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 INDEPENDENT SYSTEM OPERATOR CORPORATION ON ADMINISTRATIVE LAW JUDGE'S RULING SEEKING COMMENT ON PROPOSED SYSTEM REFERENCE PLAN AND RELATED COMMISSION POLICY ACTIONS

Roger E. Collanton
General Counsel
Anthony J. Ivancovich
Deputy General Counsel
Anna A. McKenna
Assistant General Counsel
Jordan Pinjuv
Senior Counsel
California Independent System Operator Corporation
250 Outcropping Way
Folsom, CA 95630
Tel.: (916) 351-4429
Fax: (916) 608-7222
jpinjuv@caiso.com

Attorneys for the California Independent System Operator Corporation

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I. Introduction

The California Independent System Operator Corporation (CAISO) submits these comments in response to questions raised in the Administrative Law Judge's Ruling Seeking Comment on Proposed Reference System Plan and Related Commission Policy Actions (Ruling) and the Commission's two-day integrated resource plan (IRP) workshop held on September 25 and 26 (IRP Workshop).

The CAISO appreciates the Commission's efforts to develop the IRP proposal. The CAISO's comments center around the following major topics:

- The CAISO strongly supports the Commission conducting production cost modeling to validate the RESOLVE results. The CAISO appreciates the additional effort and the Commission's responsiveness to party comments on this topic. While this is a step forward, the CAISO believes further analysis should focus on the plan's capability to meet the CAISO system reliability requirements rather than the planning reserve margin. To effectively consider the Energy Division staff's proposed production cost modeling analysis and other modeling analyses to be submitted by parties (including the CAISO), the CAISO requests that the Commission articulate a process to allow parties to enter their modeling into the evidentiary record with sufficient time to vet the both the models and their outputs.

- The CAISO remains concerned that baseline assumptions in the RESOLVE modeling unduly bias results in favor of in-state solar resources. These assumptions include (1) a pre-determined, flat

emissions rate for all imported energy without regard to the characteristics of the underlying generation resource, (2) no allowance for economic gas-fired resource retirement across the 40 year planning horizon, (3) an overly optimistic net export assumption, and (4) other load modifier assumptions such as the achievable level of energy efficiency. All of these assumptions tend to overestimate the flexible capability of resources within the state, discount out-of-state renewables, overestimate the capability to export oversupply, and underestimate renewable curtailment. The CAISO believes that adjusting these assumptions and using a production cost model will produce more realistic and reliable results.

- During the IRP Workshop, CAISO presented a series of questions regarding the connection between the IRP and the CAISO's transmission planning process (TPP). The CAISO provides answers to many of these questions in response to Ruling Questions 12 and 23. CAISO proposes a pathway for the Commission's renewable policy intent to be communicated to the CAISO under a new IRP process. In order for this process to be effective, the CAISO needs as much detailed information as possible on the MW quantity and location of new resources. Using the CAISO's transmission "rule of thumb" figures for "energy only" is an insufficient substitute for actual detailed resource information. The "rule of thumb" figures will not support a level of transmission modeling that will be helpful and actionable for stakeholders. CAISO supports the Commission staff suggestion to learn more about commercial interest via a request for offers/interest. Lastly, renewable portfolios to the CAISO, whether with or without out-of-state resources, should be cumulative over time to avoid confusion and uncertainty.

- As noted in previous comments, CAISO seeks greater clarity on exactly how the Greenhouse gas (GHG) Planning Price should be used by load serving entities (LSEs) in preparing their individual IRP plans. The current proposal in the Ruling seems to offer contradictory guidance. CAISO looks forward to reviewing additional modeling conducted by interested parties to shed more light on this issue.

II. CAISO Responses to ALJ Workshop Questions

The CAISO has addressed select questions presented in the Ruling below. The relevant questions are reproduced in bold prior to the CAISO response. Questions are numbered in accordance with the numbering in the Ruling.

1. **Please comment on the appropriateness of the baseline resources included in the RESOLVE model. What changes would you make and why?**

The CAISO has concerns regarding how the baseline resource assumptions affect the geographic and technological diversity of incremental resources selected in the RESOLVE model. There are several assumptions that tend to drive the modeling results to favor in-state solar rather than a more diverse portfolio of renewable generation. In addition there are assumptions that overestimate the flexible capability of resources within the state and overestimate the capability to export oversupply (and therefore reduce curtailment). The CAISO recommends that the Commission modify these assumptions, as described in more detail below.

A. ***Greenhouse Gas Emissions Rates for Out-of-State Resources***

The RESOLVE model contains GHG emissions rates for all out-of-state resources that drive the results to favor in-state renewable generation. The CAISO notes that the RESOLVE model includes an emissions rate for out-of-state renewable resources which biases results when GHG emissions is the binding constraint. The RESOLVE model uses the California Air Resources Board (CARB) deemed rate of 0.428 MT/MWh for all out of state resources, including renewable resources.[1] This GHG emissions rate is higher than the GHG emissions rate for a combined cycle gas turbine (CCGT) in RESOLVE. To address this issue, the RESOLVE results have an after-the-fact adjustment (offset) of 2.8 MMT to the total CAISO GHG emission. However, this after-the-fact adjustment does not change the optimization results in the RESOLVE model (see also CAISO response to Question 16).

