



February 12, 2010

VIA HAND DELIVERY

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

FILED
SECRETARY OF THE
COMMISSION
2010 FEB 12 P 4: 53
FEDERAL ENERGY
REGULATORY COMMISSION

RE: California Independent System Operator Corporation

**Amendments to the FERC Electric Tariff to Reinstitute the
Forbidden Operating Region Functionality in the Real-Time
Market**

Docket No. ER09-213-____
Docket No. ER10-____-____

Dear Secretary Bose:

The California Independent System Operator Corporation (the ISO) respectfully submits for approval by the Federal Energy Regulatory Commission (Commission) amendments to the ISO's FERC Electric Tariff (the ISO Tariff), pursuant to Section 205 of the Federal Power Act (FPA), 16 U.S.C. § 824d, and Section 35.13 of the Commission regulations, 18 C.F.R. § 35.13 (2009). The amendments would reinstate in the ISO Tariff the provisions that enable implementation of the previously-deferred forbidden operating region functionality for the real-time market as approved by the Commission in the above-referenced docket.

An original and five copies of the amendment are included for the filing. Also, included are two copies, to be date - and time-stamped and returned to the messenger.

I. Background

Forbidden operating regions are ranges of megawatt output through which, as a result of its physical characteristics, a resource can transit but within which it cannot stably operate.¹ To maintain the feasibility of dispatch

¹ *California Indep. Sys. Operator Corp.*, 126 FERC ¶ 61,150, at P 104, n.173 (2009).

instructions and better reflect resources' operating constraints, the ISO ensures that units with forbidden operating regions are ramped completely through the region – either all the way up or all the way down, depending on the direction from which the unit entered the forbidden region.

During real-time operations there are at least two manual ways of ensuring that units ramp completely through a forbidden operating region. If the ISO's market software persistently schedules or dispatches a unit within its forbidden operating region, the ISO may issue an exceptional dispatch for that unit to generate at a level either above or below the forbidden operating region. Alternatively, the generating resource may submit an entry in the ISO's outage reporting interface to prevent a dispatch within the forbidden operating region. A third approach is to include a functionality in the market software (*i.e.*, the forbidden operating region functionality) that would prevent a generating unit from being dispatched to a level within that forbidden operating region, except to transit through the forbidden region. This third software approach consists of the functionality that was previously deferred and that the ISO now seeks to reinstate.

The tariff the ISO had prepared for the start of its new market design included the automated forbidden operating region functionality in both the day-ahead and real-time markets. However, during market simulations preceding the start of its new market design on April 1, 2009, the ISO observed that the inclusion of the automated forbidden operating region functionality in the real-time market caused performance and stability issues.²

As a result of the performance and stability issues, on October 31, 2008, the ISO requested authorization from FERC to defer four MRTU market elements, including the automated forbidden operating region functionality in the real-time market.³ This deferral request required the removal of tariff language, previously approved by the Commission,⁴ that reflected the automated forbidden operating region functionality in the real-time market. A second feature the ISO requested to defer was allowing generating units to submit an unlimited range of operational ramp rates from one operating range to another. Similar to the forbidden operating region functionality, allowing unlimited changes between operational ramp rates created market performance issues during market simulation. As an alternative, the ISO proposed to place a limit on the relative size of allowable changes in operational ramp rates from one operational range to another.

In the Deferral Filing, the ISO noted that successful implementation of multi-stage generator modeling would likely address the difficulties created both

² The automated forbidden operating region functionality in the day-ahead market experienced no such performance issues and it currently exists in the ISO's day-ahead market.

³ Amendment to MRTU Tariff to Defer Availability of Four Non-Core Features of MRTU, FERC Docket No. ER09-213-000 (Oct. 31, 2008) (Deferral Filing).

⁴ *California Indep. Sys. Operator Corp.*, 116 FERC ¶ 61,274 (2006).

by including the forbidden operating region functionality in the real-time market and allowing unlimited changes to operational ramp rates. At that time, the ISO believed that multi-stage generator modeling could be implemented six to nine months after the start of its new market design. On January 30, 2009, FERC accepted the ISO's request to defer both market features.⁵ Since the start of its new market design, in the event that a resource is persistently dispatched in the real-time market within a forbidden operating region, that resource has been dispatched through the forbidden operating region with either of the two manual approaches discussed above. However, for the reasons discussed further below, the ISO now proposes to reintroduce the automated functionality that will ensure that resources are not dispatched within their forbidden operating regions in the real-time, except if necessary to transit through such regions.

With respect to the restrictions on the number of changes in the operational ramp rate within a given interval, the ISO continues to believe that when the ISO adopts the multi-stage generator modeling approach, it will be better placed to evaluate whether the restriction should in any way be relaxed. The ISO anticipates that the multi-stage generator functionality will be implemented in Fall 2010.

