July 23, 2018

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Re: California Independent System Operator Corporation
Compliance Filing
Docket No. ER18-1169-___

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO)[1] submits this filing in compliance with the Commission's "Order Accepting in Part, Subject to Condition, and Rejecting in Part, Proposed Tariff Revisions," issued in the above-referenced proceeding on June 21, 2018.[2]

I. Background

On March 23, 2018, the CAISO filed proposed revisions to its tariff to implement its commitment cost enhancements phase 3 (CCE3) initiative (March 23 Tariff Amendment). Among other changes, the March 23 Tariff Amendment included tariff revisions to implement a methodology to allow eligible use-limited resources to include opportunity cost adders in their commitment costs and energy bid costs based on their use limitations.[3]

In the June 21 Order, the Commission accepted the tariff revisions regarding the opportunity cost adder methodology, effective November 1, 2018 as requested by the CAISO, subject to the condition that the CAISO submit a compliance filing within 30 days (*i.e.*, by July 23, 2018) containing further tariff changes to comply with the Commission directives discussed below.[4]

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[1] References in this compliance filing to numbered sections are references to sections of the CAISO tariff as revised by this filing, unless otherwise indicated.

[2] *Cal. Indep. Sys. Operator Corp.*, 163 FERC ¶ 61,211 (2018) (June 21 Order).

[3] The March 23 Tariff Amendment set forth these revisions primarily in new tariff section 30.4.1.1.6.

[4] *See* June 21 Order at PP 32-34. In addition to directing the CAISO to make further tariff changes on compliance, the Commission also directed the CAISO to correct the metadata to its

II. Description of Tariff Changes to Comply with June 21 Order

A. Process for Establishing Opportunity Cost Adders

Tariff section 30.4.1.1.6.1.2 sets forth procedures for establishing opportunity cost adders using either a calculated process or a negotiated process, both of which are specified in the new tariff provisions.[5] As proposed in the March 23 Tariff Amendment, tariff section 30.4.1.1.6.1.2 included a sentence stating that "[a]ny Opportunity Cost that is determined either through the calculated or negotiated process, will remain in place unless and until the Scheduling Coordinator submits documentation, either to establish a new limitation or to modify an existing limitation, in which case the Scheduling Coordinator can request reconsideration."

In the June 21 Order, the Commission noted that several of the underlying inputs to the opportunity cost calculator are monthly values (*e.g.*, monthly start-up, minimum load, and variable energy costs), and to the extent these values or forecasted locational marginal prices (LMPs) change from month to month, the opportunity cost calculator would produce varying opportunity costs adders, even if the limitation on the resource remains the same.[6] The Commission found it appropriate for the CAISO to calculate and update opportunity costs on a monthly basis, as described in the language in tariff section 30.4.1.1.6.2.1 regarding the calculated process.[7] The Commission "therefore direct[ed] CAISO, in its compliance filing, to modify tariff Section 30.4.1.1.6.1.2 to address this ambiguity and clarify that the opportunity cost value can change based on CAISO's monthly calculations and not only based on a new or modified limit."[8]

Opportunity cost values for a resource can change each month under either the calculated process or the negotiated process, due to increases or decreases in the sizes of the amounts that are inputs to the rate formula for the calculated process or negotiated process (*i.e.*, inputs to the opportunity cost

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tariff section title of the term "Use-Limited Resource" in appendix A to the CAISO tariff. *Id.* at P 35 n.64. The CAISO is complying with that directive by correcting the metadata title in eTariff to read "Use-Limited Resources," as opposed to "Use-Limited Capacity."

5 Tariff section 30.4.1.1.6.2 sets forth the calculated process, including the methodology for the opportunity cost calculator. Tariff section 30.4.1.1.6.3 sets forth the negotiated process, pursuant to which the CAISO and the scheduling coordinator attempt to negotiate a methodology for determining opportunity cost adders.

6 June 21 Order at P 33. The Commission also noted that, similarly, formulas used to calculate opportunity costs for resources with negotiated methodologies may also contain inputs that vary monthly. *Id.* at P 33 n.63.

7 *Id.* at P 33.

