. The projected growth in BTM solar in the proposed RSP accounts for nearly 50% of the increase in total in-state renewable energy generation (RPS resources plus BTM PV) projected for 2030. (See results table in the Attachment.) This result – absent any policy consideration – is simply inconsistent with the IRP objectives of least-cost planning and resource diversity.

In the Commission order that began the implementation process for SB 350,¹² which established the IRP process, the Commission stated that the statute contemplates “comprehensive resource optimization.”¹³ It was further stated that preparing the Commission for the resource optimization analysis required in the IRP process will require “consistent methodologies for resource valuation and/or selection criteria across multiple resource types, for use in comparisons in all-source or multiple-source procurement”¹⁴ and “[c]onsistent cost-effectiveness analysis of demand-side and distributed energy resources, as well as identification of demand-side resource potential.”¹⁵ (Emphasis added.) More recently, in the Integrated Distributed Energy Resources proceeding (R.14-10-003), the Commission opted not to adopt a “societal cost test” for application only to DERs, stating:

A defining feature of integrated resource planning is the fair and unbiased consideration of both demand and supply side resources as potential solutions for

¹¹ In 2013, the CPUC forecast the cost associated with all NEM generation in 2020 (estimated to be approximately 5,573 MW) to be about \$1.1 billion per year (in \$2012). See *California Net Energy Metering Ratepayer Impacts Evaluation* at 4 and 6 (2013) (available at <https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=4292>). That translates to \$197,380/MW which, applied to 4.5 GW, amounts to over \$888 million annually.

¹² P.U. Code Section 454.51.

¹³ R.16-02-007, *Order Instituting Rulemaking to Develop an Electricity Integrated Resource Planning Framework and to Coordinate and Refine Long-Term Procurement Planning Requirements (“OIR”)*. February 19, 2016, at 13.

¹⁴ *Id.* at 15.

¹⁵ *Id.* at 16.

meeting system or societal needs. This feature is also a statutory requirement for the Commission’s Integrated Resource Planning process.¹⁶

Not only was the proposed RSP produced without modeling BTM solar as a candidate resource to be optimized, but, unlike in the 2017-18 IRP cycle, no cost sensitivity was performed to evaluate the cost of higher or lower levels of BTM solar. In the 2017-18 IRP cycle, the RESOLVE modeling results showed that reducing BTM solar to 9 GW from the initially assumed 16 GW would save ratepayers \$682 million/year in the 42 MMT case.¹⁷ Even this figure (which still did not reflect optimal levels) reflected only BTM-solar installation costs, not total ratepayer impacts. IRP (and related policy) decisions should be made with the total costs of all resource options fully transparent.

b. Assessment of RA capacity available from each CREZ

The assumed levels of deliverable wind and solar capacity in renewable energy zones within the CAISO balancing area (“CREZs”) have been substantially underestimated because that deliverable capacity does not reflect the RA values produced under the Commission’s new Effective Load Carrying Capability (“ELCC”) methodology for determining RA capacity values.¹⁸ This assumption should be corrected if any additional base case modeling runs are performed in this IRP cycle, or evaluated under a sensitivity later on in this cycle.

The generally lower QC values of wind and solar resources under the CPUC’s revised methodology – also consistent with the CAISO’s plans to revise its Deliverability Assessment Methodology – will free up thousands of megawatts of deliverability transmission capacity for new renewable energy and storage projects in all CREZs without the need for new deliverability transmission upgrades. Updating the IRP methodology using the new, ELCC-based, RA capacity values would bring several important benefits:

- The RSP will be able to identify substantially more wind, solar and storage generation capacity in most CREZs that would be deemed deliverable and can offer RA capacity, hence reducing the need for carbon-based RA resources;

¹⁶ Decision 19-05-019 (May 16, 2019) at p. 32.

¹⁷ September 19, 2017, *Ruling Seeking Comment on the Proposed Reference System Plan and Related Commission Policy Actions* Ruling, Attachment A, PDF-page 202.

¹⁸ This issue was addressed in an October 7, 2019, Ex Parte Communication to the Commission by CalWEA, the California Community Choice Association (“CalCCA”), and GridLiance West LLC.

- Much (if not all) of this capacity can be built without triggering Delivery Network Upgrades, and thus can be made available sooner, and at lower cost. Conversely, if existing deliverability capacity is not recognized in the RSP, unneeded new transmission capacity could be planned for;
- Resources can be identified for interconnection in locations where there is greater development potential, rather than in locations where development is highly unlikely, as occurred in the 2017-18 IRP; and
- As a result of all of the above, the IRP will be more likely to identify a portfolio that has a greater chance of being realized in a timely manner and at a lower cost, substantially increasing the odds of meeting our clean energy goals and RA capacity needs on time.