B. ***Flexibility of the Remaining Generation Fleet***

As other parties have noted, there is no resource retirement assumed across the IRP time horizon beyond the retirement of units subject to the State Water Resource Control Board's once-through-cooling (OTC) policy and the Diablo Canyon Power Plant. This assumption very likely overestimates the quantity of resources, particularly thermal resources, going forward. The level of renewable curtailment, GHG emissions, new resource selections, and costs observed in RESOLVE are directly affected by the assumption that there will be no additional retirements across the existing fleet. In addition, the proposed IRP workflow indicates that resource procurements are determined by the 15% Planning

[1] Ruling Attachment B, RESOLVE Documentation, p. 67. ("In addition to these cost-based hurdle rates, an additional cost is attributed to all imports to California reflecting the cost to import unspecified power into California under CARB's cap and trade program; this cost is calculated based on the relevant year's carbon cost (see Table 48) and a deemed rate of 0.428 tons/MWh.").

Reserve Margin (PRM) based on the calculated Effective Load Carrying Capability (ELCC). The no-retirement assumption for the existing generation fleet affects the calculation of both ELCC and PRM. Given the high possibility that some of the gas generation resources will retire early, this assumption will likely lead to incorrect procurement recommendations. Furthermore, assuming that all gas resources remain online except for OTC units will likely overestimate the flexibility of the future gas generation fleet and mask higher levels of renewable curtailment than may be possible.

C. ***Net Export Assumption***

As CAISO noted in previous comments and reply comments, the net export limit should be 2,000 MW, unless there is a regional expansion of the CAISO or other identified committed approach for achieving higher export level.[2] (*See* also response to Question 7.)

D. ***Energy Efficiency Assumption***

CAISO believes energy efficiency assumptions in RESOLVE should be aligned with the direction that the California Energy Commission (CEC) will decide upon at its November 8, 2017 business meeting.[3] CEC staff have published a draft report discussing its analysis of energy efficiency savings doubling specified in Senate Bill 350.[4]

CAISO strongly suggests that these assumptions are corrected when the Commission conducts its proposed production cost modeling analysis.

2. Comment on the appropriateness of the three major scenarios modeled by staff (Default Scenario, 42 MMT Scenario, 30 MMT Scenario).

See response to Question 9.

4. Comment on the viability of renewable curtailment as a grid integration strategy.

Although some level of renewable curtailment is acceptable, the CAISO is concerned that certain modeling assumptions — such as the net export capability

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[2] CAISO Comments on the IRP Staff Proposal, p. 9. (http://www.caiso.com/Documents/Jun28_2017_Comments_StaffProposal-Process_ImplementingIntegratedResourcePlanning_R16-02-007.pdf).

[3] http://www.energy.ca.gov/calendar/index.php?com=detail&eID=3047

[4] http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-06/TN215437_20170118T160001_Framework_for_Establishing_the_Senate_Bill_350_Energy_Efficienc.pdf

— and perhaps the models themselves, are underestimating the expected level of renewable curtailment. As mentioned in CAISO's response to Question 1, assuming that all gas resources remain online except for OTC units will likely overestimate the flexibility of the future gas generation fleet. In addition, the assumed net export limit provides a much greater capability to export oversupply (and therefore reduce curtailment) than may be possible.

Because the RESOLVE model has limited geographic granularity and transmission modeling, it is not clear how 9,000 MW of new solar capacity (including replacement of existing solar and additional behind the meter PV growth) impacts curtailment. The lack of granularity may explain why the RESOLVE sensitivities for Low Exports, 42 MMT Reference, and High Exports scenarios all have similar renewable curtailment amounts (5%, 4%, and 3%, respectively). More detailed production cost modeling will provide better information to determine the level of renewable curtailment that can be expected, and this modeling should inform the extent to which renewable curtailment can act as a viable grid integration strategy.

5. **Comment on the advisability of early procurement of renewables to take advantage of federal ITC and PTC availability.**

CAISO highlights several concerns raised at the IRP Workshop by parties. SCE noted that if LSEs are directed to sign contracts with renewable developers all at the same time, there may be a price *increase* despite the tax advantage. SCE further noted that collective procurement of 9,000 MW of new solar capacity over a short period of time (*i.e.*, before the expiration of the ITC and PTC) will be a challenge. Other parties pointed out that the phase-down of the ITC and PTC may reduce the economic benefits of early procurement. CAISO encourages parties to comment further on the feasibility of expedited procurement and commercial interest at potential locations.

6. **Comment on the impact of banked RPS procurement on this analysis.**

CAISO believes it is appropriate to consider banked RPS procurement and appreciates that the IRP analysis includes this impact. However, the 36-month lifespan of banked Renewable Energy Certificates (RECs) should be enforced.[5] It

[5] *See* for example https://www.sdge.com/sites/default/files/regulatory/SDGE-2013-RPS-Plan.pdf footnote 20 on page 10, "Note that banking a REC may either mean that the REC is held in SDG&E's active WREGIS sub-account to be used later in its 36 month active lifespan, or it can mean that the REC is retired before its 36 month active lifespan ends and is then held in SDG&E's retirement account for use in future compliance periods."

appears that the Reference System Plan is using RECs banked before 2022 in its 2030 results.