8 *Id.*

calculator or inputs to a rate formula negotiated by the CAISO and the scheduling coordinator) that may vary on a monthly basis.[9] However, the formula rate resulting from either the calculated process or the negotiated process itself will remain the same from month to month, unless and until a different formula rate is put in place for the resource. That is what the CAISO intended to express in tariff section 30.4.1.1.6.1.2, but as the Commission found, the section needs to be revised to make the point clear. Therefore, to comply with the Commission's directive, the CAISO proposes to revise tariff section 30.4.1.1.6.1.2 to make the following changes:

> Any Opportunity Cost formula rate~~that~~ resulting from~~is determined~~ either through the calculated or negotiated process, will remain in place unless and until the formula rate is modified or terminated by the CAISO. Opportunity Costs determined pursuant to a formula rate will remain in place until updated pursuant to Section 30.4.1.1.6.2.1 or Section 30.4.1.1.6.3 to reflect any changes in input values to the formula rate. A Scheduling Coordinator may submit~~s~~ documentation, either to establish a new limitation or to modify an existing limitation, in which case the Scheduling Coordinator can request reconsideration that may result in a new formula rate. In accordance with Section 39.7.1.3.2.2, the CAISO will make informational filings with FERC of any new, modified, or terminated Opportunity Cost~~s~~ formula rate developed~~calculated~~ pursuant to Section 30.4.1.1.6.2 or negotiated pursuant to Section 30.4.1.1.6.3.

These changes satisfy the Commission's directive by making it clear that it is the applicable formula rate (calculated or negotiated) for determining opportunity cost values, not the opportunity cost bid adders derived from using that formula rate, that will remain in place unless and until the scheduling coordinator submits documentation to establish a new limitation or modify an existing limitation, which could result in a different formula rate.[10]

B. Methodology for Opportunity Cost Calculator

As explained above, tariff section 30.4.1.1.6.2.2 sets forth the methodology for the opportunity cost calculator under the calculated process. In the June 21 Order, the Commission agreed with a concern expressed by an intervenor that details on how the CAISO will develop the forecasted prices used

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[9] *See* tariff sections 30.4.1.1.6.2 and 30.4.1.1.6.3.

[10] As the Commission noted, the opportunity cost values can change based on monthly calculations pursuant to the tariff language regarding the calculated process and the negotiated process, *e.g.*, the language in tariff section 30.4.1.1.6.2.1. June 21 Order at P 33. The CAISO does not propose to modify that tariff language in the instant compliance filing.

in the opportunity cost calculator should be filed as part of the CAISO tariff, rather than only being included in the applicable CAISO business practice manual (BPM).[11] Therefore, the Commission "direct[ed] CAISO to submit a compliance filing . . . revising the tariff to add additional detail regarding the opportunity cost methodology to tariff Section 30.4.1.1.6.2.2, consistent with [the] answer" the CAISO filed in the CCE3 proceeding.[12] The Commission specified that "[t]he additional detail should include a list of the underlying components that provide the basis for forecasted prices and a citation to the BPM that contains the specific equations and other implementation details."[13]

To comply with these Commission directives, the CAISO proposes to revise tariff section 30.4.1.1.6.2.2 to include the additional detail regarding the opportunity cost methodology, consistent with the CAISO Answer.[14] Specifically, the CAISO has revised the tariff section to state that the CAISO will forecast the LMPs used in the opportunity cost calculator by executing the following steps in the order shown below:

(1) For each future hour, calculate an hourly implied heat rate at each applicable pricing node or aggregated pricing node for a use-limited resource based on the hourly average of the fifteen-minute real-time LMPs from the same hour of the previous year, the greenhouse gas allowance price from the same day of the previous year, and the gas price index of the applicable fuel region from the same day of the previous year.

(2) For each future month, calculate a monthly future implied heat rate based on the applicable wholesale future power price of the applicable power trading hub, the most recent greenhouse gas allowance price, and the natural gas future commodity price of the applicable fuel region.

(3) For each future month, calculate a monthly historical implied heat rate based on the wholesale historic power price of the applicable power trading hub for the same month of the previous year, the average greenhouse gas allowance price for the same month of the previous year, and the average natural gas commodity price of the applicable fuel region for the same month of the previous year.

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11 *Id.* at P 32.

12 *Id.* The CAISO filed an answer to comments and protests regarding the March 23 Tariff Amendment on April 26, 2018 (CAISO Answer).