II. Description of Filing

A. Explanation of the Proposed Real-Time Market Forbidden Region Functionality and its Benefits

In the months following the start of its new market design, the ISO worked diligently with its vendor and stakeholders to develop and implement multi-stage generator modeling. As discussed above, and further discussed in the Janet Morris Direct Testimony, Exhibit No. ISO-1 in Attachment D (Morris Testimony), the ISO believed that implementation of the automated forbidden operating region functionality would be better addressed in the context of implementing the multi-stage generator modeling functionality. In the latter part of 2009, the ISO began experiencing project schedule challenges with multi-stage generator modeling and determined that the planned April 1, 2010, implementation date for multi-stage generator modeling could not be met. However, as explained in the Morris Testimony, the ISO is able to implement the automated forbidden operating region functionality prior to the implementation of the multi-stage generator functionality due, in part, to the general performance improvements in the ISO real-time market and, in larger part, to software enhancements developed as part of its efforts to develop the multi-stage generator functionality.

As part of its work on multi-stage generator modeling, the ISO's software vendor discovered a software enhancement to the forbidden operating region functionality that alleviated the prior instabilities during market simulations prior to the start of the new market in April of 2009. One notable aspect of the real-time market forbidden operating region functionality is that it contains a software

⁵ *California Indep. Sys. Operator Corp.*, 126 FERC ¶ 61,081 (2009) (*Deferral Order*).

algorithm enhancement regarding how a resource enters and transits through a forbidden operating region. As discussed in the Morris Testimony, this enhancement was developed through the ISO's development of the multi-stage generator functionality. In particular, depending on the amount of time it takes for a resource to pass through its forbidden operating region, a resource may be dispatched to the border of the forbidden operating region before proceeding to cross the forbidden operating region boundary. The functionality will optimize the best market solution based on the number of dispatch intervals it takes for the resource to cross its forbidden operating region. This enhancement does not, however, modify two key parameters of the automated forbidden operating region functionality which are to ensure that: (1) a resource is not dispatched within its forbidden region, except to transit through the region; and (2) a resource dispatched across a forbidden operating region boundary will not receive an additional dispatch in the opposite direction until it has crossed the forbidden operating region completely.

As was previously provided for in the forbidden operating region functionality, forbidden operating regions will be static and defined in the Master File along with all other resource characteristics, including the time it takes to cross the forbidden operating region. The automated forbidden operating region functionally supports up to four forbidden operating regions for a given resource. Not all resources in the ISO fleet have forbidden operating regions and those that do typically have only one or two. An implicit ramp rate for the forbidden operating region can be derived by dividing the range of the forbidden operating region by the time it takes for the unit to cross the forbidden operating region.

The most significant benefit of implementing a real-time market forbidden operating region functionality is that it would reduce the need for the two types of manual interventions in the real-time market discussed above. With the adoption of this functionality, the ISO will rely primarily on its market software to ensure that resources are not dispatched in their forbidden operating regions in the real-time, which would reduce the need to exceptionally dispatch resources or use the outages interface to transition units dispatched within their forbidden operating regions. Including these constraints in the market optimization software will further improve market performance, create more optimal market solutions, and ensure that dispatches are more compatible with resource capabilities. Another benefit of deploying the real-time market forbidden operating region functionality is that it will create greater harmony between the market features of the real-time and day-ahead markets. Currently, a form of the automated forbidden operating region functionality is included in the day-ahead but not in the real-time market. Eliminating this divergence between the two markets will further facilitate the implementation of convergence bidding.

As described in the Morris Testimony, implementing the automated real-time market forbidden operating region functionality at this time will not delay implementation of other important market initiatives, such as permitting load to more fully participate in the ISO's market, convergence bidding, and multi-stage generator modeling. Unlike the multi-stage generator functionality, the

automated forbidden operating region functionality does not pose challenges with integrating the software enhancements with existing software. Rather the nature of the functionality is such that it affects only the main optimization engine and can be turned on or off through a software flag. Therefore, implementing this functionality will not require extensive resources to implement and will not require the careful integration with other aspects of the ISO market required by other functionalities and market initiatives. Once the software functionality has gone through appropriate testing and market simulation to ensure that it does not erode the performance of the real-time market, the ISO can simply turn the feature on in its production environment. Furthermore, as explained in the Deferral Filing, the forbidden operating region functionality does not impact the ISO's settlement systems, nor does it impact the bid submission process, which means that participants are not faced with integration challenges on their side.⁶ Finally, testing to date indicates that the ISO can implement the functionality on April 15, 2010, after it has completed market simulation.

On January 15, 2010, the ISO posted to its website draft language and an explanatory statement that explained the new functionality as well as the reasons why the ISO is able to adopt the automated forbidden operating region functionality in April. On January 20, 2010, the ISO held a stakeholder conference call to discuss the Tariff amendments and the implementation of the real-time market forbidden operating region functionality. On this call, no stakeholders raised concerns or objections to the proposal. The ISO set a deadline of January 26, 2010 for stakeholders to submit written comments on the proposal. Only one stakeholder, Pacific Gas & Electric Co. (PG&E), submitted comments. In those comments, PG&E expressed support for the ISO's proposal and indicated that it had no recommended changes to the draft tariff language. Thus, no stakeholder objected to the ISO's proposal, or any part of the proposal, prior to this filing.

