California ISO
Your Link to Power

California Independent
System Operator Corporation

December 31, 2009

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

Re: California Independent System Operator Corporation Compliance Filing

Docket Nos. ER09-1542-___

Dear Secretary Bose:

The California Independent System Operator Corporation (ISO)[1] hereby submits an original and five copies of the instant filing in compliance with the Federal Energy Regulatory Commission's (FERC or Commission) October 2, 2009 Order.[2]

One additional copy of this filing is enclosed to be date-stamped and returned in the pre-paid postage and addressed envelope.

In compliance with the Commission's October 2 Order, the proposed tariff sheets include the high level guidelines that describe the ISO's transmission constraint management practices. In addition, the ISO reports on the status of additional efforts by the ISO and its stakeholders to explore additional means of improving market transparency and information sharing and the provision by the ISO of "(1) either the list of the constraints that are not enforced in the CAISO market or more visibility into how they are established and (2) the list of contingencies that are enforced in the CAISO market process."[3] While the ISO and stakeholders have made significant progress in determining what additional information is necessary for well-functioning markets as it pertains to the

---

1 Capitalized terms not otherwise defined herein have the meanings set forth in the Master Definitions Supplement, Appendix A to the ISO Tariff.

2 *California Indep. Sys. Operator Corp.*, 129 FERC ¶ 61,009 (2009) (October 2 Order)

3 *Id.* at P 44.

management and enforcement of transmission constraints, this stakeholder process has not yet been completed. To the extent this stakeholder process results in the need to modify the ISO Tariff to include guidelines for the provision of such information beyond the lists of constraints and contingencies enforced or not enforced as specified in the October 2 Order, the ISO will make any such filing consistent with the Section 205 of the Federal Power Act[4] in the first part of 2010.

I. Background

On August 3, 2009, pursuant to section 205 of the Federal Power Act, the ISO filed amendments to its tariff to (1) clarify that applicable generating units located outside the ISO's balancing authority area can be treated as regulatory must-take generation under the tariff; and (2) clarify the tariff language regarding the role of the full network model in enforcement of transmission constraints. The Commission rejected these proposed tariff clarifications when the ISO originally filed them in a March 23, 2009 compliance filing as beyond the scope of compliance with the Commission's February 19, 2009 order in Docket No. ER09-240-000 concerning the use of market optimization parameters. In the August 3 filing, the ISO explained that the intent of its proposed tariff modifications related to item (1) was unchanged from that of the corresponding modifications submitted in the March 23 filing. However, the tariff language submitted on August 3 regarding the enforcement of constraints and the full network model differed from the language previously submitted to provide additional clarity with regard to roles and scope.

On October 2, 2009, the Commission conditionally accepted the ISO's filing and proposed tariff revisions subject to additional requirements on compliance as discussed below. Item (1) of the August 3 filing concerning regulatory must-take generation was accepted in the October 2 Order without further compliance requirements. Hence, the instant filing addresses only item (2) concerning the role of the full network model and other matters related to the ISO's constraint enforcement practices.

II. Discussion

A. High Level Guidelines for Management and Enforcement of Transmission Constraints

1. Stakeholder Process to Formulate the Tariff Guidelines

In its October 2 Order, the Commission accepted the proposed tariff revisions as just and reasonable because they clarify the ISO Tariff to more

---

[4] 16 U.S.C. § 824d (2006).

accurately reflect the role of the full network model in relation to the enforcement of transmission constraints. However, notwithstanding the Commission's acceptance of the proposed tariff modifications, the Commission shared protesters' concerns regarding the need for transparency regarding manual interventions in the ISO's markets, no matter how necessary they may be.