c. Battery Storage Capacity Value

CalWEA supports the new RESOLVE modeling assumption that, as the penetration of battery storage on the system increases, the proportional capacity value of each increment of storage capacity decreases.¹⁹ The capacity value of storage is likely to decline as penetration increases because “storage tends to flatten system peaks, requiring it to discharge over progressively longer durations and reducing the marginal capacity value of additional storage.”²⁰ In California, the capacity value of 4-hour energy storage falls precipitously as system penetration exceeds 5% of system peak, from 90% capacity value to approximately 60% at 10% penetration.²¹ (As discussed in response to Question 16, the current evaluation framework cannot fully evaluate the trade-offs between 4-hour batteries and higher-cost, longer duration storage with higher capacity values; thus, the RESOLVE model likely undervalues the role that longer-duration storage facilities, like pumped hydro storage plants, could play in the RSP.)

d. Moderated solar buildout

CalWEA agrees with the assumption in the 46 MMT Alternate Scenario that limits the annual buildout of solar capacity in the early 2020s to reflect what is very likely to be a more feasible buildout scenario than would be required under the Default case, based on Commission staff’s review of historical experience, including the historical maximum pace of development

¹⁹ Ruling at 5.

²⁰ “Moving beyond ‘rules of thumb’ for smart, cost effective storage deployment,” Nick Schlag, Dan Mullen and Kush Patel, *Utility Dive* (April 30, 2019). Available at: <https://www.utilitydive.com/news/moving-beyond-rules-of-thumb-for-smart-cost-effective-storage-deployment/553674/>.

²¹ *Ibid.*

over the past decade.²² As perhaps alluded to in the Ruling,²³ an additional factor supporting the moderated solar build-out is the nascent stage of many LSEs who must carry out the RSP and the uncertainty surrounding their ability to meet their basic RPS requirements, including their long-term contracting requirements.²⁴ Numerous CCAs have, for example, requested that the Commission relax the 65 percent RPS long-term contracting requirement,²⁵ which is a prerequisite to financing and building new renewable energy capacity. The RESOLVE model advanced the full 11,800 MW of solar capacity to 2023 in order to capture expiring tax credits, which would likely need to be spread out over the preceding years.²⁶ It seems unlikely, based on their current and recent levels of procurement, that most (if not all) CCAs will be in a position to procure at these high levels.

Additional factors supporting the moderated buildout include the necessary transmission build-out and potential supply-chain issues. Transmission owners would have great difficulty accommodating such a rapid generation buildout, in terms of building the infrastructure associated with interconnection requirements. CalWEA is aware that, even at the present time, transmission-owner staff are overwhelmed with current developments. Then there are various supply-chain issues that could arise with California's scale-up of solar PV in a global context. Analysts estimate that, to achieve photovoltaic module manufacturing levels of 20 GW per year, production of supply chain materials would need to increase 520 percent for polysilicon, 38 percent for tellurium, 160 percent for indium, and 30 percent for silver, from current levels.²⁷

²² Ruling at 19.

²³ Ruling at 20. ("[T]he 46 MMT Alternate Scenario represents a realistic but still aggressive goal for the electricity sector...This is especially true in light of the numerous new LSEs whose procurement choices will contribute to this goal.")

²⁴ R.18-07-003, Proposed Decision of Administrative Law Judge Thomas on 2019 Renewables Portfolio Standard Procurement Plans (Nov. 19, 2019) at Section 12.

²⁵ *Id.* at 57.

²⁶ Ruling at Attachment A, slides 122 and 123.

²⁷ Dustin Mulvaney, *Solar Power: Innovation, Sustainability and Environmental Justice* (April 2019), citing the U.S. DOE's SunShot Initiative.

5. Provide any comments on the scenarios and sensitivities modeled

The sensitivity that extends the solar investment tax credit only, without exploring extended tax credits for other resources, was not justified. Extension of many renewable energy tax credits are being discussed in Congress,²⁸ and there is particular support for extending tax credits for nascent renewable technologies, such as offshore wind.²⁹

6. Provide any comments on the common metrics compared across cases

No comment at this time.

B. Questions Regarding Section 3.2

7. Provide any comments on the results from the major scenarios or sensitivities analyzed by Commission staff to develop the RSP recommendation

CalWEA joins the CAISO in calling for Energy Division Staff to re-run the RESOLVE model to identify an optimal, reliable portfolio without the 2,000 MW of generic capacity that staff added *post hoc* to the 46 MMT Portfolio and without the assumed availability of OTC resources after 2020.³⁰ CalWEA recommends one change to the CAISO’s proposal, however: rather than reducing the import energy limit to match the resource adequacy import limit (*i.e.*, to 5,000 MW), that limit should apply only during hours when RA capacity counting is critical, *e.g.*, when gross electric demand is higher than the 95th percentile. As the Ruling explains in discussing why this limit was applied to SERVM, this constraint would approximate the stressed hours of the year that the resource adequacy program is intended to cover.³¹

²⁸ See, *e.g.*, discussion draft legislation by Rep. Mike Thompson, “The Growing Renewable Energy and Efficiency Now, or GREEN, Act,” which would extend the federal Investment Tax Credit for solar and offshore wind for five years, keep a 60 percent Production Tax Credit for onshore wind in place for five years, and include incentives for energy storage.