B. Description of the Proposed Tariff Language

The ISO is seeking to reinsert language into the ISO Tariff permitting implementation of the forbidden operating region functionality for the real-time market. In most relevant respects, the proposed tariff language is nearly identical to the language that previously was approved by the Commission as part of the ISO's new market design and was part of the extensive stakeholder process surrounding the development of that new design.

In Section 34.15.1(b), there are two alterations to the previously-approved language. The first change involves language clarifying that once a unit enters a forbidden operating region it must proceed all the way to the other side. The second change involves correcting an error in the prior language involving ancillary services. Under the proposed language, a unit with a forbidden operating region may provide ancillary services in a fifteen minute dispatch interval provided that it can complete its transit through the relevant forbidden

⁶ Deferral Filing at 5.

operating region within that dispatch interval. Under the previously-approved language, a unit with a forbidden operating region could provide ancillary services if it could cross the forbidden operating region in less than twenty minutes. This prior language was erroneous, as it did not correspond with the ISO's fifteen minute Dispatch Interval.

It should be noted that in the time since the *Deferral Order* was issued, several changes have been made to the language of Section 34.19.2.3 that are unrelated to the forbidden region functionality. Those changes include: (1) changing the term "Default Energy Bids" to "Generated Bids;" (2) making the word "constraints" lower-case; (3) updating the terminology used to refer to a "Dynamic Resource-Specific System Resource" rather than a "Dynamic System Resource;" (4) clarifying that a resource is ineligible to set the LMP where it is "Dispatched below its Minimum Operating Limit or above the highest MW value in its Economic Bid range or Generated Bid" rather than the more general restriction on setting LMP where the resource is "Dispatched beyond its Economic Bid range;" and (5) removing the modifier "two-hour" before the term "Time Horizon."⁷ While these changes are unrelated to the forbidden operating region functionality, they alter the previously approved tariff language as it existed prior to the Deferral Filing.

However, focusing on the language pertaining specifically to forbidden operating regions, the only other change from the previously-approved language involves the addition of a comma between the phrase "a boundary of a Forbidden Operating Region" and "or dispatched for a quantity of Energy such that its full Ramping capability is constraining the ability of the resource."

III. Effective Date and Part 35 Compliance

The ISO requests that the amendments included in this filing be made effective for the April 15, 2010 Trading Day. This is the date on which the ISO intends to implement its forbidden operating region functionality for the real-time market.

To the extent that the information provided in the instant filing does not fulfill the requirements of Section 35.13 of the Commission's regulations (18 CFR § 35.13), the ISO requests waiver of such requirements based on the Commission's prior approval of the ISO tariff that included enabling language for the automated real-time market forbidden operating region functionality.⁸ On the same basis, the ISO additionally requests waiver of any other applicable requirement of Part 35 of the Commission's regulations for which waiver is not specifically requested, if necessary, in order to permit Commission acceptance of this filing.

⁷ These amendments were approved in a Commission order issued on March 24, 2009. *California Indep. Sys. Operator Corp.*, 126 FERC ¶ 61,262 (2009).

⁸ *California Indep. Sys. Operator Corp.*, 116 FERC ¶ 61,274 (2006).

IV. Communications

Communications regarding this filing should be addressed to the following individuals:

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* Individuals designated for service pursuant to Rule 203(b)(3),
18 C.F.R. § 385.203(b)(3)

V. Service

The ISO has served copies of this transmittal letter, and all attachments, on the parties included on the service lists for the docket in which the *Deferral Order* was issued (ER-09-213-___). In addition, the ISO is posting this transmittal letter and all attachments on its website. If there are any questions concerning this filing, please contact the undersigned.

VI. Attachments

The following attachments, in addition to this transmittal letter, support the instant filing:

Attachment A	Revised ISO Tariff sheets that incorporate the proposed changes described above.
Attachment B	The proposed changes to the ISO Tariff shown in black-line format.
Attachment C	The pre-Deferral Filing language of Section 34.15.1 and Section 34.19.2.3.
Attachment D	Testimony of Janet Morris, Director, ISO Program Management Office.

The ISO respectfully requests that the Commission approve the attached tariff sheets. Please contact the undersigned if you have any questions regarding this matter.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read "David S. Zlotlow", written over a horizontal line.

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Attachment A – Clean sheets

Forbidden Operating Regions Amendment to Tariff

Fourth Replacement Tariff

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Schedule. Resource Adequacy Resources that are not required to offer their Resource Adequacy Capacity in accordance with Section 40 may voluntarily submit Energy Bids. Submitted Energy Bids shall be subject to the maximum and minimum Bid requirements and Mitigation Measures as set forth in Section 39.

34.14 Real-Time Operational Activities in the Hour Prior to the Settlement Period.

34.14.1 Confirm Interchange Transaction Schedules (ITSs).

Also in the hour prior to the beginning of the Operating Hour the CAISO will:

- (a) adjust Interchange transaction schedules (ITSs) as required under Existing Contracts in accordance with the procedures in the CAISO Tariff for the management of Existing Contracts;
- (b) adjust ITSs as required by changes in transfer capability of transmission paths occurring after Market Close of the HASP; and
- (c) agree on ITS changes with adjacent Balancing Authorities.

