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June 5, 2009

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

Re: California Independent System Operator Corporation
Docket No. ER09-____- 000

Tariff Amendment Regarding Designation of Reference Bus in Day-Ahead Price Calculations

Request for Waiver of 60-Day Notice Requirement

Dear Secretary Bose:

Pursuant to Section 205 of the Federal Power Act ("FPA"),[1] 16 U.S.C. § 824d (2008), and Section 35.13 of the regulations of the Federal Energy Regulatory Commission ("Commission"), 18 C.F.R. § 35.13 (2008), the California Independent System Operator Corporation (the "ISO") respectfully submits for filing an original and five copies of an amendment to its tariff.

In this filing, the ISO proposes to modify certain language in Appendix C of its tariff describing the calculation of Locational Marginal Prices ("LMPs"). Specifically, the ISO proposes a minor modification to the provisions regarding the designation of a reference bus as it pertains to the calculation of the marginal cost of energy. The ISO tariff currently provides that the ISO will use a distributed load reference bus in calculating the marginal cost of energy. If accepted for filing, this amendment will explicitly clarify that the ISO has the flexibility to use a distributed generation reference bus as a backstop measure in cases where the Integrated Forward Market ("IFM") cannot clear using a distributed load reference bus.

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[1] Capitalized terms not otherwise defined herein have the meanings set forth in the Master Definitions Supplement, Appendix A to the ISO Tariff, and in Part G (Definitions) of Appendix BB to the ISO Tariff.

This amendment is just and reasonable because it will provide a backstop measure to the reference bus methodology already reflected in the tariff and accepted by the Commission and will ensure that the ISO will be able to clear the IFM under circumstances where the IFM is unable to reach a solution using a distributed load reference bus.

Two extra copies of this filing are also enclosed. Please stamp these copies with the date and time filed and return them to the messenger.

I. BACKGROUND AND NEED FOR TARIFF AMENDMENT

The ISO's new Market Redesign and Technology Upgrade, or "MRTU", is based on Locational Marginal Prices, the same pricing method used in other organized markets throughout the country. LMPs consist of three components: the marginal cost of energy, the marginal cost of congestion, and the marginal cost of losses. These three components together compose the market-clearing LMP for each node on the ISO system. This tariff amendment deals with the calculation of the marginal cost of energy component (or the "System Marginal Energy Cost" or "SMEC" under the tariff).[2]

In calculating the SMEC, because transmission losses are not known before determining the least cost solution, a so-called "slack" or "reference bus" is designated in the network solution to absorb any positive or negative power mismatches. Once the reference bus is selected, the LMP at that bus becomes the System Marginal Energy Cost for the whole system. The marginal loss and congestion components are zero at the designated reference bus. Marginal loss and congestion components at other nodes are then determined relative to the reference bus. The accompanying declaration of Mark Rothleder, appended hereto as Attachment C, contains a detailed discussion of the role of the reference bus in determining the SMEC.

A reference bus can either be a single node on the system or a set of nodes, called a "distributed reference bus." There are two ways to implement the distributed reference bus method for calculating the SMEC: distributed load reference bus or distributed generation reference bus. A distributed load reference bus is a set of load nodes on the system. A distributed generation bus is a set of generation nodes on the system. All reference busses play the same role, namely to establish the marginal cost of energy on all nodes of the system. This amendment concerns the ISO's ability to use a distributed generation reference bus in circumstances where use of a distributed load reference bus cannot be used for calculating the SMEC component of LMPs in the IFM.

When it filed the MRTU Tariff in 2006, Section 27.1.11 specified that the ISO would use a distributed reference bus. In Paragraphs 64 and 97 of its September 21, 2006

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[2] For reference purposes, the ISO submitted extensive testimony from Dr. Farrokh Rahimi in Docket No. ER06-615 that discusses LMP pricing components, including the SMEC, in considerable detail; that testimony is available on the ISO's website at http://www.caiso.com/1798/1798ea1b23080.html.

MRTU Order, the Commission directed the ISO to augment its tariff with more details concerning the LMP calculation and its components. On August 3, 2007, in compliance with that order, the ISO filed Appendix C to its MRTU Tariff that contained additional details on price calculation. In that amendment, the ISO included language that specified the use of a distributed load reference bus in calculating the SMEC component of LMPs. Specifically, Part B of Appendix C (System Marginal Energy Cost Component of LMP) states: "For the designated reference location the CAISO will utilize a distributed reference bus for which constituent PNodes are weighted in pre-specified proportions, referred to as reference bus distribution factors. The distribution factors are based on actual Demand at each PNode that represents Load."