<https://mikethompson.house.gov/newsroom/press-releases/chairman-thompson-ways-and-means-democrats-unveil-growing-renewable-energy>

²⁹ See, *e.g.*, Norton Rose Fulbright, PTC Extension Legislation Update (Dec. 6, 2019). (“...the one part of this bill that has a better chance is for offshore wind [which is] a little more nascent.”) Available at: <https://www.projectfinance.law/podcasts/2019/december/ep79-ptc-extension-legislation-update/>

³⁰ See note 3, *supra* at p.5. (CAISO Nov. 27 *Ex Parte*.) While the CAISO offered two other possible solutions, the one noted here was referenced as the “first and most comprehensive solution.”

³¹ Ruling at 16. While there are more accurate ways of selecting hours on which to impose import limits, for example, selecting the hours that CAISO considers critical for RA capacity counting, they would be more complicated to implement.

With these changes, the RESOLVE model can re-optimize the portfolio, better determine how much RA capacity is warranted on what timeline, and better characterize the RA need. That is, given the retirement of Diablo Canyon, are baseload resources needed (as suggested in the Ruling³²), or does the need have more to do with meeting high loads as the sun sets? Moreover, sensitivities can and should be applied to the results to explore the diversity premium that would be associated with substituting more diverse resource options to meet the identified capacity need. For further discussion on this point, see our comments in Section III.

In addition, as discussed in CalWEA’s response to Question 4 (sub-item b), the model’s deliverable capacity does not reflect the RA values produced under the Commission’s new ELCC methodology for determining RA capacity values. This assumption should be corrected if any additional base case modeling runs are performed in this IRP cycle, or evaluated under a sensitivity later on in this cycle.

8. *Comment on the modifications to SERVM made by Commission staff to approximate RESOLVE’s PRM constraint, which limits the amount of imports that can count towards resource adequacy. Were the changes appropriate? Why or why not?*

As indicated in our response to Question 7, CalWEA agrees with the modification made to SERVM regarding the import energy limit, which appropriately approximates constrained time periods.

9. *Comment on the manual addition of 2,000 MW of “generic effective capacity” in order to produce a portfolio with an LOLE result of less than 0.1. Would you recommend a different way of depicting the reliability gap in the portfolio? If so, describe in detail.*

Please see CalWEA’s response to Question 7.

C. Questions Regarding Section 4.2

10. *Do you support the 46 MMT Alternate Scenario as the basis for the GHG emissions goal for 2030 to be affirmed by the Commission? Why or why not? If you propose a different scenario, explain your rationale.*

CalWEA agrees with the modified, and more realistic, near-term pace of the solar buildout reflected in the 46 MMT Alternate Scenario, as discussed above in response to Question 4 (sub-item d). This scenario also has the important advantage of providing the Commission and

³² Ruling at 24.

other agencies with time to deliberatively, but swiftly, consider the costs and benefits of adopting a more diverse resource portfolio in the next IRP cycle, while remaining on the trajectory to meet the state’s 2030 GHG goals, even with the retirement of the Diablo Canyon nuclear plant in 2024 and 2025.³³ (See Section III for further discussion of this point.)

However, additional modeling is warranted immediately to properly characterize RA resource needs, including the timing of needed resources. As explained in the Ruling,³⁴ other than the pace of the solar buildout, the primary change in the 46 MMT Alternate Scenario was the assumed partial extension of OTC units. Then, 2,000 MW of “generic” effective capacity (i.e., capacity with perfect RA characteristics) was manually added in 2026 to the SERVM production cost modeling to ensure reliability. There are three significant problems with these reliability-related assumptions:

- Approximately half of the OTC units scheduled to retire at the end of 2020 are instead extended and relied upon for three years (through the end of 2023). We concur with the view expressed by the CAISO that the OTC unit extensions should be viewed only as backstop capability;³⁵
- The addition of 2,000 MW of generic capacity produced a portfolio that is considerably more reliable than necessary. While a reliable portfolio must achieve a loss of load expectation (“LOLE”) of at least 0.1, the 46 MMT Alternate achieves LOLE results of 0.07, 0.056 and 0.016 for the years 2022, 2026 and 2030, respectively.³⁶ These results indicate that significantly fewer reliability resources are likely to be needed than the generic 2,000 MW included in the Proposed RSP.
- The 2,000 MW of added generic capacity was not adequately characterized. As the CAISO has noted, such capacity “has no operating characteristics; is not specified as renewable or non-renewable; has no greenhouse gas emissions profile; cannot be identified as a single resource or many resources; and has no specific location on the grid.”³⁷ We do not know, therefore, how the 3,300 MW of RA resources ordered by the Commission in the IRP “Procurement Track”³⁸ compares to this 2,000 MW of generic capacity, or to what extent the 3,300 MW mandate has been justified.

³³ Ruling at 19-20.

³⁴ Ruling at pp. 16-19.

³⁵ See note 3, *supra* at 4. (CAISO Nov. 27 *Ex Parte*.)

³⁶ Ruling at Table 4.

³⁷ See note 3, *supra* at 3. (CAISO Nov. 27 *Ex Parte*.)

³⁸ D.19-11-016 Requiring Electric System Reliability Procurement for 2021-2023 (Nov. 7, 2019).