34.15 Rules For Real-Time Dispatch of Imbalance Energy Resources.

34.15.1 Resource Constraints

The SCED shall enforce the following resource physical Constraints:

- (a) Minimum and maximum operating resource limits. Outages and limitations due to transmission clearances shall be reflected in these limits. The more restrictive operating or regulating limit shall be used for resources providing Regulation so that the SCED shall not Dispatch them outside their Regulating Range.

- (b) Forbidden Operating Regions. When ramping in the Forbidden Operating Region, the implicit ramp rate will be used as determined based on the time it takes for the resource to cross its Forbidden Operating Region. A resource can only be ramped through a Forbidden Operating Region after being dispatched into a Forbidden Operation Region. The CAISO will not Dispatch a resource within its Forbidden Operating Regions in the Real-Time Market, except that the CAISO may Dispatch the resource through the Forbidden Operating Region in the direction that the resource entered the Forbidden Operating Region at the maximum applicable Ramp Rate over consecutive Dispatch Intervals. A resource with a Forbidden Operating Region cannot provide Ancillary Services in a particular fifteen (15) minute Dispatch Interval unless that resource can complete its transit through the relevant Forbidden Operating Region within that particular Dispatch Interval.

System Unit is Dispatched between zero (0) MW and the highest MW value within its submitted Economic Bid range or Generated Bid. If a resource is Dispatched below its Minimum Operating Limit or above the highest MW value in its Economic Bid range or Generated Bid, or the CAISO enforces a resource-specific constraint on the resource due to an RMR or Exceptional Dispatch, or the resource is Ramping through its Forbidden Operating Region, the resource will not be eligible to set the LMP. Resources identified as MSS Load following resources are not eligible to set the LMP. A resource constrained at an upper or lower operating limit, a boundary of a Forbidden Operating Region, or dispatched for a quantity of Energy such that its full Ramping capability is constraining the ability of the resource to be dispatched for additional Energy in target interval, cannot be marginal (i.e., it is constrained by the Ramping capability) and thus is not eligible to set the Dispatch Interval LMP. Non-Dynamic System Resources are not eligible to set the Dispatch Interval LMP. Dynamic System Resources are eligible to set the Dispatch Interval LMP. A Constrained Output Generator that has the ability to be committed or shut off within the Time Horizon of the RTM will be eligible to set the Dispatch Interval LMP if any portion of its Energy is necessary to serve Demand. Dispatches of Regulation resources by EMS in response to AGC will not set the RTM LMP. Dispatches of Regulation resources to a Dispatch Operating Point by RTM SCED will be eligible to set the RTM LMP.

34.19.2.4 [NOT USED]

34.19.2.5 Price for Uninstructed Deviations for Participating Intermittent Resources.

Deviations associated with each Participating Intermittent Resource in a Scheduling Coordinator's portfolio shall be settled as provided in Section 11.12 at the monthly weighted average Dispatch Interval LMP, as calculated in accordance with Section 11.5.4.1 at each Pnode associated with the Participating Intermittent Resource, and using the monthly weighted average with weights equal to total Real-Time Generation.

Attachment B – Blacklines

Forbidden Operating Regions Amendment to Tariff

Fourth Replacement Tariff

February 12, 2010

* * *

34.15.1 Resource Constraints-

The SCED shall enforce the following resource physical Constraints:

- (a) Minimum and maximum operating resource limits. Outages and limitations due to transmission clearances shall be reflected in these limits. The more restrictive operating or regulating limit shall be used for resources providing Regulation so that the SCED shall not Dispatch them outside their Regulating Range.
- (b) ~~Forbidden Operating Regions. When ramping in the Forbidden Operating Region, the implicit ramp rate will be used as determined based on the time it takes for the resource to cross its Forbidden Operating Region. from the resource's transit time will be used when Dispatching in the Forbidden Operating Region even if the Forbidden Operating Region constraint is not enforced through the SCED process. The CAISO will not Dispatch a resource within its Forbidden Operating Regions in the Real-Time Market, except that the CAISO may Dispatch the resource through the Forbidden Operating Region in the direction that the resource entered the Forbidden Operating Region at the maximum applicable Ramp Rate over consecutive Dispatch Intervals. A resource ramping through a Forbidden Operating Region shall not set the LMP at its location. A resource with a Forbidden Operating Region cannot provide Ancillary Services in a particular fifteen (15) minute Dispatch Interval unless that resource can complete its transit through the relevant Forbidden Operating Region within that particular Dispatch Interval.~~
- (c) Operational Ramp Rates and Start-Up Times. The submitted Operational Ramp Rate for resources shall be used as the basis for all

Dispatch Instructions, provided that the Dispatch Operating Point for resources that are providing Regulation remains within their applicable Regulating Range. The Regulating Range will limit the Ramping of Dispatch Instructions issued to resources that are providing Regulation. The Ramp Rate for Non-Dynamic System Resources cleared in the HASP will not be observed. Rather, the ramp of the Non-Dynamic System Resource will respect inter-Balancing Authority Area Ramping conventions established by WECC. Ramp Rates for Dynamic System Resources will be observed like Participating Generators in the RTD. Each Energy Bid shall be Dispatched only up to the amount of Imbalance Energy that can be provided within the Dispatch Interval based on the applicable Operational Ramp Rate. The Dispatch Instruction shall consider the relevant Start-Up Time as, if the resource is off-line, the relevant Operational Ramp Rate function, and any other resource constraints or prior commitments such as Schedule changes across hours and previous Dispatch Instructions. The Start-Up Time shall be determined from the Start-Up Time function and when the resource was last shut down. The Start-Up Time shall not apply if the corresponding resource is on-line or expected to start.