Consistent with Appendix C, the distributed load reference bus is the current default method of designating a reference bus employed by the ISO. However, during factory testing of the MRTU software, the ISO became aware that under certain circumstances the software would not be able to successfully clear the IFM using a distributed load reference bus. The reasons for this failure to clear the IFM were not readily apparent at that time.[3] However, the ISO was able to determine that this problem could be avoided by running the IFM with a distributed generation reference bus. Accordingly, the ISO modified the MRTU simulation software to run the IFM using a distributed generation reference bus, pending a solution to this issue, and also modified Section 3.2.1 of its Business Practice Manual ("BPM") for Market Operations to include language indicating that the ISO has the flexibility to use a distributed generation reference bus in the IFM. Specifically, the BPM contains this phrase: "CAISO uses a distributed load slack in all applications except IFM where distributed generation slack may be used." This revision was captured in Version 6 of the BPM for Market Operations published on October 1, 2008. At the time the BPM was amended to include that phrase, however, the tariff provision in Appendix C stating that the ISO will only use a distributed load reference bus was not modified.

On May 22, 2009, the ISO implemented software enhancements that mitigate the software problem that resulted in an inability to reach a market solution in the IFM using a distributed load reference bus under certain circumstances. Although the ISO is reasonably confident that it will be able to clear the IFM with a distributed load reference bus, the ISO believes that the most prudent approach is to ensure that it has the tariff authority to revert to a distributed generation reference bus if the circumstances require it. The ISO submits that using a distributed generation reference bus to run the IFM is preferable to not being able to reach a solution and clear that market. Therefore, the ISO is proposing to clarify in its tariff that it has the authority to use a distributed generation reference bus as a backstop mechanism.

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[3] The ISO subsequently determined that because the IFM is based on bid-in load (rather than forecasted load), when load bids were exhausted, the amount of difference between losses in the initial iteration and the subsequent power flow iteration required larger use of the reference bus to balance power flow. When that occurred, the power flow failed to converge and no market solution was obtained.

II. PROPOSED TARIFF CHANGES

The ISO is proposing to modify Appendix C to its tariff to permit the ISO to use a distributed generation reference bus in those circumstances in which the IFM cannot clear using a distributed load reference bus. Specifically, the ISO is proposing to amend Section B of Appendix C to state that the ISO will utilize a distributed load reference bus, except that in the event that the IFM fails to reach a solution using a distributed load reference bus, in which case the ISO will employ a reference bus based on distributed generation in clearing the IFM. The tariff sheets implementing this change are appended hereto as Attachments A and B.

Pursuant to stakeholder requests in comments prior to filing, the ISO is adding the additional clarification that the distributed load reference bus utilizes Load Distribution Factors in the determination of the distributed load reference bus.[4] The tariff provides that the distributed generation reference bus will consist of constituent nodes and weights as determined within the running of the Integrated Forward Market.

This tariff amendment is just and reasonable because it implements a prudent measure to ensure that the IFM clears as designed. As noted above, there exists a possibility (albeit a narrower possibility since the May 22 software enhancements) that the IFM will not clear with a distributed load reference bus. This is not an acceptable market outcome. Accordingly, the ISO proposes here a simple backstop measure to ensure that it can properly designate a reference bus in all cases so that the IFM will clear as designed. Furthermore, the ISO continues to investigate the root cause of instances in which IFM fails with the use of distributed load and the ISO must resort to running with distributed generation reference bus and will continue to work towards eliminating these occurrences. The ISO will also provide notification to market participants of what IFM runs the ISO has had to fall back to the use of distributed generation as opposed to the distributed load reference bus.

As discussed by Mr. Rothleder in his declaration, the impact of using a distributed generation reference bus produces price outcomes that are reasonably consistent with the distributed load reference bus. As the data in Mr. Rothleder's declaration show, the use of a distributed generation reference bus will be expected to have a *de minimis* impact on market outcomes when compared with the volume of sales and purchases being transacted in the ISO markets on a daily basis. Because this change affects how the ISO calculates the SMEC, which is the marginal cost of energy for every node on the ISO system, this change affects each market participant uniformly, with no entities disproportionately impacted by the change.