Therefore, CalWEA joins the CAISO in calling for Energy Division Staff to re-run the RESOLVE model to identify an optimal, reliable portfolio without the 2,000 MW of generic capacity that staff added *post hoc* to the 46 MMT Portfolio and without the assumed availability of OTC resources after 2020.³⁹ CalWEA recommends one change to the CAISO’s proposal, described in response to Question 7, above. This modification will improve RESOLVE’s ability to address both reliability and energy needs, although ideally the optimal portfolio’s reliability would also be tested in SERVM.

Based on the “stack analyses” that were relied upon for the IRP Procurement Track decision (a very crude tool compared with RESOLVE and, especially, SERVM analysis), CalWEA remains unconvinced that the 3,300 MW of RA resources ordered by the Commission are needed in the 2021-23 timeframe, particularly if OTC resources are available as a backstop.⁴⁰ Our skepticism is underscored by Energy Division’s SERVM analysis of 46 MMT Alternate, which demonstrates that adding 2,000 MW of “generic” capacity would exceed reliability requirements in all years modeled after the addition of the generic capacity, particularly if OTC units are available as a backstop.

This lack of necessary information warrants the Commission’s resources in re-running the RESOLVE case to inform its adopted RSP. The results, if confirmed by SERVM, could also be used to modify the phase-in schedule for the 3,300-MW RA-procurement requirement, especially the 50% required after 2021,⁴¹ since the RESOLVE model was configured to run additional modeling years, including 2020, 2021 and 2023. At the same time, the Commission could begin to evaluate whether a more diverse set of renewable resources, which could provide greater RA capacity in the mid-2020s timeframe, should be planned for, as discussed further in Section III, by looking at the incremental costs of adding diverse resources in the mid-2020s and 2030.

³⁹ See note 3, *supra* at 5. (CAISO Nov. 27 *Ex Parte*.) While the CAISO offered two other possible solutions, the one noted here was referenced as the “first and most comprehensive solution.”

⁴⁰ See CalWEA’s comments on Proposed Decision Requiring Electric System Reliability Procurement for 2021-2023 (October 2, 2019).

⁴¹ See note 38 *supra* at 47 and Conclusion of Law 9. (Proc Track Decision.)

E. Questions Regarding Section 5.2

11. Are you concerned about the risk of overreliance on solar as part of the recommended portfolio? Why or why not?

Yes, CalWEA agrees with the Ruling's discussion⁴² of the risks of "putting all of California's eggs in a few baskets." The Commission should be concerned with the recommended portfolio's overreliance on solar PV and battery storage, namely, a total of over 46 GW of solar photovoltaics (including BTM solar) and 14 GW of battery storage by 2030 under both the 46 MMT Default and Alternate Scenarios – levels never before seen in any electric system anywhere in the world, with much less capacity from other resource types and with the existing base of diverse resources at risk (see response to Question 3, sub-item b).

As the Ruling notes, these risks include development risks, cost risks, and operational risks (given that batteries will be used more heavily than they are currently) and the overall system-reliability risk that comes from untested reliance of the system on just two technologies – solar PV (including BTM PV) and battery storage – that would, under the 46 MMT Default and Alternate Scenarios, provide more than 50% of overall supply capacity by 2030 and meet a very high fraction of load. In addition to these risks are the potential risks associated with transmission-infrastructure buildup and supply-chain issues noted in our response to Question 4 (sub-item d). All of these risks also create a risk of not meeting the state's GHG targets on time.

12. Are you concerned about the risk of overreliance on battery storage as part of the recommended portfolio? Why or why not?

Yes; please see our response to Question 11. The CAISO has expressed concern regarding the operability of a predominantly solar and storage portfolio.⁴³

13. Is the retention of most or all of the current thermal generation fleet reasonable and realistic? Why or why not?

As discussed above in response to Questions 7 and 10, further study is needed to identify the amount and characteristics of needed RA resources in the near-term and 2030 timeframes, and to evaluate the incremental cost of adding diverse resources that would meet or reduce that RA need. It may make sense to retain most or all of the current thermal generation fleet, if

⁴² Ruling at 22-23.

⁴³ R.16-02-007. Notice of *Ex Parte* Communication by the California Independent System Operator Corporation at 1 (November 1, 2019).

necessary, to allow sufficient time to conduct further study and/or to allow sufficient lead-time to accommodate development of the identified diverse resources that would then enable a greater fraction of the existing generation fleet to be permanently retired.

We note, for example, that the 2045 High Electrification sensitivity that was run for higher levels of wind⁴⁴ showed that adding just under 7 GW of offshore wind and 3 GW of out-of-state wind would allow for the retirement of 5.2 GW of gas capacity,⁴⁵ whereas adding 23 GW of out-of-state-wind-with-new-transmission would allow for the retirement of just 1 GW of gas capacity (compared to the base case retirement of 4.5 GW).⁴⁶

14. Do you have additional comments about the portfolio associated with the 46 MMT Alternate Scenario?

Not at this time, other than as relate to our comments under Section III.