7. **Comment on the impact of import/export constraints on this analysis.**

As noted in response to Question 1 and in previous comments in this proceeding, the CAISO believes that a 2,000 MW simultaneous net export limit is appropriate and reflects how much energy other balancing authorities can take from the CAISO without broader regional coordination. To accommodate this level of net exports, the CAISO would need to export an amount to counter all prevailing existing imports (which average 3,000–4,000 MW) in addition to exporting 2,000 MW of energy. This scenario would be a significant departure from historical norms, as the CAISO has traditionally always been a net importer. In fact, net export limits above 2,000 MW would need to be assessed by the Western Electricity Coordinating Council (WECC) because there is currently no experience with any level of net exports out of California. The CAISO believes that unless a significant change occurs (such as the establishment of a regional ISO), the 2,000 MW net export is the most appropriate assumption. Assuming otherwise may overstate the capability to export renewable oversupply (and thus understate curtailment).

8. **Comment on the results of the three long-lead-time resource studies summarized in this analysis:**
    a. **Pumped storage**
    b. **Geothermal**
    c. **Out-of-state wind**

As noted in response to Question 1, other baseline assumptions may negatively impact the competitiveness of these three long-lead-time resources.

Notwithstanding the comment above, the Commission should specify how it plans to utilize these three resource studies. The Reference System Plan currently provides no guidance to LSEs regarding how to consider these studies.

9. **Do you agree with the recommendation to utilize the 42 MMT Scenario for IRP planning purposes? Why or why not?**

Production cost modeling analysis is necessary to determine whether the 42 MMT Scenario will meet state policy requirements reliably. CAISO is encouraged that the 42 MMT scenario is within the CARB's electric sector GHG emission range of 30 to 52 MMTCO2e as presented at the CARB's October 12 meeting.[6] While the overall GHG constraint is aligned with state policy, it is

[6] Slide 17 at: https://www.arb.ca.gov/cc/scopingplan/meetings/101217/sp-october-workshop-slides.pdf

unclear if the 42 MMT scenario is also consistent with other state policies such as AB 617, which aims to reduce exposure to criteria and toxic pollutants in California's most burdened communities. The RESOLVE post-processing results provide some insight, but only reflect estimated locational and broad resource class impacts, rather than individual unit dispatch. As explained in response to Question 1, several assumptions drive the preference for in-state solar resources. Therefore, it is not clear if this portfolio will meet other requirements until the Commission has conducted the proposed production cost modeling exercise.

10. Do you support the use of the Reference System Portfolio associated with the 42 MMT Scenario as the model for LSE portfolio planning for their individual IRPs? Why or why not?

Regardless of its association with the 42 MMT Scenario, the LSEs are directed to adhere to the Reference System Portfolio "as closely as possible"[7] but would be allowed to deviate from the resource mix subject to an explanation of "why its unique circumstances or other factors make it prudent to do so, when filing its individual IRP."[8] The guidance understandably allows for variation because the Reference System Plan has not been vetted through any Production Cost Modeling assessment. It may be inappropriate to use the Reference System Plan as the standard for assessing the LSEs' plans. The Commission should clarify how individual LSE responsibilities will be allocated the cost for any planned remediation based on the overall portfolio.

11. Do you support transmitting the Default Scenario and associated portfolio to the CAISO for use as the reliability base case in the TPP for 2018? Why or why not?

This question will be addressed in the CAISO's answer to Question 12.

12. Do you support transmitting the 42 MMT Scenario and associated portfolio to the CAISO for use as the policy-driven case in the TPP for 2018? Why or why not?

At the IRP Workshop, the CAISO presented a series of questions about the policy, intent and propriety of transmitting the 42 MMT Scenario (and, more broadly, any IRP scenario) to the CAISO's Transmission Planning Process

[7] CPUC, R.16-02-007, Administrative Law Judge's Ruling seeking comment on Proposed Reference System Plan and Related Commission Policy Actions ("ALJ Ruling"), September 19, 2017, p. 23.
[8] ALJ Ruling, p. 26.

(TPP).[9] In response to some of the questions listed on pages 8 through 11 of CAISO's presentation, the CAISO proposes the following process to facilitate use of IRP scenarios in the TPP. This response does not comment on the substantive merit of either scenario (which is discussed in more detail in the CAISO's response to Question 1 and 10), but rather focuses on process and how to meet the Commission's policy intent. This proposed process does not yet consider interregional transmission, which is addressed in more detail in the CAISO's response to Question 23.

CAISO understands that the Commission would like to establish a new process for transmitting IRP scenarios into the TPP to convey policy intent resulting from the Commission-approved IRP, regardless of whether the scenarios lead to direct procurement or potential transmission reinforcements. To meet these objectives, CAISO proposes the following process for the 2017-2018 IRP cycle:

For the Reference System Plan:

Default Scenario – The 2018-2019 TPP can reflect a Default Scenario from the Reference System Plan as the reliability case.

Reference System Portfolio – The 2018-2019 TPP can reflect a Reference System Portfolio from the Reference System Plan as a sensitivity scenario to analyze policy-driven needs.

The CAISO tariff requires that policy-driven transmission solutions be categorized as either Category 1 or Category 2 transmission solutions. Category 1 solutions are those that are found to be needed and are recommended for approval as part of the comprehensive Transmission Plan in the current cycle.[10] In contrast, Category 2 transmission solutions are defined as:

> those that could be needed to achieve state, municipal, county or federal policy requirements or directives but have not been found to be needed in the current planning cycle based on the criteria set forth in this section. The CAISO will determine the need for, and identify such policy-driven transmission solutions that efficiently and effectively meet applicable policies under alternative resource location and integration assumptions and scenarios, while mitigating the risk of stranded investment.[11]

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9 http://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/IRP%20Proposed%20RSP%20Workshop_2017-09_CAISO%20Slides.pdf

10 CAISO Tariff, Section 24.4.6.6.

11 CAISO tariff, Section 24.4.6.6.

By reflecting the Reference System Portfolio as a sensitivity, the CAISO can assess potential transmission solutions as Category 2 transmission upgrades. The CAISO will be able to reflect the portfolio in the TPP to provide an indication of potentially necessary transmission upgrades without seeking CAISO Board approval for new policy-driven transmission solutions in the 2018-2019 TPP cycle.