In response to the ISO's August 3 filing, intervenors argued that the details concerning relaxing, not enforcing, and manually adjusting transmission constraints must be included in the ISO tariff.[5] Intervenors were concerned that the lack of specific information in the tariff may negatively impact parties' ability to participate in the ISO markets. The Commission found that, without additional information in the record, it was unable to discern whether the failure to enforce certain constraints "significantly affects rates, terms or conditions of service." The Commission further found that although it would be impractical to list in the tariff all instances in which the ISO will relax, enforce, or manually adjust constraints, it is reasonable for the tariff to include the general guidelines explaining the ISO's constraint management practices. The Commission concluded that the inclusion of such guidelines in the ISO tariff should give market participants additional market confidence by providing additional transparency into the ISO operations they sought, while preserving the ISO's ability to engage in reasonable operating practices and market management in order to ensure a well-functioning, efficient market.

Accordingly, the Commission directed the ISO, through its stakeholder process, to develop guidelines for its constraint management practices, and, within 90 days of issuance of its order, submit tariff sheets setting forth those principles that significantly affect rates, terms or conditions.[6] The ISO has conducted the requisite stakeholder process to discuss these guidelines[7] and, as discussed in greater detail below, submits proposed tariff sheets that contain the high level guidelines developed through the ISO's stakeholder process.

Prior to the October 2 Order, in response to stakeholder requests in various forums that the ISO consider making available additional information about market inputs and processes to facilitate their market participation, the ISO had already begun internal preparation to commence a stakeholder process to discuss and explore market participant information needs for efficient, well-functioning markets. Shortly after the issuance of the October 2, 2009 order, the ISO decided to structure the information initiative in phases, with the first phase focused on meeting the Commission's requirements in the October 2 Order with

---

5 *See October 2 Order*, at P 45.

6 *Id.*

7 CAISO Data Release and Accessibility Stakeholder Initiative, Phase 1 on Transmission Constraints, http://www.caiso.com/244c/244cae3b46bb0.html

regard to transmission constraint enforcement and management. In particular, the Phase 1 effort included the task of determining the appropriate level of detail that should be included in the ISO's tariff regarding its transmission constraint management and enforcement practices.

On November 5, 2009, the ISO posted an initial issue paper that provided a description of the ISO's transmission enforcement practices. This paper reflected description of the ISO's transmission constraint and enforcement practices, as contained in the ISO's Business Practice Manual for the Management of the Full Network Model (BPM) and the Technical Bulletin issued on July 13, 2009 regarding the Process for Biasing Flowgate-Nomogram Operating Limits for Day Ahead and Real Time Markets (Technical Bulletin).[8] The ISO also scheduled two stakeholder meetings to provide an opportunity to discuss the ISO's practices as reflected in those two documents.[9] In addition, during its weekly market issues conference calls over the past eight months, the ISO has responded to numerous questions and provided significant information regarding the root causes of market outcomes including the impact of the ISO's specific transmission constraint management and enforcement practices.

The BPM for FNM provides a detailed description of the ISO's practices and procedures as they pertain to the procedures the ISO follows for the enforcement and management of transmission constraints, including contingencies and nomograms in the ISO markets. The Technical Bulletin provides a description of the ISO's operating practices for conforming and adjusting transmission constraints consistent with good utility practice. Since the start of the ISO new market design on April 1, 2009, the ISO has operated the ISO markets consistent with these principles.

Although stakeholders have frequently questioned ISO staff about the ISO's practices, neither the stakeholder process nor the ISO's operating experience to date has indicated any need to substantially alter these practices and guidelines. Market participants did state, however, both during the December 10, 2009 stakeholder meeting regarding the high level guidelines proposed by the ISO to be included in its tariff and in their written comments submitted subsequently, that while they did not oppose the specific proposed tariff language, they believe it is important to continue to have opportunities for dialogue with the ISO regarding its practices and the impacts on the ISO markets.

The ISO understands the need to continuously evaluate the impacts its practices have on market outcomes, and is committed to providing transparency

---

[8] Technical Bulletin, http://www.caiso.com/23ea/23eae8aef980.pdf.