C. Questions Regarding Section 6.2

15. Should the Commission take steps to begin development of transmission and/or generation from geothermal resource areas? If so, what steps? If not, why not?

Please see Section III for our fuller response to this and related questions. At this time, CalWEA believes that there is insufficient information to justify mandating one resource type over another for the purpose of adding diversity to the portfolio.

With regard to geothermal resources, we urge the Commission to evaluate whether existing geothermal resources, as well as other existing diverse resources, are at risk of retirement and whether specific actions are warranted to preserve this existing diversity, which the IRP analyses presume will continue to exist. (Also see our response to Question 3, sub-item b.)

16. Should the Commission take steps to support the development of at least one pumped storage facility in California? If so, what steps? If not, why not?

⁴⁴ Ruling at Attachment A, Slide 161.

⁴⁵ Figure pulled from RESOLVE modeling results: Framing2045_HighElectrification_OSW_20191104v. Also see Ruling at Attachment A, slide 161.

⁴⁶ *Id.* at Framing2045_HighElectrification_FullOOSTx_20191104. Also see Ruling at Attachment A, slide 161.

Please see Section III for our fuller response to this and related questions. At this time, CalWEA believes that there is insufficient information to justify mandating one resource type over another for the purpose of adding diversity to the portfolio.

With regard to storage specifically, it is important that the Commission identify the storage investments that provide the greatest value to the system. CalWEA agrees with experts who study storage that “[b]ringing more rigor into our thinking and treatment of storage will help decision-makers optimize the type, size, and timing of storage investments. It can also guide market participation rules and eligibility requirements.”⁴⁷ Current evaluation frameworks cannot evaluate the trade-offs between 4-hour batteries and higher-cost, longer duration storage with higher capacity values.⁴⁸ Therefore, the modeling of longer-duration storage resources deserves serious review and potential revision for the next IRP cycle. In addition, thought should be given to the fact that current IRP modeling techniques do not fully differentiate the value of storage that is co-located with solar resources and operated for the benefit of the seller or purchasing LSE versus the value of storage controlled by the CAISO in locations that maximize system benefits.

17. Are there other actions the Commission should take specifically with respect to replacement capacity for the Diablo Canyon nuclear plant? Describe in detail.

As explained further in CalWEA’s response to Question 7 and in Section III, the need for RA resources should be better defined, in terms of how much RA capacity is warranted, on what timeline, and characteristics. The retirement of Diablo Canyon does not necessarily mean that baseload resources are best suited to fulfill the “generic” capacity need that has been identified, given that the critical reliability period is when loads increase as the sun sets.

18. Are there other actions the Commission should take with respect to development of any other types of capacity or resources such as offshore or out-of-state wind? Describe in detail.

Please see Section III for our fuller response to this and related questions. At this time, CalWEA believes that there is not sufficient information to justify mandating one resource type over another for the purpose of adding diversity to the portfolio.

⁴⁷ See note 20 *supra*. (Schlag et al., *Utility Dive*.)

⁴⁸ *Ibid.*

With regard to offshore wind, specifically, we believe that the massive technical resource potential of 114 GW⁴⁹ and potential cost savings associated with offshore wind over the long term warrants the Commission’s substantial attention to this resource. A recent study conducted by E3 for Castle Wind LLC⁵⁰ found that offshore wind could be a least-cost resource option for meeting California’s long-term GHG goals. Specifically, the study found that 7-9 GW of offshore wind capacity in the state’s energy mix by 2040 would produce ratepayer savings of approximately \$1 to \$2 billion on a net present value basis.⁵¹ Offshore wind generates most of its energy during valuable and higher-emission evening hours, and thus can reduce the need for battery storage as well as baseload units.⁵²

CalWEA agrees with the Ruling that assumptions regarding offshore wind should be further developed with stakeholder vetting so that offshore wind can be modeled as a default resource available for selection in the next IRP cycle. As part of that, the CPUC could analyze, or work with other entities to analyze, transmission interconnection options along the coast where existing power plants have closed or will be closing and freeing up transmission capacity. The Commission should consider whether these sites should be prioritized for access by offshore wind, given the potentially massive resource potential for offshore wind. Lastly, given commercial interest demonstrated for the mid-2020s,⁵³ consideration should be given to making a limited amount of offshore wind capacity available to the model in that timeframe. Developing early experience in deploying floating platforms off the California coast is likely to be very important in building momentum for larger deployments. Please see Section III for a description of CalWEA’s modeling run along these lines.

⁴⁹ Walter Musial, et. al., National Renewable Energy Laboratory, *Potential Offshore Wind Energy Areas in California: An Assessment of Locations, Technology, and Costs* at 7 (December 2016).

⁵⁰ Energy + Environmental Economics (E3), *The Economic Value of Offshore Wind Power in California* (August 2019).

⁵¹ *Id.* at p. 33.

⁵² *Id.* at p. 21.

⁵³ See, e.g., *Windpower Engineering & Development*, “MBCP signs up for about 1,000 MW of California’s future floating wind energy,” (August 15, 2019). Available at <https://www.windpowerengineering.com/mhcp-signs-up-for-about-1000-mw-of-californias-future-floating-wind-energy/>.