Through this proposal, the Commission will be able to establish a regular process for transmitting scenarios from the Reference System Plan to the CAISO's TPP to reflect the Commission's policy intent without triggering CAISO-approved projects.

This outcome is preferable to conducting "special studies" which do not carry weight under the CAISO's tariff. Furthermore, analyzing the portfolio and designating only Category 2 solutions based on the Reference System Plan would eliminate the complicated and arbitrary task of categorizing undefined portions of the policy portfolio as "energy only" to avoid triggering reliability upgrades. At the IRP Workshop, Commission staff explained that CAISO's "rule of thumb" was used to guide portfolio development as it was used in the RPS Calculator. The "rule of thumb" was developed by CAISO in 2015 to represent the approximate capacity available on the existing transmission system by renewable energy zone to interconnect energy only resources before significant congestion is expected to occur.[12] However, as the name reflects, these rules of thumb are not a guarantee that no transmission is needed. Actual upgrades based on realistic locations still need to be verified through modeling in the TPP. Furthermore, the larger the renewable energy zone, the less accurate the rule of thumb may be. CAISO understands that the renewable zones modeled in IRP are at larger aggregations than the RPS calculator.

CAISO's analysis of Category 2 transmission upgrades can provide useful information to parties in this proceeding (such as guidance to LSEs) and stakeholders in the TPP, but it is critical that as much granular information is provided as possible with the portfolios, including location and quantity of each resource type in the portfolio. The CAISO believes the Commission should be the source of this information because these portfolios support state policy. For example, if policy portfolios are intended to benefit disadvantaged communities suffering from poor air quality or low economic development, then the location of resources should reflect this policy intent. Imprecise locations can under-or over-estimate transmission upgrades and expansion.

Specifically, the CAISO requests the following information for the generation to be included in the portfolios:

- geographical location;
- resource type; and

[12] See Update on the 2015 Special Study (http://www.caiso.com/Documents/Updateon2015_50_SpecialStudy.pdf).

- the installed capacity of the generators.

For the Preferred System Plan:

Default Scenario – The 2019-2020 TPP can reflect a Default Scenario from the Preferred System Plan as the reliability case.

Preferred System Portfolio – The 2019-2020 TPP can reflect a Preferred System Portfolio from the Preferred System Plan as the policy preferred (baseline) portfolio. The CAISO's tariff would reflect transmission solutions identified based on this portfolio as Category 1 solutions.

This is similar to the current process and aligns well with the Preferred System Plan scenarios because it leads to an authorization for procurement and cost allocation.

CAISO suggests that the Commission adopt this process for the 2017-2018 IRP cycle (one iteration each of the Reference System and Preferred Portfolio Plans) and then evaluate its effectiveness.

CAISO provides additional thoughts on interregional transmission in response to Question 23.

13. Should the RETI 2.0 work or other available information be incorporated into the TPP recommendations for 2017? If so, how?

The Commission was one of the lead agencies supporting the RETI 2.0 effort.[13] The initiative itself was in response to Governor Brown's Executive Order B-30-015 and SB 350. While the findings do not endorse any specific project, it was written to inform planning and regulatory processes (specifically referring to the IRP) on environmental issues and an assessment of transmission implications and options for developing and delivering utility-scale renewable energy potential in California and the West under different scenarios. Significant effort was taken to understand land use impacts within California and resource potential in the West. These two points may be complementary to the RESOLVE modeling.

14. Do you support the staff recommendation for how LSEs should utilize the GHG Planning Price in preparing their individual LSE IRPs? Why or why not?

It is unclear how exactly the GHG Planning Price will be used by the LSEs in preparing their individual IRP Plans.

[13] See: http://docketpublic.energy.ca.gov/PublicDocuments/15-RETI-02/TN216198_20170223T095548_RETI_20_Final_Plenary_Report.pdf

According to the ALJ Ruling, "[C]ommission staff proposes that the individual LSEs use the GHG Planning Price as a constraint in their individual IRP submittals. If the GHG Planning Price is used as an input in the IRP process, as the marginal GHG abatement cost, each LSE should be able to identify a resulting portfolio with an estimated GHG emissions profile for its individual customer base and portfolio of owned or contracted resources."[14]

Based on the CAISO's understanding, the LSEs need to match the marginal costs of the GHG emission constraints in their IRP Plans with the GHG Planning Price in the Reference System Plan. To get the marginal cost, each LSE needs to have a GHG emissions target as the upper limit of the emission constraint. The target is most likely the Commission staff proposed GHG Emissions Benchmark. However, the ALJ Ruling specifies that "[t]his benchmark would serve as a reference point by which both the LSE and the Commission can cross-check the LSE's use of the GHG Planning Price. Again, this is not intended as a compliance requirement and no enforcement is contemplated."[15] If this is the Commission's intent, then the GHG Emissions Benchmark cannot be used as the limit of GHG emission constraint in LSEs' IRP Plans; otherwise, it is a requirement and is enforced.