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4 Section 27.5.5 already provides the how the LDFs are determined and how often they are updated.

III. STAKEHOLDER PROCESS

Because of the immediate need to have the flexibility provided by this tariff amendment, and what ISO believes to be the relatively uncontroversial nature of this proposal, the ISO conducted an abbreviated stakeholder process for this amendment. On May 27, 2009, the ISO posted the proposed changes to Appendix C of the ISO Tariff on its website. On May 28, 2009, the ISO discussed with Market Participants this proposed amendment during its weekly Market Issues call. Based on feedback received on that call and comments received subsequently prior to this filing, the ISO does not believe that there is any stakeholder opposition to this amendment. Finally, in light of the fact that the proposed revision concerns a level of implementation detail that is not considered by its Board of Governors, ISO management concluded that this tariff amendment is authorized by the Board of Governors' prior authorization to file the MRTU tariff.

IV. EFFECTIVE DATE – REQUEST FOR WAIVER OF 60-DAY NOTICE PERIOD OR, IN THE ALTERNATIVE, REQUEST FOR WAIVER OF TARIFF PROVISION

Pursuant to Section 35.11 of the Commission's regulations,[5] the ISO requests that the Commission waive the 60-day prior notice requirement for this tariff amendment, accept it for filing, and permit it to become effective on June 6, 2009, one day after the filing of this amendment. Good cause exists to grant this waiver in this case because without the authority to resort to a backstop reference bus designation, the possibility exists that the IFM will not clear properly, which would result in unjust and unreasonable market outcomes.[6] Therefore, it is important that the ISO have the flexibility provided for in this amendment as soon as possible.

If the Commission does not, however, waive the 60-day prior notice requirement, then, in the alternative, the ISO requests that the Commission grant the ISO a limited waiver of the requirement set forth in Section B of Appendix C of the ISO Tariff that the ISO use a distributed load reference bus to calculate the SMEC component of LMPs in the IFM during the 60-day notice period. This will allow the ISO the flexibility to use a distributed generation reference bus if necessary in order to clear the IFM prior to the effectiveness of the enclosed amendment. The ISO's request meets the Commission's standard for tariff waivers:[7] (1) good cause exists for the waiver because of the need to

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5 18 C.F.R. § 35.11 (2008).

6 *See California Indep. System Operator,* 125 FERC ¶ 61,153 (2008) (granting waiver of 60-day notice period to permit timely allocation of Congestion Revenue Rights in MRTU market).

7 *See Cal. Indep. Sys. Operator Corp.,* 118 FERC ¶ 61,226 at P 24 (2007) (granting waiver to generator interconnection procedures to facilitate efficient and cost-effective treatment of 4,350 MW of wind-related interconnection requests), *citing ISO New England,* 117 FERC ¶ 61,171 at P 21(2006) (allowing a limited and temporary change to tariff to correct an error); *Great Lakes Gas Transmission Ltd. Partnership,* 102 FERC ¶ 61,331 at P 16 (2003) (granting emergency waiver involving force majeure event granted for good

ensure that the IFM is able to clear; (2) the waiver will not unfairly disadvantage any Market Participants because, as discussed above, the price differences between using a distributed load versus distributed generation reference bus are minor, and do not disproportionately impact any Market Participant or class of Market Participants; and (3) the waiver will be of limited duration, expiring upon the effectiveness of the enclosed amendment at the close of the 60-day notice period.

V. COMMUNICATIONS

Communications regarding this filing should be addressed to the following individuals, whose names should be placed on the official service list established by the Secretary with respect to this submittal:

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VI. SERVICE

The ISO has served copies of this transmittal letter, and all attachments, on the California Public Utilities Commission, the California Energy Commission, the California Electricity Oversight Board, all parties with effective Scheduling Coordinator Service Agreements under the ISO Tariff, and all parties in Docket No. ER06-615. In addition, the ISO is posting this transmittal letter and all attachments on the ISO website.

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cause shown); and *TransColorado Gas Transmission Co.*, 102 FERC ¶ 61,330 P 5 (2003) (granting waiver for good cause shown to address calculation in variance adjustment).