- (d) Maximum number of daily Start-Ups. The SCED shall not cause a resource to exceed its daily maximum number of Start-Ups.
- (e) Minimum Run Time and Down Time. The SCED shall not start up off-line resources before their Minimum Down Time expires and shall not shut down on-line resources before their Minimum Run Time expires.
- (f) Operating (Spinning and Non-Spinning) Reserve. The SCED shall Dispatch Spinning and Non-Spinning Reserve subject to the limitations set forth in Section 34.16.3.

- (g) Non-Dynamic System Resources. If Dispatched, each Non-Dynamic System Resource flagged for hourly pre-dispatch in the next Trading Hour shall be Dispatched to operate at a constant level over the entire Trading Hour. The HASP shall perform the hourly pre-dispatch for each Trading Hour once prior to the Operating Hour. The hourly pre-dispatch shall not subsequently be revised by the SCED and the resulting HASP Intertie Schedules are financially binding and are settled pursuant to Section 11.4.
- (h) Daily Energy use limitation to the extent that Energy limitation is expressed in a resource's Bid. If the Energy Limits are violated for purposes of Exceptional Dispatches for System Reliability, the Bid will be settled as provided in Section 11.5.6.1.

* * *

34.19.2.3 Eligibility to Set the Real-Time LMP.

All Generating Units, Participating Loads, Dynamic System Resources, System Units, or COGs subject to the provisions in Section 27.7, with Bids, including Generated Bids, that are unconstrained due to Ramp Rates or other temporal constraints are eligible to set the LMP, provided that (a) a Generating Unit or a Dynamic Resource-Specific System Resource is Dispatched between its Minimum Operating Limit and the highest MW value in its Economic Bid or Generated Bid, or (b) a Participating Load, a Dynamic System Resource that is not a Resource-Specific System Resource, or a System Unit is Dispatched between zero (0) MW and the highest MW value within its submitted Economic Bid range or Generated Bid. If a resource is Dispatched below its Minimum Operating Limit or above the highest MW value in its Economic Bid range or Generated Bid, or the CAISO enforces a resource-specific constraint on the resource due to an RMR or Exceptional Dispatch, or the resource is Ramping through its Forbidden Operating Region, the resource will not be eligible to set the LMP. Resources identified as MSS Load following resources are not eligible to set the LMP. A resource constrained at an upper or lower operating limit, a boundary of a Forbidden Operating Region, or

dispatched for a quantity of Energy such that its full Ramping capability is constraining the ability of the resource to be dispatched for additional Energy in target interval, cannot be marginal (i.e., it is constrained by the Ramping capability) and thus is not eligible to set the Dispatch Interval LMP. Non-Dynamic System Resources are not eligible to set the Dispatch Interval LMP. Dynamic System Resources are eligible to set the Dispatch Interval LMP. A Constrained Output Generator that has the ability to be committed or shut off within the Time Horizon of the RTM will be eligible to set the Dispatch Interval LMP if any portion of its Energy is necessary to serve Demand. Dispatches of Regulation resources by EMS in response to AGC will not set the RTM LMP. Dispatches of Regulation resources to a Dispatch Operating Point by RTM SCED will be eligible to set the RTM LMP.

**Attachment C - CAISO Tariff language pertaining to real-time forbidden operating region
functionality as it existed before the October 31, 2008 Deferral Filing**

Forbidden Operating Regions Amendment to Tariff

Fourth Replacement Tariff

February 12, 2010

* * *

34.15.1 Resource Constraints.

The SCED shall enforce the following resource physical Constraints:

- (a) Minimum and maximum operating resource limits. Outages and limitations due to transmission clearances shall be reflected in these limits. The more restrictive operating or regulating limit shall be used for resources providing Regulation so that the SCED shall not Dispatch them outside their Regulating Range.
- (b) Forbidden Operating Regions. Resources can only be ramped through these regions. The SCED shall not Dispatch resources within their Forbidden Operating Regions unless at the maximum applicable Ramp Rate to clear the Forbidden Operating Region in consecutive Dispatch Intervals. Resources ramping through a Forbidden Operating Region shall not set LMP at its location and cannot provide Ancillary Services and will not be called upon to provide Ancillary Services, unless the resource can cross the Forbidden Operating Region in less than twenty (20) minutes.