Another way to use the GHG Planning Price is to use it as an input cost coefficient of GHG emissions in LSEs' IRP Plans. However, this may not produce the GHG emission and resource additions that match with the IRP Reference System Plan. This exact issue was brought up by PG&E during the October 3 IRP Modeling Advisory Group "office hours." PG&E posed the following question and answer based on a run they conducted using RESOLVE and the 42 MMT scenario: "GHG prices vs. targets: if you take a GHG-binding case (such as 42 MMT), use the GHG shadow price outputs as GHG price inputs in another case that removes the GHG constraint, will that other case show the same resulting portfolios as the GHG-binding case? ... For instance, we [PG&E] ran a case (no GHG cap) using the resulting 2030 $150/MMT abatement cost from the 42 MMT case. The result was a GHG emission of 43 MMT at a significantly higher system cost and a higher renewable build."[16]

While these are PG&E's results, each LSE will have different generation and demand portfolios, as well as options for new resources. The stress on their portfolios' GHG emission is different and so are the GHG emission marginal costs. Therefore, instead of forcing the GHG Planning Price in the LSEs' IRP

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[14] ALJ Ruling, p. 23.

[15] ALJ Ruling, p. 27.

[16] PG&E questions for IRP Office Hour, October 3, 2017 (http://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/IRPOfficeHours01_Submitted%20Questions_2017-10-03.pdf).

Plans, the Commission should consider assigning a GHG emission allowance in million metric tons to each LSE and enforce the allowance as the emission constraint limit. This method is consistent with the goal of the IRP, which is to find the least-cost portfolio to achieve the state RPS and GHG reduction targets.

15. Do you support the staff recommendation for how LSEs should utilize the Reference System Portfolio in preparing their individual LSE IRPs? Why or why not?

See response to Questions 10, 14, and 16.

16. Do you agree with the above-described relationship between the Reference System Portfolio and the GHG Planning Price? Why or why not?

The treatment of imported energy in GHG calculation may have distorted the results of the Reference System Plan and GHG Planning Price.

In RESOLVE, all imported energy, including generation from renewable and hydro resources, is assumed to be as unspecified. The CARB deemed GHG emissions rate of 0.428 MT/MWh is applied to all imported energy, which is higher than emissions rate for a CCGT.[17] To account for the fact that some specified generation imported into CAISO has lower GHG content, RESOLVE includes an after-the-fact adjustment (offset) of 2.8 MMT to the total CAISO GHG emission.[18]

However, this after-the-fact adjustment does not change that this approach incorrectly dispatches out-of-state resources and imported energy by applying a higher GHG emissions rate and higher costs in the RESOLVE optimization. The direct result of this approach is that imports are reduced and out-of-state resources disadvantaged in comparison with in-state resources. It also drives up the marginal cost of the GHG emissions constraint, which is the main part of the GHG Planning Price.

17. Do you support the staff recommendation for calculating and assigned a GHG Emissions Benchmark for LSEs to use in preparing their individual LSE IRPs? Why or why not? Would you recommend an alternative means of developing a similar benchmark? Explain.

See response to Question 14.

[17] In RESOLVE a CCGT is assumed to have a GHG emissions rate equal to 116.8 lb./MMBtu. This is equivalent to 0.378 MT/MWh emissions rate at a 7,000 Btu/kWh heat rate.

[18] ALJ Ruling, Attachment B, p. 79.

23. **Should the Commission initiate activities with the CAISO or others to investigate further development of out-of-state wind?**
    a. **Why or why not?**
    b. **If so, what specific steps should be taken?**
    c. **Should out-of-state wind be included in a special study or as part as a policy-driven scenario for TPP? Why or why not?**

At the IRP Workshop Commission staff also raised several questions related to Question 23. The CAISO's response to Question 23 also incorporates responses to these related questions. These questions are presented on page 46 of the IRP Workshop slide deck and are reproduced below.

Discussion of OOS Wind Resources

- **Conclusion: Out-of-state wind resources might be part of the optimal portfolio, but existing transmission may be insufficient to deliver the optimal quantity of OOS wind into CA**
- **Policy Action: CPUC to coordinate with CAISO to convene intensive, rapid study of out-of-state (OOS) wind generation and transmission costs and procurement options**
    - **Option 1: Transmit policy-preferred portfolio reflecting one or more approaches to serving CA load with OOS wind to CAISO's Transmission Planning Process**
    - **Option 2: Conduct study under the aegis of a broader regional western transmission planning process**

From the outset, the CAISO notes that it is not feasible at this point to begin a new study to review out-of-state wind transmission and procurement costs that would be completed in time to inform the LSEs preferred plans. As a result, the CAISO has concerns with the two options presented above. However, the CAISO notes that Commission staff offered a third option at the IRP Workshop which incorporated a request for offers/interest to gauge commercial interest. The CAISO supports this third option and further provides that the LSEs may be able to leverage relevant information from the CAISO's ongoing interregional transmission planning process to inform their out-of-state wind procurement options. The CAISO discusses each of the options presented in more detail below.

With respect to the options presented at the IRP Workshop, the CAISO also notes that to reasonably study a policy-preferred portfolio and provide probative results, the Commission would need to include detailed information regarding the MW amount and exact location of out-of-state wind resources to support the Commission's policy direction. Because including out-of-state resources offsets in-state builds, a comprehensive portfolio would be needed to provide guidance to the LSEs. For Option 2, the Commission would first have to provide same out-of-state portfolio that is necessary under Option 1. In other words, what is

currently characterized as “Option 2” is actually a subsequent step of Option 1 (more explanation is provided below).