F. Questions Regarding Section 7.2

19. Comment on the recommendation to use the 46 MMT Alternate Scenario as the reliability and policy-driven base cases for the next CAISO TPP

Please see our response to Question 7 above, which discusses the need to update and refine the 46 MMT Alternate Scenario. CalWEA supports using that updated case along with the current 46 MMT Alternate Scenario as the two reliability and policy-driven base cases for the next CAISO TPP. The transmission solutions that are identified in the TPP process will be different for each of these cases, and the upgrades that are common to both of them will constitute least-regret transmission upgrades that should be pursued. (The principles of least regrets planning were adopted in the CAISO tariff in relation to Policy Transmission Upgrades,⁵⁴ which would precisely apply to these TPP runs for the IRP.)

20. Comment on the recommendations for policy-driven sensitivities around curtailment in particular transmission zones and the associated impact on EO or full deliverability for renewables

CAISO's revamp of its deliverability assessment methodology, noted earlier in our response to Question 4 (sub-item b), not only will significantly increase the amount of "transmission-upgrade-free" FCDS wind and solar generation capacity from various CREZs but will also fundamentally change how the CAISO's generation interconnection process influences transmission congestion in the CAISO footprint via the Off-Peak Deliverability Assessment component of the new deliverability assessment methodology. Once the new CAISO deliverability assessment methodology is fully implemented, CAISO's various study group reports produced under its Generator Interconnection Deliverability Allocation Procedures ("GIDAP") will not only provide invaluable information regarding congestion for newly queued generation projects but also the needed transmission upgrades to address such congestion. This should enable CAISO and the Commission to develop significantly more accurate estimates of the level of wind and solar generation that can be accommodated from various CREZs in and around the CAISO footprint at various levels of congestion as well as the associated transmission upgrade costs for use in the future IRP cycles.

For this 2019-20 cycle, however, CalWEA emphasizes that the level of energy-only ("EO") capacity in a CREZ is determined under one very unique operating system condition

⁵⁴ California Independent System Operator Corp., 133 FERC ¶ 61,224 (2010).

(super peak load plus multiple contingencies) and, as a result, does not necessarily translate into transmission congestion from that CREZ, which is a function of 8,760 hours of operation under significantly less stringent operating conditions. Hence, CalWEA recommends that the level of EO capacity from various CREZs be significantly raised to allow TPP to determine whether economic transmission upgrades will be required to address potential transmission congestion, if any. Such an outcome is consistent with the original intent of the IRP/TPP coordinated studies to realize the most economic integrated resource plan for California.

21. Comment on the suggested process for seeking formal input on busbar mapping of the proposed RSP.

CalWEA supports the proposal to have the busbar mapping process proceed on a parallel path with the adoption of the RSP. We hope that this process will enable our suggested change to the methodology (supported also by CalCCA and GridLiance West⁵⁵) to be evaluated as discussed in response to Question 4 (sub-item b), which will demonstrate the true, greater potential of deliverable wind and solar capacity, without necessarily triggering transmission upgrades.

We appreciate the level of detail and the added transparency that has been provided to this important element of the IRP process.

G. Questions Regarding Section 8.2

22. For a particular resource type and zone, where the aggregated resources in LSE plans exceed the resource potential, this suggests that some portion of the selected resources are non-viable from an economic, environmental, or land use perspective. What level of exceedance over resource potential is acceptable, if any, before staff should reallocate resources when aggregating resource choices to form a PSP?

Exceedance over the Commission-identified resource potential in each zone should be acceptable only where specific proposed projects have been identified that exceed the estimated potential. Actual development activity is the best indication of potential because “on the ground” evaluation has occurred to evaluate the myriad site-specific aspects that go into project development.

⁵⁵ See note 18 *supra*.

23. *What showings should LSEs be required to make to demonstrate that deviations, if any, between the aggregation of LSE portfolios and the RSP are appropriate and necessary to better adhere to the IRP statutory requirements?*

Please see previous response.

24. *What criteria should Commission staff use to determine whether transmission upgrade needs identified by LSEs in their IRPs are appropriate to be reflected in the PSP and the TPP reliability base case adopted by the Commission?*

Please see our response to Question 19, above. Policy-related transmission upgrades should be built only in response to the results of least-regrets transmission planning as provided in the CAISO tariff.

25. *Provide any other comments on the Commission staff-proposed aggregation approach, including any process suggestions for how LSEs can more effectively participate or give input to the planning process.*

No comment at this time.