[9] On November 12, 2009, the ISO held a conference call during which it responded to numerous inquiries regarding its specific practices.

and ongoing opportunities for dialogue with stakeholders on these topics. Toward that end, the ISO is currently considering enhancements to its stakeholder processes designed specifically for evaluating market performance issues and considering enhancements that may make both market participation and market outcomes more efficient and effective. The ISO also anticipates that with the provision of the additional data regarding the constraints (discussed later in the instant filing), including contingencies and nomograms, as well as the causes for the binding constraints, over time market participants will have better visibility and ability to evaluate the impact of the ISO's enforcement practices on market outcomes. In addition, the more frequent provision of information regarding the ISO's adjustments to transmission limits for reliability purposes will also assist market participants in evaluating market outcomes. The ISO encourages stakeholders to continue to participate in the stakeholder forums where these matters are discussed.

2. Discussion of Specific Tariff Provisions

The Commission directed the ISO to include high level guidelines in its tariff in compliance with the October 2 Order. The ISO proposes to modify Tariff Section 27.5.1 and include a new Section 27.5.6 to incorporate high level guidelines for the management and enforcement of constraints in the ISO markets. The ISO formulated the high-level guidelines based on its existing practices as largely reflected in the BPM for FNM and the Technical Bulletin.

In Section 27.5.1, the ISO is proposing to include the concept of a Base Market Model and to modify that section to discuss the use of network models in the ISO markets more generally. The ISO proposes to define the Base Market Model as a "computer based data model of the CAISO Controlled Grid that is derived from the Full Network Model as described in Section 27.5.1 and that, as described further in Section 27.5.6, is used as the basis for formulating the market models used in the operation of each of the CAISO Markets." In concept the relationships among the three fundamental model types can be understood as follows, and as elaborated further in this section. The Full Network Model is the starting point for formulating the specific models that will be used in each of the ISO markets, but it is not itself the final model that is input to the markets. The FNM is derived from and consistent with a version of the west-wide WECC model, but focuses on the network topology that will be reflected in the ISO's State Estimator. The FNM is updated by the ISO every six to eight weeks and remains static between updates. Next, the Base Market Model is derived from the FNM through a number of refinements described in Section 27.5.1.1, which are needed to produce a network model formulation that is suited to the actual functioning of the ISO market optimization software. The Base Market Model is updated with each update of the FNM and, like the FNM, remains static between

updates.[10] Finally, the network model that is actually input to and used by the ISO optimization software for each market takes the Base Market Model and applies any adjustments needed (like outages and derates) to reflect actual system conditions anticipated for the relevant markets. As such, the actual market models used in running the ISO markets may be slightly different from the Base Market Model and can change between successive ISO markets.

This clarification of network model formulation introduces a new term to the tariff – the Base Market Model – in order to reflect the modifications made to the Full Network Model as the ISO prepares the model for use in the ISO markets. This definition also provides a label for the network model that is further adjusted and conformed for the purposes of operating each of the ISO markets. This principle is reflected in the new language included at the start of Section 27.5.1.1, a new section created to divide Section 27.5.1 into parts in order to separate out the description of the Base Market Model from the original FNM. Proposed Section 27.5.1.1, therefore, characterizes the Base Market Model and sets the stage for the activities the ISO performs to establish, enforce and manage transmission constraints in the various ISO market runs.

Attachment B also reflects proposed tariff changes to show the movement of certain language that already appears in Section 27.5.1 for the purpose of incorporating and clarifying the concept of the Base Market Model. Specifically, the preexisting discussion at the end of Section 27.5.1 regarding the differences in modeling portions of the FNM that are outside the ISO balancing authority area (as opposed to the portions inside) are now moved to the middle of the proposed Section 27.5.1.1. These proposed changes aid in clarifying the concept of the Base Market Model in this discussion but do not substantively alter the preexisting ISO tariff provisions regarding how the network model is prepared for use in the ISO markets.