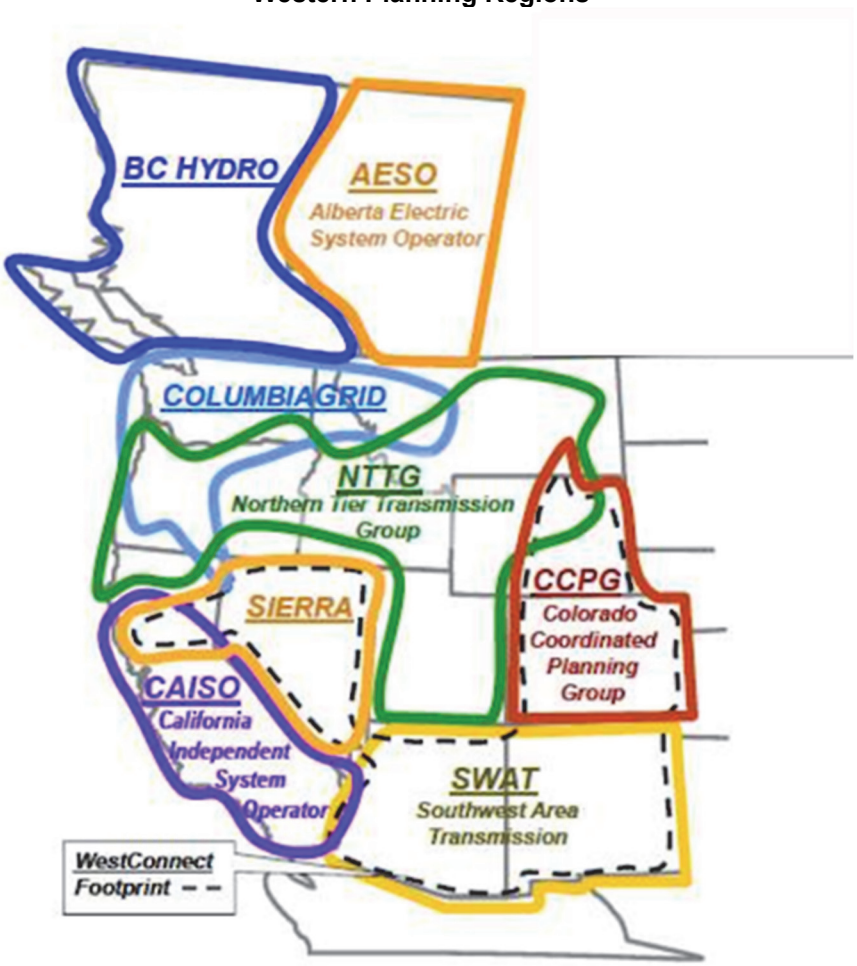
As noted under Option 2, Commission staff is also contemplating conducting a study through a broader regional western transmission planning process. In the Commission staff presentation and questions provided at the IRP Workshop, there was an interest in including California policy information into the WECC ADS data set. CAISO believes that the Commission will be better served via the Federal Energy Regulatory Commission’s (FERC’s) Order 1000 process.

Commission staff verbally offered a third option (Option 3) to direct LSEs to conduct requests for offers/interest to better understand where renewable development interest is located and at what cost. Of these three options, CAISO believes Option 3 may work well to inform the Commission of its ultimate policy direction. It may also be possible to receive interest for out-of-state wind development that is packaged with the transmission rights to deliver to California. Through this information provided by the LSEs, the Commission can develop the policy-preferred portfolio envisioned under Option 1.

In 2011, FERC issued Order 1000, which required a robust, open, and transparent regional planning and interregional coordination process that identifies more efficient or cost-effective regional/interregional transmission and non-transmission solutions and provides a mechanism for regional/interregional cost allocation. In the Western Interconnection, there are six main planning regions as shown in the map below. CAISO actively participates and advances interregional coordination with the three other U.S. western planning regions: ColumbiaGrid, Northern Tier Transmission Group, and WestConnect. The western planning regions interregional coordination cycle spans two years and starts in each even-numbered year.[19]

[19] *See*: http://www.caiso.com/planning/Pages/InterregionalTransmissionCoordination/default.aspx

Western Planning Regions



Source: http://www.transmissionhub.com/content/dam/hubs/migrated/2012/07/24/WECC-subregional-groups32.png
Entities within overlapping planning boundaries only participate in one of the planning regions.

If the Commission pursues Option 3, there is already a body of work that LSEs can refer to that would dovetail well with the detailed commercial information from request for offers/interest. For example, LSEs should be encouraged to consider the CAISO study work being released at the end of 2017 and the RETI 2.0 work in developing their IRPs in 2018. 2017 is the second year of the current two-year interregional transmission planning cycle, which considers projects submitted into the different regions at the beginning of each even-numbered year. The CAISO conducted analysis of the submissions that the LSEs (and all parties) can review. In addition, LSEs should also be encouraged to consider the RETI 2.0 work in developing their IRPs. At the end of 2018 or early 2019, when the Preferred System Portfolio has been selected by the Commission, any out-of-state portfolios and transmission projects can be submitted to CAISO to be integrated into the interregional planning process.