VII. ATTACHMENTS

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

Attachment A	Revised Tariff Sheets – Clean
Attachment B	Revised Tariff Sheets - Blackline
Attachment C	Declaration of Mark Rothleder

VIII. CONCLUSION

For the foregoing reasons, the ISO respectfully requests that the Commission approve this tariff revision as filed. Please feel free to contact the undersigned if you have any questions concerning this matter.

Respectfully submitted,

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Attachment A – Clean Sheets

Distributed Load Reference Bus Revisions

Fourth Replacement CAISO Tariff

June 5, 2009

- MCC_i is the LMP component representing the Marginal Cost of Congestion (also referred to as ρ) at bus i relative to the Reference Bus.
- MCL_i is the LMP component representing the Marginal Cost of Losses (also referred to as γ) at bus i relative to the Reference Bus.

B. The System Marginal Energy Cost Component of LMP

The SMEC shall be the same for each location throughout the system. SMEC is the sensitivity of the power balance constraint at the optimal solution. The power balance constraint ensures that the physical law of conservation of Energy (the sum of Generation and imports equals the sum of Demand, including exports and Transmission Losses) is accounted for in the network solution. For the designated reference location the CAISO will utilize a distributed Load Reference Bus for which constituent PNodes are weighted using the Reference Bus distribution factors. The Load distributed Reference Bus distribution factors are based on the Load Distribution Factors at each PNode that represents cleared Load in the Integrated Forward Market or forecast Load for MPM-RRD, RUC, HASP and RTM. In the Integrated Forward Market, in the event that the market is not able to clear based on the use of a distributed load Reference Bus, the CAISO will use a distributed generation Reference Bus for which the constituent nodes and the weights are determined economically within the running of the Integrated Forward Market based on available economic bids. A distributed Load Reference Bus will be used for MPM-RRD, RUC, HASP and RTM regardless of whether a distributed Generation Reference Bus were used in the corresponding Integrated Forward Market run. Once the Reference Bus is selected, the System Marginal Energy Cost is the cost of economically providing the next increment of Energy at the distributed Reference Bus, based on submitted Bids.

C. Marginal Congestion Component Calculation

The CAISO calculates the Marginal Costs of Congestion at each bus as a component of the bus-level LMP. The Marginal Cost of Congestion (MCC_i) component of the LMP at bus i is calculated using the equation:

$$MCC_i = -\left(\sum_{k=1}^{k} PTDF_{ik} * FSP_k\right)$$

where:

- K is the number of thermal or interface transmission constraints.

$PTDF_{ik}$ is the Power Transfer Distribution Factor for the generator at bus i on interface k which limits flows across that constraint when an increment of power is injected at bus i and an equivalent amount of power is withdrawn at the Reference Bus. The industry convention is to ignore the effect of losses in the determination of PTDFs.

Attachment B - Blacklines

Distributed Load Reference Bus Revisions

Fourth Replacement CAISO Tariff

June 5, 2009

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CAISO TARIFF APPENDIX C

Locational Marginal Price

* * *

B. The System Marginal Energy Cost Component of LMP

The SMEC shall be the same for each location throughout the system. SMEC is the sensitivity of the power balance constraint at the optimal solution. The power balance constraint ensures that the physical law of conservation of Energy (the sum of Generation and imports equals the sum of Demand, including exports and Transmission Losses) is accounted for in the network solution. For the designated reference location the CAISO will utilize a distributed Load Reference Bus for which constituent PNodes are weighted ~~in pre-specified proportions, referred to as~~ using the Reference Bus distribution factors. The Load distributed Reference Bus distribution factors are based on the Load Distribution Factors~~actual Demand~~ at each PNode that represents cleared Load in the Integrated Forward Market or forecast Load for MPM-RRD, RUC, HASP and RTM. In the Integrated Forward Market, in the event that the market is not able to clear based on the use of a distributed load Reference Bus, the CAISO will use a distributed generation Reference Bus for which the constituent nodes and the weights are determined economically within the running of the Integrated Forward Market based on available economic bids. A distributed Load Reference Bus will be used for MPM-RRD, RUC, HASP and RTM regardless of whether a distributed Generation Reference Bus were used in the corresponding Integrated Forward Market run. Once the Reference Bus is selected, the System Marginal Energy Cost is~~and Demand has dictated the distribution factors,~~ the cost of economically providing the next increment of Energy at the distributed Reference Bus, based on submitted Bids~~, at that Reference Bus becomes the System Marginal Energy Cost~~.