* * *

34.19.2.3 Eligibility to Set the Real-Time LMP.

All Generating Units, Participating Loads, Dynamic System Resources, System Units, or COGs subject to the provisions in Section 27.7, with Bids, including Default Energy Bids, that are unconstrained due to Ramp Rates or other temporal Constraints are eligible to set the LMP, provided that the Generating Unit, Participating Load, Dynamic System Resource, or System Unit is Dispatched within its submitted Economic Bid range. If a resource is Dispatched beyond its Economic Bid range, the CAISO enforces a resource-specific Constraint on the resource due to an RMR or Exceptional Dispatch, or the resource is Ramping through a Forbidden Operating Region, the resource will not be eligible to set the LMP. Resources identified as MSS Load following resources are not eligible to set the LMP. A resource constrained at an upper or lower operating limit, a boundary of a Forbidden Operating Region or dispatched for a quantity of Energy such that its full Ramping capability is constraining the ability of the resource to be dispatched for additional Energy in target interval, cannot be marginal (i.e., it is

CAISO Tariff language pertaining to real-time forbidden operating region functionality as it existed before the October 31, 2008 Deferral Filing

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constrained by the Ramping capability) and thus is not eligible to set the Dispatch Interval LMP. Non-Dynamic System Resources are not eligible to set the Dispatch Interval LMP. Dynamic System Resources are eligible to set the Dispatch Interval LMP. A Constrained Output Generator that has the ability to be committed or shut off within the two-hour Time Horizon of the RTM will be eligible to set the Dispatch Interval LMP if any portion of its Energy is necessary to serve Demand. Dispatches of Regulation resources by EMS in response to AGC will not set the RTM LMP. Dispatches of Regulation resources to a Dispatch Operating Point by RTM SCED will be eligible to set the RTM LMP.

ATTACHMENT D

PREPARED DIRECT TESTIMONY OF JANET MORRIS

**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

**California Independent System)
Operator Corporation)**

**Docket Nos. ER09-213-000 &
ER10-____ - ____**

**PREPARED DIRECT TESTIMONY
OF
JANET MORRIS**

1 **UNITED STATES OF AMERICA**
2 **BEFORE THE**
3 **FEDERAL ENERGY REGULATORY COMMISSION**

4
5
6 **California Independent System) Docket Nos. ER09-213-000 &**
7 **Operator Corporation) ER10-____ - ____**
8
9

10 **PREPARED DIRECT TESTIMONY**
11 **OF**
12 **JANET MORRIS**
13

14
15 **I. Introduction**

16 **Q. Please state your name and business address.**

17 A. My name is Janet Morris. My business address is 151 Blue Ravine Road,
18 Folsom, California 95630.

19 **Q. By whom and in what capacity are you employed?**

20 A. I am employed as the Director of the Program Office of the California
21 Independent System Operator Corporation (ISO). As Director of the
22 Program Office, I am responsible for overseeing the schedule for
23 development, testing, and implementation of market enhancements, such
24 as a real-time market forbidden operating region functionality.

25 **Q. Please describe your professional and educational background.**

26 A. I joined the ISO in 2003 as Contract Project Manager, became Senior
27 Project Manager in 2006, became Manager of the Program Office in 2007,
28 and in 2009, I assumed my current job. In these positions, I have worked
29 extensively in the project management and implementation of new market
30 initiatives.

1 I received my Bachelor of Science degree in Computer Science from
2 California Polytechnic State University in San Luis Obispo, California, and
3 my Master of Science degree in Engineering Management from Santa
4 Clara University in Santa Clara, California. After graduating, I spent over
5 18 years as a Project Manager in Software Research & Development and
6 Service for Hewlett-Packard. For the four years before I joined the ISO, I
7 was the Director of Engineering responsible for Project Management for
8 Commerce One, an Internet software company. I have a total of over 25
9 years of experience in the software design field.

10 **Q. Have you previously testified before the Commission?**

11 A. Yes. In Docket No. ER06-615, I provided a declaration describing the
12 factors that led to the ISO extending the schedule of convergence bidding.

13 **Q. What is the purpose of your testimony in this proceeding?**

14 A. I will discuss the implementation of the forbidden operating region
15 functionality in the real-time market and why its implementation on April
16 15, 2010 will not delay implementation of other important ISO market
17 initiatives, such as permitting load to fully participate in the ISO's market,
18 convergence bidding, and multi-stage generator modeling.

19 **II. Implementing the Forbidden Operating Region Functionality in Real**
20 **Time Market**

21 **Q. Are you familiar with the reasons why, on October 31, 2008, the ISO**
22 **requested to defer implementation of a forbidden operating region**
23 **functionality for the real-time market?**

1 A. Yes I am. Prior to the start of the new market design, as the ISO and
2 market participants conducted market simulations, we determined that the
3 inclusion of the forbidden operating region functionality in the real-time
4 market caused performance and stability issues. At that time we observed
5 that during real-time market runs, the inclusion of this functionality in the
6 software essentially was preventing the market from generating solutions.
7 It appeared as though including this functionality exacerbated the already
8 complex nature of the real-time market, leading to its failure to generate a
9 solution. We did not experience these types of issues in the day-ahead
10 market because the day-ahead market is not faced with as many variables
11 and complexities.