13 June 21 Order at P 32.

14 *See* CAISO Answer at 7-8.

(4) For each future month, calculate a monthly power price conversion factor as the ratio of the future implied heat rate calculated under (2) above and the historical implied heat rate calculated under (3) above.

(5) For each future hour, scale the hourly implied heat rate calculated under (1) above by the power price conversion factor calculated under (4) above.

(6) For each future hour, calculate the LMPs by applying the gas price index of the future month and the most recent greenhouse gas costs to the scaled implied heat rates calculated under (5) above.

To comply with the Commission's directives, the CAISO has also revised tariff section 30.4.1.1.6.2.2 to state that additional detail regarding the calculation of opportunity costs is provided in a new appendix (Appendix N) to the BPM for Market Instruments.

III. Materials Provided in this Compliance Filing

In addition to this transmittal letter, this compliance filing includes attachments A and B. Attachment A contains clean CAISO tariff sheets reflecting the tariff revisions described above. Attachment B shows these revisions in red-line format.

If there are any questions regarding this filing, please contact the undersigned.

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Attachment A – Clean Tariff

Commitment Cost Enhancements Phase 3 Compliance Filing

California Independent System Operator Corporation

30.4.1.1.6.1.2 Establishing Opportunity Cost Adders

A Scheduling Coordinator for a Use-Limited Resource that elects the Proxy Cost methodology may seek to establish Opportunity Cost adders for any limitation(s) that meet all three (3) of the following criteria:

(1) Satisfy the requirements of Section 30.4.1.1.6.1.1;

(2) Apply for period(s) longer than the time horizon considered in the applicable Day-Ahead Market process; and

(3) Can be reflected in a monthly, annual, and/or rolling twelve (12) month period.

The CAISO will review the documentation provided by the Scheduling Coordinator and determine whether the CAISO can calculate an Opportunity Cost pursuant to the methodology set forth in Section 30.4.1.1.6.2 using the Opportunity Cost calculator, or whether the Opportunity Cost for the limitation must instead be established pursuant to the negotiation process set forth in Section 30.4.1.1.6.3. Resources with limits that can be modelled using the Opportunity Cost calculator, are not eligible for a negotiated Opportunity Cost. Any Opportunity Cost formula rate resulting from either through the calculated or negotiated process, will remain in place unless and until the formula rate is modified or terminated by the CAISO. Opportunity Costs determined pursuant to a formula rate will remain in place until updated pursuant to Section 30.4.1.1.6.2.1 or Section 30.4.1.1.6.3 to reflect any changes in input values to the formula rate. A Scheduling Coordinator may submit documentation, either to establish a new limitation or to modify an existing limitation, in which case the Scheduling Coordinator can request reconsideration that may result in a new formula rate. In accordance with Section 39.7.1.3.2.2, the CAISO will make informational filings with FERC of any new, modified, or terminated Opportunity Cost formula rate developed pursuant to Section 30.4.1.1.6.2 or negotiated pursuant to Section 30.4.1.1.6.3.

The following types of Use-Limited Resource capacity are not eligible for an Opportunity Cost adder: the capacity of a Condition 2 RMR Unit, a Reliability Demand Response Resource, Regulatory Must-Take capacity, and any other type of Use-Limited Resource to the extent it has a limitation that satisfies the requirements of Section 30.4.1.1.6.1 but applies for a period less than or equal to the time horizon considered in the Day-Ahead Market.

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30.4.1.1.6.2.2 Methodology for Opportunity Cost Calculator

For the Opportunity Cost calculator developed by the CAISO, each calculation of Opportunity Costs will equal the estimated profits foregone if the Use-Limited Resource had one fewer unit of starts, run-hours, or Energy output, whichever is applicable, in the future time period of the validated limitation. With regard to each validated limitation of the Use-Limited Resource, the calculation will take into account a margin set forth in the Business Practice Manual. The calculation will also take into account the effect of any validated limitation on a Use-Limited Resource's number of starts, number of run-hours, or Energy output in the monthly and annual and/or rolling twelve month periods. For MSG Transitions, the Opportunity Cost for each transition will be derivative of the number of Start-Ups required for the MSG Resource to achieve a specific MSG Configuration.