III. ADDITIONAL COMMENTS

A. The Commission Should Study the “Insurance Premium” Associated with a More Diverse 46 MMT Portfolio to Address the Risks of a Portfolio Lacking Resource Diversity and to Set the Stage for Longer-Term GHG Goals

Various cases and sensitivities involving diverse (i.e., non-PV, non-battery) resources were conducted for this IRP cycle that indicate that greater resource diversity can lower the cost of meeting GHG goals under stringent 2030 GHG targets or in the post-2030 timeframe.⁵⁶ What is missing, however, is a more comprehensive analysis comparing all promising diversity options, and combinations of options (including the preservation of existing diverse resources), to determine what the incremental total cost would be if the 46 MMT Alternate portfolio were

⁵⁶ See, e.g., Ruling at Attachment A, slides 95, 103, 113, 161 and 166. These slides indicate that: 1,600 MW of offshore wind would reduce incremental costs in the 30 MMT, 2030 portfolio by ~\$25 million/year if OOS wind is not available; some geothermal is included in the 30 MMT, 2030 portfolio if either solar or battery costs are higher than expected; and out-of-state wind, offshore wind, and/or a small amount of geothermal in 2045 displaces in-state solar and batteries and lowers the cost of meeting long-run GHG goals.

reasonably diversified in the mid-2020s and 2030. As importantly, as discussed in our response to Question 10, these diversity options must be tested for loss of load expectation in the SERVM model for 2030, and the years leading up to 2026, to determine how much these options could reduce the need for storage and thermal RA resources, which will improve the cost-effectiveness of the options.

With this information, the Commission will be able to make a reasonable judgement about whether the incremental cost of a more diversified portfolio is warranted to reduce the “all-eggs-in-one-basket” risks, which are difficult, if not impossible, to quantify. At this point, however, there is insufficient information to justify mandating one resource type over another for the purpose of adding diversity to the 46 MMT Alternate portfolio.⁵⁷

As we discuss in response to Question 7, the Ruling notes that the 2,000 MW of generic capacity that it identified as needed in 2026 “will need to be defined more precisely and procured by LSEs at some point in the near future” and it asks “what types of resources should provide the additional 2,000 MW of needed effective capacity?”⁵⁸ In answering these questions, the Commission would ideally take the opportunity also to evaluate whether diverse, higher-capacity-factor renewable resources and/or pumped storage could serve, or partially serve, this need at an acceptable incremental cost, which could be considered a risk-insurance premium. These analyses should treat (non-diverse) BTM solar resources as candidate resources, rather than resources that are assumed to be competitive. As the Ruling states, “there is the possibility that the Commission should recommend or require the development of a different portfolio of resources, or additional resources, beyond the portfolio identified by RESOLVE as the optimal one.”⁵⁹

⁵⁷ Geothermal resources (1.7 GW) that were included in the 2018 Preferred System Plan in 2030 were replaced by solar and storage in the 46 MMT Default and Alternate Cases. (Ruling at Attachment A, slides 67, 92 and 125.) In the high-PV-cost sensitivity, only a small amount (135 MW) of geothermal was selected (Ruling at Attachment A, slide 107) and only in the most stringent 30 MMT 2030 case. In the high-cost battery sensitivity, 1.3 GW of geothermal is found to be cost-effective in the 30 MMT 2030 case (Ruling at Attachment A, slide 110). Otherwise, more out-of-state wind was selected in all cases (offshore wind was not made available to the model, but other sensitivities show offshore wind to be potentially closely competitive with out-of-state wind).

⁵⁸ Ruling at 22.

⁵⁹ Ruling at 23.

Providing an example of such an analysis, CalWEA shows that a more diverse portfolio can, in fact, come at a lower cost. CalWEA ran the RESOLVE model for a scenario in which the “Low BTM” level of solar was selected (15.6 GW vs. the 20 GW in the “Mid BTM” level reflected in the proposed RSP) in 2030. In addition, we added 500 MW of offshore wind in 2026. The results showed a reduction in total costs of \$183 million per year (reflecting the saved installation costs of BTM solar, not much higher NEM-related costs), a 207-MW reduction in battery storage, a net decrease of 2,300 MW of total solar,⁶⁰ and a slight reduction in onshore wind. See results table in the Attachment.

As time likely does not allow for a comprehensive analysis of diversity options to be conducted in time for the current IRP cycle, a more involved analysis should be conducted as soon as possible (perhaps in conjunction with SB 100 activities) for consideration at the outset of the 2021-22 IRP cycle, possibly in another expedited Procurement Track. Attention is also needed to determine how any resource-diversity requirements would be specifically implemented pursuant to P.U. Code Sections 451.51(c) and 451.51(d), which authorize the Commission to direct the investor-owned utilities to procure renewable integration resources on behalf of the electricity system as a whole and allocate those costs on a non-bypassable basis to all benefitting customers, and to permit procurement of renewable integration resources by CCAs to fulfill their portion of the renewable integration requirements, and to require long-term commitments to such resources.⁶¹

Advancing, in the near-term, those resource-diversity options that can be obtained at a reasonable cost premium to address the various risks associated with a portfolio that would otherwise be over-reliant on a narrow set of resources will build the momentum necessary to exceed the 46 MMT target in 2030 or sooner. As the 2045 sensitivity modeling and other studies indicate, a more diverse set of resources can lower the cost (and risks) of meeting long-term GHG goals.⁶² Beginning to deploy those resources sooner rather than later will create the experience and capabilities needed to build the momentum for larger-scale deployment of these resources after 2030, which will position the state to accelerate its GHG targets.

⁶⁰ 2.2 GW of additional in-front-the-meter solar compensated in part for the loss of 4.5 GW of BTM solar.