CAISO believes this process would be superior to conducting a new special study with no new relevant commercial generation information or weight under the CAISO's tariff. Furthermore, the interregional planning process is the correct process to consider out-of-state wind projects and related transmission solutions. In contrast, the WECC process is not binding over the planning regions and is not designed to authorize necessary transmission upgrades. The planning regions are the entities responsible for planning transmission and have the mechanism to provide cost allocation for approved projects.

CAISO notes that this proposed process depends on receiving a renewable portfolio that is cumulative from year to year. As noted in the RESOLVE results, adding 3,000 MW of out-of-state wind (regardless if this occurs before or after the expiration of the PTC), will displace in-state solar PV, wind, and energy storage.[20] Furthermore, the displacement could impact the location of remaining resources. The Commission should avoid transmitting a renewable portfolio in a later Preferred Reference Plan cycle that unwinds the portfolio from an earlier cycle, because it would create an unreasonable amount of uncertainty for the CAISO, LSEs and transmission and generation developers. CAISO provided an illustrative numerical example of the impact of non-cumulative portfolios with and without out-of-state wind in its presentation at the IRP Workshop.[21]

24. Should the Commission utilize the GHG Planning Price as an input to the IDER avoided cost calculator, as described in this ruling?
   a. Why or why not?
   b. Do you have specific recommendations for the appropriate methodology for use of the GHG Planning Price in IDER or other demand-side resource proceedings/activities? Describe in detail.

Based on CAISO's concerns about the GHG Planning Price as outlined in response to Question 14, it would be a challenge to use the GHG Planning Price in the IDER avoided cost calculator or other demand-side resource proceedings/activities. See also the CAISO response to Question 25.

25. If the Commission were to engage in development of a CRVM:
   a. What resource areas should be prioritized for incorporation into the CRVM?
   b. Do you have specific recommendations for the appropriate structure of a CRVM? Include examples from other jurisdictions where possible.

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[20] ALJ Ruling, Attachment A, pp. 213-214.

[21] http://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/IRP%20Proposed%20RSP%20Workshop_2017-09_CAISO%20Slides.pdf, p. 12.

c. What would be the appropriate application of such a method?

The "Path to Future All-Resource Planning" in Attachment A of the Ruling briefly mentions that the Commission would "[r]eform the RPS Least Cost Best Fit (LCBF) methodology prior to a potential 2018 RPS RFO, as part of IRP's development of a Common Resource Valuation Methodology (CRVM)."[22] The Commission also notes that the "IRP should develop a Common Resource Valuation Methodology (CRVM) in close cooperation with IDER staff."[23] During the IRP Workshop, the Commission staff presentation identified two ways to consider how the CRVM may be used:

- *Vertical: Alignment of the resource attributes valued in IRP with those valued in procurement*
- *Horizontal: Alignment of the attributes used for valuing resources across all procurement processes, allowing "apples to apples" comparisons from resource to resource (e.g., RPS vs. EE)*[24]

Although CAISO does not disagree with the development of a CRVM in theory, it is unclear how the CRVM would interact with, replace, or supplement other values developed at the Commission including IDER avoided costs and the GHG Planning Price. For example, the Commission notes that the CRVM can be used in a horizontal evaluation by comparing energy efficiency (EE) with transmission-connected RPS resources. However, if the CRVM is used for EE, why would it not be applied to all load-modifying resources? Designating a sub-set of resources as "priority" may lead to inconsistent evaluation that could bias results. The CAISO requests further information and discussion on the CRVM including the timing of its development and consistent usage at the Commission.

26. Should the Commission initiate activities with the CAISO or others to analyze the type and viability of the natural gas fleet? What activities should be undertaken and why?

CAISO agrees that this is a worthwhile path to pursue and more analysis is needed. The CAISO's 2016-2017 TPP included a special study on the risks of early economic retirement of the gas fleet under a 50% RPS.[25] In this preliminary analysis, CAISO analyzed the potential risks to system reliability if

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[22] ALJ Ruling, Attachment A: "Path to Future All-Resource Planning," p. 142.

[23] ALJ Ruling, Attachment A: "Path to Future All-Resource Planning," p. 143.

[24] *See*: http://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/IRP%20Proposed%20RSP%20Workshop_2017-09_Energy%20Division%20Staff%20Slides.pdf, p. 58.

[25] http://www.caiso.com/Documents/Board-Approved_2016-2017TransmissionPlan.pdf, section 6.1.

similarly economically-situated generators retire at approximately the same time. CAISO focused on both local areas as well as system-wide reliability requirements such as load following, operating reserves, and regulating reserve levels. CAISO will build upon this analysis in the 2017-2018 TPP in a follow-on special study.[26]

27. **Please comment on the slides in Attachment A titled "Path to Future All-Resource Planning" with respect to the following:**
    a. **Are any of the conclusions, implications, or action items inappropriate? If so, how would you amend them?**
    b. **Are any conclusions, implications, or actions missing that the Commission should consider? Explain.**

The opening slide in Attachment A notes that the conclusions used to develop implications and action items are based on the preliminary RESOLVE modeling results.[27] As noted in response to Question 1, CAISO has several significant concerns about the modeling assumptions that, if changed, may impacts the current results. CAISO suggests that the Commission validate any conclusions, implications, and action items against the proposed production cost modeling exercise. The CAISO also strongly supports coordination with the California Energy Commission (CEC) on load-modifier forecasts to ensure consistent treatment through the CEC's Integrated Energy Policy Report and in all proceedings at the Commission.