The CAISO will calculate the estimated profits for each validated limitation over the future time period of the limitation based on the following estimated inputs: (a) the forecasted hourly average of fifteen-minute LMPs for Energy at the Use-Limited Resource's PNode or Aggregated PNode multiplied by (b) the optimal hourly dispatch of the Use-Limited Resource, minus (c) the estimated monthly Start-Up Cost of the Use-Limited Resource, minus (d) the estimated monthly Minimum Load Cost of the Use-Limited Resource, minus (e) the estimated monthly variable Energy cost of the Use-Limited Resource multiplied by the difference between (f) the optimal hourly commitment and dispatch of the Use-Limited Resource and (g) the PMin of the Use-Limited Resource, minus (h) the estimated monthly Transition Cost of the Use-Limited Resource.

The CAISO will calculate input (a) listed above by executing the following steps in the order shown below:

(1) For each future hour, calculate an hourly implied heat rate at each applicable PNode or Aggregated PNode for a Use-Limited Resource based on the hourly average of the fifteen-minute Real-Time LMPs from the same hour of the previous year, the Greenhouse Gas Allowance Price from the same day of the previous year, and the gas price index of the applicable fuel region from the same day of the previous year.

(2) For each future month, calculate a monthly future implied heat rate based on the applicable wholesale future power price of the applicable power Trading Hub, the most

recent Greenhouse Gas Allowance Price, and the natural gas future commodity price of the applicable fuel region.

(3) For each future month, calculate a monthly historical implied heat rate based on the wholesale historic power price of the applicable power Trading Hub for the same month of the previous year, the average Greenhouse Gas Allowance Price for the same month of the previous year, and the average natural gas commodity price of the applicable fuel region for the same month of the previous year.

(4) For each future month, calculate a monthly power price conversion factor as the ratio of the future implied heat rate calculated under (2) above and the historical implied heat rate calculated under (3) above.

(5) For each future hour, scale the hourly implied heat rate calculated under (1) above by the power price conversion factor calculated under (4) above.

(6) For each future hour, calculate the LMPs by applying the gas price index of the future month and the most recent greenhouse gas costs to the scaled implied heat rates calculated under (5) above.

For a Use-Limited Resource that has twelve (12) or fewer months of LMP data at its PNode or Aggregated PNode, the CAISO will calculate input (a) listed above using LMP data from a comparable PNode or Aggregated PNode.

Additional detail regarding the calculation of Opportunity Costs is provided in Appendix N to the Business Practice Manual for Market Instruments. Any dispute regarding the calculation of Opportunity Costs will be subject to the CAISO ADR Procedures set forth in Section 13.

Attachment B – Marked Tariff

Commitment Cost Enhancements Phase 3 Compliance Filing

California Independent System Operator Corporation

30.4.1.1.6.1.2 Establishing Opportunity Cost Adders

A Scheduling Coordinator for a Use-Limited Resource that elects the Proxy Cost methodology may seek to establish Opportunity Cost adders for any limitation(s) that meet all three (3) of the following criteria:

(1) Satisfy the requirements of Section 30.4.1.1.6.1.1;

(2) Apply for period(s) longer than the time horizon considered in the applicable Day-Ahead Market process; and

(3) Can be reflected in a monthly, annual, and/or rolling twelve (12) month period.

The CAISO will review the documentation provided by the Scheduling Coordinator and determine whether the CAISO can calculate an Opportunity Cost pursuant to the methodology set forth in Section 30.4.1.1.6.2 using the Opportunity Cost calculator, or whether the Opportunity Cost for the limitation must instead be established pursuant to the negotiation process set forth in Section 30.4.1.1.6.3. Resources with limits that can be modelled using the Opportunity Cost calculator, are not eligible for a negotiated Opportunity Cost. Any Opportunity Cost formula rate~~that~~ resulting from~~is determined~~ either through the calculated or negotiated process, will remain in place unless and until the formula rate is modified or terminated by the CAISO. Opportunity Costs determined pursuant to a formula rate will remain in place until updated pursuant to Section 30.4.1.1.6.2.1 or Section 30.4.1.1.6.3 to reflect any changes in input values to the formula rate. A Scheduling Coordinator may submit~~s~~ documentation, either to establish a new limitation or to modify an existing limitation, in which case the Scheduling Coordinator can request reconsideration that may result in a new formula rate. In accordance with Section 39.7.1.3.2.2, the CAISO will make informational filings with FERC of any new, modified, or terminated Opportunity Cost~~s~~ formula rate ~~calculated~~developed pursuant to Section 30.4.1.1.6.2 or negotiated pursuant to Section 30.4.1.1.6.3.