12 **Q. Why did the ISO choose to proceed without this functionality in the**
13 **real-time market?**

14 A. While this functionality was part of the original market design, the ISO
15 determined that the ISO and market participants could operate the
16 markets effectively without the functionality by taking other actions to
17 address the existence of forbidden operating regions in the real-time. For
18 example, we knew that the functionality would have prevented the
19 dispatch of resources within a forbidden operating region. Without this
20 functionality, in the event that the real-time market dispatched a resource
21 within a forbidden operating region, the ISO could exceptionally dispatch
22 the resource to take it through the region. We also knew that resource
23 owners themselves could manage their forbidden operating regions

1 through the submission of outages to the ISO. From a long term
2 perspective, neither of these alternatives is preferable to having the
3 functionality in place. However, in the interest of not delaying the launch
4 of its new market design, the ISO proposed to delay the implementation of
5 this functionality at go-live to harden the performance of the real-time
6 market. This delay was made with the understanding that implementation
7 would be pursued at a later time.

8 **Q. What actions did the ISO take after go-live to determine whether the**
9 **forbidden operating region functionality should be included for the**
10 **real-time market?**

11 A. Even prior to the start of the new market, the ISO determined that
12 adoption of the multi-stage generating unit modeling functionality would
13 improve the performance of the real-time market and permit inclusion of
14 the forbidden operating region functionality. Therefore, after the new
15 market went live in April 2009, the ISO concentrated its efforts towards
16 developing the multi-stage generator modeling functionality.

17 **Q. Can you describe why the ISO expected multi-stage generator**
18 **modeling to improve the performance of the real-time market and**
19 **permit inclusion of the forbidden operating region functionality?**

20 A. One of the reasons for the performance issues observed with the inclusion
21 of the forbidden operating region functionality in the real-time market was
22 that many resources that would be better modeled through multi-stage
23 modeling registered forbidden operating regions. For example, resources

1 like combined cycle gas units can operate in different configurations but
2 also have operating ranges within which they cannot operate reliably. The
3 ISO determined that in the absence of multi-stage modeling, many such
4 resources intended to rely on the forbidden region functionality as a
5 second-best alternative. Inclusion of multi-stage generator modeling will
6 allow such resources to instead rely on that functionality, which will in turn
7 relieve volume-related constraints to the real-time market forbidden region
8 functionality.

9 **Q. Does multi-stage generator modeling resolve the need for a**
10 **forbidden operating region functionality?**

11 A. No. After go-live, through the multi-stage generator stakeholder process,
12 the ISO came to understand that there are some resources that may be
13 served better by the forbidden operating region functionality in the real-
14 time than they would be by multi-stage modeling. This includes gas
15 turbine peaking units, as well as some types of relatively small combined
16 cycle resources. Therefore, the ISO concluded that adopting multi-stage
17 modeling would not eliminate the need for the forbidden operating
18 functionality.

19 **Q. What enables the ISO to now implement the previously-deferred**
20 **functionality?**

21 A. Since the start of its new market design numerous tuning and adjustment
22 efforts across the various elements of the ISO's market software and
23 processes have contributed to an overall increase in performance of the

1 market systems. This marked improvement in performance enables the
2 ISO to more confidently pursue enhancements such as the forbidden
3 operating region functionality. In addition, and most importantly, while the
4 ISO determined that due to project and implementation challenges it is
5 necessary to delay implementation of the multi-stage generating unit
6 functionality, the ISO and its vendor were able to leverage the work they
7 did on developing the multi-stage generator functionality and transfer that
8 knowledge to the forbidden operating region in the real-time market
9 functionality. The ISO and its vendor were able to determine that certain
10 optimization requirements could be enhanced in a manner that allows the
11 real-time market optimization to avoid parts of the heuristic approach
12 previously thought necessary for the adoption of the forbidden operating
13 functionality in the real-time market. More specifically, the ISO and its
14 vendor determined that an additional software algorithm enhancement
15 relating to how a resource enters and transits through a forbidden
16 operating region would reduce the performance issues previously
17 encountered. In particular, depending on the amount of time it takes for a
18 resource to pass through its forbidden operating region, a resource may
19 be dispatched to the border of the forbidden operating region before
20 proceeding to cross the forbidden operating region boundary. The
21 functionality will optimize the best market solution based on the number of
22 dispatch intervals it takes for the resource to cross its forbidden operating
23 region. These improvements enable the activation of the forbidden

1 operating region functionality while maintaining the performance of the
2 real-time market.

3 **Q. When did the ISO first become aware that a software enhancement**
4 **might alleviate the earlier problems experienced with the real-time**
5 **market forbidden operating region functionality?**

6 A. In October of 2009, while the ISO was evaluating the project schedule of
7 the multi-stage generating unit functionality, the ISO discussed with its
8 vendor the possibility of adopting the optimization enhancements
9 discussed above that allow it to turn on the forbidden operating region in
10 the real-time market functionality before the implementation of the multi-
11 stage generating unit functionality. At that point, due in large part to the
12 significant work done in developing the multi-stage functionality, the
13 vendor determined that the optimization enhancements could be readily
14 provided without any impact on delivering other pending software
15 enhancements and variances. An important consideration in reaching this
16 conclusion is the fact that while the multi-stage generator modeling
17 functionality impacts the market engine it also requires the integration of a
18 number of other market functions, whereas the forbidden operating region
19 functionality simply impacts the market engine and has no integration
20 issues. This enabled the ISO to accept the software enhancement and
21 insert the testing and market simulation of the functionality into the ISO's
22 existing schedule for the spring release functionalities that include proxy

1 demand resources, procurement of ancillary services in the hour-ahead
2 scheduling process, and scarcity pricing.