⁶¹ See note 38 *supra* at 36-37. (CPUC Procurement Track Decision.)

⁶² Ruling at Attachment A, slide 166, and note 50 *supra* (E3 Castle Wind study).

B. In Order for LSE Procurements to Produce the RSP, the Commission Must Allocate Integration-Resource Requirements or Costs to LSEs Based on Their Individual Contribution to the Need for These Resources

As the Commission considers whether to mandate diverse resources in order to reduce risks associated with over-dependence on limited technologies, it will also need to take steps to secure the diversity identified as cost-effective in its adopted RSP. The proposed RSP includes additional wind resources and it assumes that existing diverse resources (geothermal, biomass, small hydro and wind) will continue to operate when, in fact, they are at risk, as discussed in response to Question 3 (sub-item b), above. To secure that diversity, it is critical that the Commission allocate integration-resource requirements or costs to LSEs based on their individual contribution to the need for these resources. Absent these cost signals, procurement decisions will not take into account the indirect costs that are factored into the IRP analysis, and thus will not collectively produce results similar to the RSP. Integration costs include flexible-RA resources⁶³ as well as any integration resources that are identified and mandated in the IRP process.⁶⁴

Implementing these cost signals is not only necessary to provide accurate cost signals that will encourage LSEs to minimize the potentially significant indirect system integration costs associated with their resource portfolios, but is also now required by the passage of AB 1584 (adding P.U. Code Sec. 397), which was signed into law on October 2, 2019, and becomes effective January 1, 2020.

IV. CONCLUSION

Wherefore, for the above reasons, CalWEA urges the Commission to: adopt the GHG emissions target of 46 MMT for 2030 with a realistic pace for assumed near-term solar and battery build-out; re-run the RESOLVE model to better characterize the need for RA resources in the near-term through 2030; evaluate whether diverse resource options could fulfill part or all of

⁶³ See CalWEA's Comments on Preliminary Scoping Memo and Determinations in R. 19-11-009 (Dec. 3, 2019).

⁶⁴ The IRP Procurement Track decision (D.19-11-016) states (at Finding of Fact 6), “Additional electric capacity resources are necessary to ensure integration of large volumes of renewable energy being procured by LSEs.” (Emphasis added.)

that need while reducing the various risks associated with over-relying on a narrow set of technologies; reconsider the schedule for the addition of 3,300 MW of RA resources in the 2021-2023 timeframe; conduct a more comprehensive analysis of resource-diversity options, including BTM PV resources, as soon as possible for consideration at the outset of the 2021-22 IRP cycle; advance, in the near-term, those resource-diversity options that can be obtained at a reasonable cost premium; and meanwhile ensure that integration resource needs and costs are assigned to LSEs based on their causation for those resource needs and costs. Taken together, these steps will help build the momentum necessary to exceed the 46 MMT target in 2030, or soon thereafter, with a more-diverse and lower-cost portfolio.

We look forward to further discussion of these issues.

Respectfully submitted,

/s/ Nancy Rader
Nancy Rader
Executive Director
California Wind Energy Association
1700 Shattuck Ave., #17
Berkeley CA 94709
Telephone: (510) 845-5077 x1
Email: nrader@calwea.org

On behalf of the California Wind Energy Association

December 17, 2019

ATTACHMENT
RESULTS FROM CALWEA'S RESOLVE RUNS

Added Resources	Scenario			Units
	PUC Proposed Reference System Plan (RSP)	Proposed RSP with 4.5 GW Less BTM PV	Proposed RSP with 4.5 GW Less BTM PV & 500 MW Offshore Wind Added in 2026	
Gas	-	-	-	MW
Biomass	-	-	-	MW
Geothermal	-	-	-	MW
Hydro (Small)	-	-	-	MW
Wind	2,837	2,837	2,667	MW
Wind OOS New Tx	-	-	-	MW
Offshore Wind	-	-	500	MW
Solar	11,774	14,650	14,002	MW
Customer Solar	-	-	-	MW
Battery Storage	11,384	11,376	11,178	MW
Pumped Storage	-	-	-	MW
Shed DR	222	222	222	MW
In-State RPS Resources	14,611	17,487	17,168	MW
Customer Solar	12,828	8,332	8,332	MW
Solar PV as % of Total RPS Resources	90%	89%	88%	
Consumer Solar Addition as % of Total Renewable Addition	47%	32%	33%	
Total 2030 Resource Cost	45,234	44,956	45,051	\$MM/yr
Change in Total Cost Compared to Proposed RSP	-	(278)	(183)	\$MM/yr

VERIFICATION

I, Nancy Rader, am the Executive Director of the California Wind Energy Association. I am authorized to make this Verification on its behalf. I declare under penalty of perjury that the statements in the foregoing copy of "Comments of the California Wind Energy Association on Proposed Reference System Plan and Related Policy Actions" are true of my own knowledge, except as to the matters which are therein stated on information and belief, and as to those matters I believe them to be true.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on December 17, 2019, at Berkeley, California.

/s/ Nancy Rader

Nancy Rader
Executive Director
California Wind Energy Association