The following types of Use-Limited Resource capacity are not eligible for an Opportunity Cost adder: the capacity of a Condition 2 RMR Unit, a Reliability Demand Response Resource, Regulatory Must-Take capacity, and any other type of Use-Limited Resource to the extent it has a limitation that satisfies the requirements of Section 30.4.1.1.6.1 but applies for a period less than or equal to the time horizon considered in the Day-Ahead Market.

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30.4.1.1.6.2.2 Methodology for Opportunity Cost Calculator

For the Opportunity Cost calculator developed by the CAISO, each calculation of Opportunity Costs will equal the estimated profits foregone if the Use-Limited Resource had one fewer unit of starts, run-hours, or Energy output, whichever is applicable, in the future time period of the validated limitation. With regard to each validated limitation of the Use-Limited Resource, the calculation will take into account a margin set forth in the Business Practice Manual. The calculation will also take into account the effect of any validated limitation on a Use-Limited Resource's number of starts, number of run-hours, or Energy output in the monthly and annual and/or rolling twelve month periods. For MSG Transitions, the Opportunity Cost for each transition will be derivative of the number of Start-Ups required for the MSG Resource to achieve a specific MSG Configuration.

The CAISO will calculate the estimated profits for each validated limitation over the future time period of the limitation based on the following estimated inputs: (a) the forecasted hourly average of fifteen-minute LMPs for Energy at the Use-Limited Resource's PNode or Aggregated PNode multiplied by (b) the optimal hourly dispatch of the Use-Limited Resource, minus (c) the estimated monthly Start-Up Cost of the Use-Limited Resource, minus (d) the estimated monthly Minimum Load Cost of the Use-Limited Resource, minus (e) the estimated monthly variable Energy cost of the Use-Limited Resource multiplied by the difference between (f) the optimal hourly commitment and dispatch of the Use-Limited Resource and (g) the PMin of the Use-Limited Resource, minus (h) the estimated monthly Transition Cost of the Use-Limited Resource.

The CAISO will calculate input (a) listed above by executing the following steps in the order shown below:

(1) For each future hour, calculate an hourly implied heat rate at each applicable PNode or Aggregated PNode for a Use-Limited Resource based on the hourly average of the fifteen-minute Real-Time LMPs from the same hour of the previous year, the Greenhouse Gas Allowance Price from the same day of the previous year, and the gas price index of the applicable fuel region from the same day of the previous year.

(2) For each future month, calculate a monthly future implied heat rate based on the applicable wholesale future power price of the applicable power Trading Hub, the most recent Greenhouse Gas Allowance Price, and the natural gas future commodity price of the applicable fuel region.

(3) For each future month, calculate a monthly historical implied heat rate based on the wholesale historic power price of the applicable power Trading Hub for the same month of the previous year, the average Greenhouse Gas Allowance Price for the same month of the previous year, and the average natural gas commodity price of the applicable fuel region for the same month of the previous year.

(4) For each future month, calculate a monthly power price conversion factor as the ratio of the future implied heat rate calculated under (2) above and the historical implied heat rate calculated under (3) above.

(5) For each future hour, scale the hourly implied heat rate calculated under (1) above by the power price conversion factor calculated under (4) above.

(6) For each future hour, calculate the LMPs by applying the gas price index of the future month and the most recent greenhouse gas costs to the scaled implied heat rates calculated under (5) above.

For a Use-Limited Resource that has twelve (12) or fewer months of LMP data at its PNode or Aggregated PNode, the CAISO will calculate input (a) listed above using LMP data from a comparable PNode or Aggregated PNode.

Additional detail regarding the calculation of Opportunity Costs is provided in Appendix N to the Business Practice Manual for Market Instruments. Any dispute regarding the calculation of Opportunity Costs will be subject to the CAISO ADR Procedures set forth in Section 13.

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon all of the parties listed on the official service list for the above-referenced proceeding, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Washington, DC, this 23rd day of July, 2018.

_/s/ *Bradley R. Miliauskas*__
Bradley R. Miliauskas