28. **Please comment [on] any aspect [of] the staff proposal included as Attachment E to this ruling. Explain the reasoning behind any recommended revisions. Please organize your comments according to the major topics of the proposal.**

Attachment E provides an overview of the production cost modeling process to review IRP portfolios. The CAISO asserts that production cost modeling is a necessary step to ensuring the reliability of the portfolios produced in the IRP process. Production cost modeling will better identify whether there operability risks throughout the year, especially in hours ending (HE) 18 and 19, when solar generation decreases rapidly while loads remain relatively high.

The CAISO notes that the modeling processes for both the Reference System Plan and Preferred System Plan include a Planning Reserve Margin (PRM) assessment. The Commission proposed Production Cost Modeling framework includes two parts: SERVM production cost modeling and a PRM assessment. The PRM assessment will be conducted based on the results of the SERVM model runs (calculated ELCC).

[26] http://www.caiso.com/Documents/Final2017-2018StudyPlan.pdf, section 7.2.
[27] ALJ Ruling, Attachment A: "Path to Future All-Resource Planning," p. 129.

The SERVM production cost modeling runs hourly chronological simulations for the simulated year and captures the insufficiency of capacity and flexibility of the system within the software's capability and model's assumptions. The simulation runs through multiple iterations with different combinations of the historical load and renewable generation patterns built into the model. The Loss of Load Expectation (LOLE) can be calculated from the results of the multiple-iteration simulations. The Commission can decide if the system portfolio meets the reliability requirements of the system using the LOLE, as directed in the ALJ Ruling Directing Production Cost Modeling Requirements.[28]

The PRM assessment does not add anything new to the results of the SERVM model run. It cannot capture the need for flexibility during the daily downward and ramping of net load and need for capacity during the net load peak hours in the evening. What the PRM assessment does is to retire some resources if the PRM is higher than 15% or add some generic resources if the PRM is lower than 15%. Such modifications would change the input assumptions of the SERVM production cost modeling runs. However, the Commission staff's proposed modeling steps do not re-run the SERVM production cost model with the changed assumptions. This creates a disconnect between the final PRM assessment and the original SERVM production cost simulation results. Even if the SERVM production cost model is re-run, the previously determined least-cost portfolio to meet the GHG emission target could change. Total system cost could go up, and system fleet as well as the ELCC of various resources could also change. The new PRM could be different from 15%. Then another iteration starts. It is unclear when the iterations will end and any benefit the PRM assessment brings to the IRP process.

The CAISO believes that the PRM assessment should not be included in the IRP production cost modeling process because it does not provide relevant information, and it has the potential to undermine the SERVM production cost simulation results. Using the SERVM production cost simulation should be sufficient to ensure that reliability needs are met.

At the IRP Workshop Commission staff noted that SERVM production cost modeling results would be provided to parties for comment and that parties that wish to provide their own modeling results may do so in comments. CAISO plans to provide production cost modeling results at this time but requests that the Commission articulate a process that allows parties to enter their modeling results into the evidentiary record and sufficient time to vet the models and model results. Such a process is necessary to build an evidentiary record on which the Commission can ultimately make procurement recommendations. CAISO looks forward to working with the Commission, Commission staff, and parties to

[28] ALJ Ruling, Appendix E, p.4 Footnote 1.

establish this process.

III. CAISO Responses to IRP Workshop Questions

The following questions are from the Commission staff slide deck presented at the IRP Workshop. The CAISO has reproduced the relevant questions in bold below.

IRP Workshop Slide Deck, p. 37: Key PCM Issues to Consider

1. **Given the accelerated 2017-2018 IRP schedule:**
   - **How important is it to model with both the 2016 IEPR Update and the 2017 IEPR?**
   - **Which years must be modeled (proposal recommends 2022 and 2030)?**
   - **Should any modeling steps be eliminated? Are any steps missing?**
2. **Proposing to model BTM PV as supply (with associated ELCC), and AAEE as load-modifier (no ELCC and counted on demand side of reserve margin calculation). Is this sufficient for IRP system plan review purposes?**
3. **Proposing to calculate marginal ELCCs for utility-scale solar and wind. Is the proposed size, location, and technology type granularity sufficient for IRP purposes of guiding LSE plan development?**
4. **Proposing to produce only annual ELCC values. Are monthly ELCCs required for IRP system plan review and/or to guide LSE plan development?**

BTM PV should be modeled as supply in SERVM production cost modeling as it should follow the same historical generation patterns as the utility scale PV in the multi-iteration simulations.

During the 2016 Long-Term Procurement Plan (LTPP) process, the CEC provided an hourly shape for AAEE. AAEE should be modeled as load-modifier with the hourly shape.

The CAISO recommends excluding PRM assessment from the IRP production cost modeling process (see response to Question 28). Therefore, the ELCC calculation should not be carried out in the IRP process.

IV. Conclusion

The CAISO appreciates this opportunity for continued dialogue on the Commission's Reference System Plan and looks forward to providing more input as this proceeding progresses.

Respectfully submitted,

By: /s/ Jordan Pinjuv

Roger E. Collanton
General Counsel
Anthony Ivancovich
Deputy General Counsel
Anna McKenna
Assistant General Counsel
Jordan Pinjuv
Senior Counsel
California Independent System Operator Corporation
250 Outcropping Way
Folsom, CA 95630
Tel.: (916) 351-4429
Fax: (916) 608-7222
jpinjuv@caiso.com

Attorneys for the California Independent System Operator Corporation

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