* * *

Attachment C

Declaration of Mark Rothleder

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	**)** **)**	**Docket No. ER09-___-000**

DECLARATION OF MARK ROTHLEDER

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation) Docket No. ER09-___-000

DECLARATION OF MARK ROTHLEDER

Q. Please state your name, title, and business address.

A. My name is Mark Rothleder and I am the Principal Market Developer for the California Independent System Operator Corporation ("ISO" or "CAISO"). My business address is 151 Blue Ravine Road, Folsom, CA 95630.

Q. What are your responsibilities at the CAISO?

A. Since joining the CAISO over eleven years ago, I have worked extensively on implementing and integrating the approved market rules for California's competitive Energy and Ancillary Services markets, and the rules for Congestion Management, into the operations of the CAISO control area. Most recently, I have played a lead role in the design and implementation of market rules, operating procedures and software modifications related to the Market Redesign and Technology Upgrade ("MRTU").

Q. Please describe your educational and professional background.

A. I am a registered Professional Electrical Engineer in the state of California. I hold a B.S. degree in Electrical Engineering from the California State University, Sacramento. I have taken post-graduate coursework in Power System Engineering from Santa Clara University and earned an M.S. in Information Systems from the University of Phoenix. I have co-authored technical papers on aspects of the California market design in professional journals and have frequently presented to industry forums. Prior to joining the ISO in 1997, I worked for eight years in the Electric Transmission Department of Pacific Gas & Electric Company, where my responsibilities included Operations Engineering, Transmission Planning and Substation Design.

Q. Have you previously testified before the Commission?

A. Yes. In Docket No. EL00-95-045, I testified to the process by which the ISO calculated incremental heat rates for gas-fired Generating Units associated with Generators that are subject to price mitigation in the ISO's markets. I also submitted testimony in Docket No. ER06-615-000 supporting the original MRTU Tariff filing. Most recently, I submitted testimony in Docket No. ER08-1113 in support of the adoption of the Integrated Balancing Authority Area modeling and pricing approach.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain why in clearing the Integrated Forward Market (IFM) to calculate LMPs, the ISO requires the flexibility to fall back to use a distributed Reference Bus that is based on constituent nodal generation in the event that the IFM does not clear with a Reference Bus that is based on distributed load. This need for flexibility supports the ISO request to clarify the tariff so that it is clear that the ISO may use the distributed generation reference bus to calculate LMPs in situations where the IFM cannot clear using a distributed load Reference Bus. I will provide some technical background, provide a brief history of this issue, and discuss why this tariff amendment is necessary.

Q. What is a reference bus?

A. The reference bus is a critical element used in calculating the Locational Marginal Price components in the ISO's markets: System Marginal Energy Cost (SMEC), the marginal cost of congestion and the marginal cost of losses. The SMEC is the sensitivity of the power balance constraint at the optimal solution. When the optimization calculates the least cost solution, transmission losses are not known. The optimization therefore designates a so-called "slack" or "reference bus" in the network solution to absorb any positive or negative power mismatch in the power balance constraint in the optimal solution.

Once the reference bus is selected, the LMP at that bus becomes the System Marginal Energy Cost, and is the same for the whole system given the selected reference bus. In addition, the marginal cost of losses and marginal cost of congestion components of the LMP at the reference bus are zero. Therefore, the differences in LMP at other locations are a consequence of the differences in the congestion and losses costs at the relative locations relative to the reference bus. The marginal cost of losses then is the cost impact of losses for an incremental amount of injections a location and a compensating opposite injection at the reference bus. Similarly, the marginal cost of congestion reflects the cost impact on the system for an incremental amount of injection at a location and a compensating opposite injection at the reference bus.

Additional information regarding the reference bus and LMP components can be found in the testimony of Dr. Farrokh Rahimi, which was submitted as part of the initial filing of the MRTU Tariff in Docket No. ER06-615. That testimony is available on the ISO's website at http://www.caiso.com/1798/1798ea1b23080.html.