3 **Q. What resources did the ISO expend to develop the software patch in**
4 **question?**

5 A. As discussed above, the software patch was a beneficial by-product of
6 work on developing the multi-stage generating unit functionality. The ISO
7 did not directly expend resources on the development of the software
8 enhancement.

9 **Q. What steps has the ISO taken to determine whether there likely will**
10 **be performance issues in deploying its intended patch?**

11 A. On December 14, 2009, the ISO received from its vendor the software
12 patch that enables the ISO to turn the forbidden operating region
13 functionality on without comprising performance. The ISO already has
14 tested its compatibility with the ISO's existing market software and was
15 able to determine with a reasonable degree of confidence that this
16 enhancement could be adopted without compromising market
17 performance. Based on these preliminary results, the ISO believes that
18 the software enhancement addresses the earlier problems it experienced
19 with implementing the forbidden operating region functionality for the real-
20 time market. Further confirmation will be provided by the upcoming
21 market simulations.

22 **Q. What additional steps will the ISO take to ensure that the real-time**

1 **market forbidden operating region functionality will be ready for**
2 **implementation on April 15, 2010?**

3 A. Because the forbidden operating region functionality can be turned on with
4 minimal effort, the ISO plans to include this functionality in already
5 scheduled market simulations that begin on March 1, 2010. The
6 upcoming simulation was put in place to provide market participants with
7 the opportunity to test market performance with the inclusion of other new
8 functionalities. These new functionalities include ancillary services
9 procurement in the hour-ahead scheduling process, scarcity pricing, and
10 proxy demand resources. The market simulation will allow market
11 participants to observe four forbidden operating region scenarios and
12 validate market results. The goal of the scenarios is to force forbidden
13 operating regions to be crossed and to monitor their behavior and the
14 performance of all other units that must balance commodities during the
15 crossing of the forbidden operating regions.

16 **Q. Once the market simulation process is complete, what additional**
17 **steps will the ISO take to deploy the real-time market forbidden**
18 **operating region functionality?**

19 A. The ISO will deploy the software patch to the market software. At that
20 point, implementing the functionality simply will be a matter of enabling a
21 software flag that turns the function on.

22 **Q. Has the ISO's focus on implementing the real-time market forbidden**
23 **operating region functionality up to this point caused schedule**

1 **delays for implementing other market initiatives, such as instituting**
2 **participating load, MSG modeling, and convergence bidding?**

3 A. No. The schedule for those market initiatives so far has been unaffected
4 by the real-time market forbidden operating region functionality. The fact
5 that the vendor and the ISO were able to leverage the work done in
6 developing the multi-stage generator functionality enabled the ISO to
7 reduce any impact it would have on its effort to complete other projects.

8 **Q. Will the ISO's future work on implementing the real-time market**
9 **forbidden operating region functionality likely cause future schedule**
10 **delays on other pressing market initiatives?**

11 A. No. Those other projects are distinct from the ISO's efforts relating to the
12 real-time market forbidden operating region functionality. In conducting
13 internal tests of the software patch, the ISO has confirmed that
14 deployment of the forbidden operating region functionality does not
15 interface significantly with other ISO computer systems. For this reason,
16 the ISO does not believe that any further work on the proposed forbidden
17 operating region functionality would impact those other proposals.

18 **Q. Does the ISO anticipate that market participants will be able to**
19 **devote the resources to be ready for the proposed April 15, 2010**
20 **implementation date?**

21 A. Yes. Implementing the real-time market forbidden operating region
22 functionality does not impact market participant interfaces. For this
23 reason, the ISO does not anticipate that market participants will need to

1 expend many resources to prepare for a real-time market forbidden
2 operating region functionality.

3 **Q. If both the ISO and market participants will not have to devote**
4 **significant resources to meet the proposed April 15, 2010**
5 **implementation date, are there other reasons to believe that meeting**
6 **this proposed implementation date will cause delays in the current**
7 **schedule for implementing participating load, multi-stage generator**
8 **unit modeling, and convergence bidding?**

9 A. I have no reason to believe that the work on implementing the real-time
10 market forbidden operating region functionality will delay implementation
11 of any other market initiative the ISO currently is pursuing.

12 **III. Conclusion**

13
14 **Q. Does this conclude your declaration?**

15
16 A. Yes, it does.
17

18 I affirm under penalty of perjury that the foregoing statements are true and
19 correct to the best of my knowledge, information, and belief.

20

21



Janet Morris

22

23 Executed this 12th day of February, 2010.