Q. How is a reference bus determined?

A. The optimization software may be configured in such a way that a reference bus may be designated as a single node or a collection of nodes. In some cases, market operators have opted to designate an actual single physical generation location with a large amount of capacity as the reference bus. The CAISO systems use a distributed reference bus that is determined through the optimization based on the distribution of actual generation or load in the system. A distributed reference bus that is based on the set of generation at specific locations in the system is referred to as distributed generation reference bus, whereas a distributed reference bus that is based on the load at the various locations on the system is referred to as distributed load reference bus. If a distributed reference bus option is selected, then the contribution of different nodes in the set to power balance mismatch correction is specified by the so-called "distribution factors." The use of a distributed reference bus is now a common industry practice, and consistent with this practice, the ISO chose to use a distributed reference bus for MRTU. When using a distributed generation reference bus, the determination of the distribution factors is dynamically determined based on the economics and quantity of available generation Energy bids submitted to the relevant market. When using a distributed load reference bus, the determination of the distribution factors is based on the same Load Distribution Factors used to clear load in IFM and the forecast load in the all other market passes solving for forecast load.

Q. What is the difference between a distributed load reference bus and a distributed generation reference bus?

A. As I just described, there are two ways to implement the distributed reference bus method for calculating the SMEC: by using load or generation nodes. Basically, by using a distributed load reference bus, the reference bus is the set of load nodes on the system. Distributed generation slack is the set of generation nodes. However, both play the same role, which is to establish the marginal cost of energy at all nodes of the system given the selected reference bus. When using a distributed load reference, the determination of the distribution factors is based on the same Load Distribution Factors used to distribute load to clear load in IFM and the forecast load in the all other market passes solving for forecast load.

When using a distributed load reference the marginal cost of losses is a cost impact of losses for an incremental amount of injections a location and a compensating opposite injection distributed to the distributed load reference bus. Similarly, the marginal cost of congestion reflects the cost impact on the system for an incremental amount of injection a location and a compensating opposite injection at the distributed load reference bus.

Q. Which of the two options has the ISO adopted in its markets and why?

A. For several reasons, the ISO has chosen to use a distributed load reference bus in all of its market processes from the Integrated Forward Market through the Real-Time Market processes. First, using a distributed load reference bus is more consistent with the general purpose of LMP pricing; that is, to determine the marginal cost of serving the next increment of load on the system. In addition, in using distributed load for the purposes of determining the reference bus in the market run, the ISO is able to use the same distribution factors that are used to distribute load on the system (load distribution factors) in its Load Aggregation Point (LAP) clearing process. Also, the ISO has some concerns that using a distributed generation reference bus could in some cases result in a more concentrated reference bus than intended. The ISO has observed that the use of a distributed generation reference bus can result in a disproportionate distribution of generation behind a particular transmission constraint, which in turn could lead to increased congestion given that concentration. Such a concentration may increase the SMEC in those periods as greater amounts of energy are dispatched in order to resolve the constraint. A recent

ISO technical bulletin (available at http://www.caiso.com/23a0/23a0d3b01cb00.pdf) explains this effect.

Q. Which method of reference bus calculation is reflected in the ISO tariff?

A. When it filed the MRTU tariff in 2006, the ISO specified that it would use a distributed reference bus where the constituent PNodes would be weighted in prespecified portions rather than a single node reference bus, consistent with other markets. At that time the ISO had already anticipated using a distributed load reference bus throughout the ISO markets. In the September 21, 2006 MRTU order the Commission directed the ISO to include in its tariff more details concerning the LMP calculation and its components. In compliance with that order, the ISO on filed Appendix C to its MRTU tariff on August 3, 2007, and in that filing the ISO included the additional detail on how LMPs are calculated. In that amendment, the ISO stated that it would use a distributed load reference bus for calculating LMPs. Specifically, Part B of Appendix C states: "For the designated reference location the ISO will utilize a distributed reference bus for which constituent PNodes are weighted in pre-specified proportions, referred to as reference bus distribution factors. The distribution factors are based on actual Demand at each PNode that represents Load."

Q. Did the ISO's experience in preparing for MRTU implementation after filing Appendix C reveal any additional information about the selection of a reference bus?

A. Yes. As a result of factory testing of the MRTU software, the ISO through its discussions with its software developer recognized that under certain circumstances the software would not be able to successfully clear the IFM using a distributed load reference bus. The reasons for this failure to clear the IFM were not readily apparent at that time. However, the ISO has since determined that because the IFM is based on bid-in load (rather than forecasted load), when load bids were exhausted, the amount of difference between losses in the initial iteration and the subsequent power flow iteration(s) required larger use of the reference bus to balance the power flow solution. When that occurred, the power flow failed to converge and no market solution was obtained. However, in testing we found that when the market ran under these same conditions with a distributed generation reference bus, the IFM was able to successfully complete a power flow and market run.

Q. What steps did the ISO take to address this problem?

A. After discovering the difficulties I just described with clearing the IFM in market simulation using a distributed load reference bus, the ISO set the distributed reference bus setting during market simulations so that in the IFM alone the ISO would use a distributed generation reference bus. In addition, in the fall of 2008, the ISO revised Section 3.2.1 of the BPM for Market Operations so as to state that the ISO has the flexibility to use a distributed generation reference bus in running the IFM because it anticipated it would need the flexibility to use the distributed generation reference bus in light of the potential that IFM would not solve with distributed load. Specifically, the following language was added to Section 3.2.1: "the CAISO uses a distributed load slack in all applications except IFM where distributed generation slack may be used."

Q. Were these decisions communicated to ISO market participants?

A. Yes. In addition to modifying the distributed reference bus setting in market simulations and adding the language I just cited to the BPM for Market Operations, the ISO discussed the need for flexibility in determining the reference bus in the IFM with market participants during the course of market simulations in several meetings relating to the simulation and status of implementation activities. Also, as reflected in the LECG Final Report on Analysis Track Testing of CAISO MRTU Pricing and Dispatch, because of the potential need to use either distributed reference bus type in the IFM, during analysis track testing the ISO and LECG evaluated prices outcomes using both the distributed load and distributed generation reference bus in the IFM. This is reflected in the following presentations and Final LECG Report available on the ISO's website: http://www.caiso.com/1cb4/1cb4d8577a60.pdf and http://www.caiso.com/2067/2067769c1c5a0.pdf.

Q. Was the ISO Tariff also modified to provide for this flexibility?

A. No. Due to internal oversight, the language from Appendix C stating that the ISO would use a distributed load reference bus was not revised to be consistent with the language in Section 3.2.1 of the Market Operations BPM reflecting flexibility in choosing a reference bus in the IFM.

Q. Did the ISO determine that it needed to use a distributed generation reference bus upon MRTU implementation?

A. Yes. Because of the software issues I just described, the ISO determined that it would use a distributed generation reference bus in the IFM when it first began operating the MRTU markets. The ISO made this determination because we felt that the possibility of not reaching a market solution was an unacceptable risk given all of the operational challenges involved with ensuring that MRTU go-live was successful in its initial stages. After seventeen days of running the IFM with a distributed generation reference bus, the ISO changed to a distributed load reference bus. Since April 17, the ISO ran the IFM with a distributed load reference bus with the exception of four days on April 19 and May 2, 17 and 18 where a solution could not be reached using a distributed load reference bus.

Q. You mentioned that, in some cases, using a distributed load reference bus makes it impossible to clear the IFM due to a software problem. Has this software problem been addressed?

A. Yes, as of May 22 of this year, the software problem that resulted in an inability to reach a market solution in some cases while using a distributed load reference bus has been mitigated. As a consequence, the ISO plans to continue to run the IFM using a distributed load reference bus as the "default setting" going forward.

However, even with the software improvements, the ISO cannot know with absolute certainty that the IFM will always clear with a distributed load reference bus. The ISO has no reason to believe that it will not be able to clear the IFM with a distributed load reference bus, but has decided that the prudent approach is to ensure we have the tariff authority to revert to a distributed generation reference bus if the circumstances require it. Because failing to clear the market is not a viable option and a reasonable backstop measure exists, the ISO is proposing to clarify in its tariff that it has the authority to use a distributed generation reference bus as a backstop mechanism.

Q. Will market participants know if the ISO reverts to a distributed generation reference bus?

A. Yes, the ISO will issue a system operating message to notify market participants if a distributed generation reference bus has been used to run the IFM.

Q. Based on this, what specifically is the ISO proposing in this filing?

A. The ISO is proposing to use a distributed load reference bus approach as its default approach to calculating SMEC. Only in circumstances when the ISO cannot clear the IFM will the ISO resort to distributed generation reference bus. While I describe this as flexibility the ISO will have, it is actually an entirely objective trigger for the use of distributed generation reference bus. That is, the ISO will only have the tariff authority to use the distributed generation reference bus approach when it is unable to clear the IFM under the distributed load approach. The tariff sheets accompanying this filing document this authority. Market participants will be notified of every occasion in which the ISO uses a distributed generation reference bus.

Q. What are the consequences of the ISO not having the ability to fall back on the use of the distributed generation bus in the IFM?

A. The simple result is that there may be days when the IFM would not be able to clear. Consequently, the ISO would not have a market solution from the IFM run for those days. In that case, the ISO would have to take other measures such as falling back to the prior day's market results or conduct a number of exceptional dispatches and commitments to meet its day-ahead requirements.

Q. Does the ISO expect that the need to use a distributed generation reference bus will be frequent?

A. No. As I said, given the recent software improvement, the ISO has no reason to think the distributed load reference bus approach will fail to clear the IFM. The authority requested in this filing is merely a prudent backstop measure to ensure that the ISO has the requisite authority to clear the IFM with a distributed generation reference bus should the need arise, rather than being in the position of having no viable market solution.

Q. During periods when the ISO will employ a distributed generation reference bus instead of a distributed load reference bus, do you have a sense of what impact that will have on market clearing prices?

A. Yes. In those infrequent uses of a distributed generation reference bus, I expect the price impacts to be minimal when compared to LMPs derived with a distributed load reference bus. To illustrate this conclusion, under my direction, the ISO used actual market data from April of this year and ran comparative analyses using both a distributed load reference bus and a distribution generation reference bus to determine what price impact this change would have. As the data below show, the price impact from using a distributed generation reference bus was minimal. On most days studied, the price impact in each of three default Load Aggregation Points (LAPs) was only a few thousand dollars. Other days were higher, but still negligible when compared to the hundreds of millions of dollars in transactions clearing in the ISO markets every day.

The values in this chart reflect the difference between the distributed load and distributed generation reference bus approach across the three default LAP for the entire day shown. Negative numbers indicate how much lower prices would be with a distributed load reference bus, when compared with using a distributed generation reference bus on the same day. Conversely, positive numbers indicate an aggregate increase in price across the day when using a distributed load reference bus, when compared with using a distributed generation reference bus on the same day.

	PG&E	SCE	SDG&E
1-Apr	($165,964.72)	($189,215.74)	($16,591.42)
2-Apr	$30,311.82	$986.50	$3,234.84
3-Apr	$78,160.57	$79,447.08	$18,845.94
4-Apr	$10,837.20	($13,543.81)	($2,638.92)
5-Apr	$31,305.20	($9,957.70)	($2,747.65)
6-Apr	($105,591.85)	($146,705.27)	($37,233.53)
7-Apr	$11,617.87	$8,952.54	$3,207.27
8-Apr	($105,842.17)	($110,604.38)	($20,307.72)
9-Apr	($35,997.99)	($38,031.72)	($5,843.21)
10-Apr	$265,354.85	$294,662.90	$71,168.78
11-Apr	$5,973.57	$9,480.68	$2,735.32
12-Apr	$14,859.32	$12,996.09	$3,088.72
13-Apr	($8,470.31)	$8,413.17	$3,091.12
14-Apr	$82,681.42	$75,412.43	$31,304.89
15-Apr	($38,624.74)	($22,236.76)	($2,630.53)
16-Apr	$25,297.33	$51,907.12	$17,253.12
17-Apr	($115,531.30)	($114,008.37)	($27,052.52)
19-Apr	$192,457.75	$154,120.07	$164.85
2-May	($211,905.76)	$244,830.71	$48,285.47
17-May	$248,348.42	$58,477.39	($30,849.20)
18-May	($315,520.46)	($240,120.69)	($44,762.74)
Total	($106,243.97)	$115,262.25	$11,722.88

Q. What do you conclude from this analysis?

A. Because of the relatively small difference in overall cost of market transactions using the distributed generation versus load reference bus, I believe that the difference to the market in terms of costs of this minimal as compared to the alternative of not having a market solution in the IFM.

Q. Thank you. I have no further questions at this time.