The ISO proposes to include new Section 27.5.6, to incorporate the actual guidelines the ISO follows in preparing the model and additional inputs to use in running each of the ISO markets (*i.e.*, IFM, RUC, HASP and RTM) as required by the Commission in its October 2 Order. Section 27.5.6 reflects that the ISO operates the ISO markets through the use of a market software system that utilizes various information, including the Base Market Model, the State Estimator, submitted bids and self-schedules and generated bids, and transmission constraints, including nomograms and contingencies. Section 27.5.6 then states that the Base Market Model is based on the FNM, which provides the ISO markets software with a detailed data representation of the physical transmission network and physical power system, on which the energy scheduled or dispatched through the operation of the ISO markets will flow. The

[10] Updates to the Base Market Model may also occur between FNM updates to reflect updates to Master File data.

ISO believes this provision is important to maintain in the tariff a clear high level description of how the Base Market Model and FNM are related. The ISO further proposes to include in the same section a statement that explains that to create a more relevant time-specific network model for use in the ISO markets, the ISO will adjust the Base Market Model to reflect outages and derates that are known and applicable when the respective ISO market will operate.

Section 27.5.6, also introduces the concept of the separate market models created by the ISO and used in each of the ISO market or process: IFM, RUC, HASP, and Real-Time Market. This proposed section stipulates that the CAISO will manage the enforcement of transmission constraints, including nomograms and contingencies, consistent with good utility practice, to ensure, to the extent possible relevant to the objectives of the market process, that the market model used in each market accurately reflects factors that contribute to actual real-time flows on the ISO controlled grid and that the ISO market results are aligned with actual physical conditions on the grid. This is a crucial principle that governs all of the ISO's transmission constraint management practices.

The inclusion of the Base Market Model term and related concepts requires an evaluation of whether the instances in which the ISO previously used the term Full Network Model or FNM in the tariff should instead now use the term Base Market Model. The ISO has identified several sections of the tariff where this change is necessary and submits proposed tariff amendments for this purpose.[11]

Proposed Section 27.5.6 then provides the five high-level guidelines that guide the ISO's practices in operating the ISO markets. This section stipulates that the ISO may take the following actions so that, to the extent possible, the ISO market solutions are feasible, accurate, and consistent with good utility practice:

1. The ISO may enforce, not enforce, or adjust flow-based transmission constraints, including nomograms and contingencies, if the ISO observes that the ISO markets produce or may produce inaccurate or infeasible market solutions either because (a) the ISO reasonably anticipates that the ISO market run will include congestion that is unlikely to materialize in real-time or (b) the ISO reasonably anticipates that the ISO market will fail to identify congestion that is likely to appear in the real-time. The ISO does not make such adjustments to intertie scheduling limits.

---

[11] *See* Sections 8.3.35, 27, 27.1.1.2, 27.5.1, 27.5.2, 27.5.3, 27.5.4, 31.5, 33.2, 34 and 34.1 as reflected in Attachments A and B to this Transmittal Letter. In addition, the ISO is modifying certain Section titles to conform the titles consistent with FERC Order No. Order 714 (124 ¶ 61,270) and 73 Fed. Reg. 57515 (Oct. 3, 2008). See Sections 8.3.3.5, 27.5.1 and 27.5.3.4.

This provision reflects the ISO's need to manage transmission constraints, including nomograms and contingencies, as it prepares to execute the actual market runs in manner that ensures that, to the extent practical, the ISO market optimization solution is feasible and reflects anticipated actual grid conditions. This practice is important, first, to reduce the occurrence of phantom congestion in the ISO markets created by modeling errors that may cause anomalies between the market input and actual grid conditions. Phantom congestion would cause the market to excessively limit energy flows that would be feasible in real-time. Second, this practice is needed to minimize the occurrence of real-time congestion that was not anticipated in the ISO market results, which can needlessly complicate real-time operation. This principle of constraint management is reflected in the ISO's BPM for FNM[12] and the Technical Bulletin.

2. The ISO may enforce or not enforce transmission constraints, including nomograms and contingencies, if the ISO has determined that enforcement or non-enforcement of such constraints may result in the unnecessary commitment and scheduling of use-limited resources.

This provision reflects the ISO's practice of managing transmission constraints in order to ensure that resources that have use limitations are not unnecessarily scheduled or committed by the ISO markets, thereby squandering the limited use of such facilities. Such unnecessary commitment or scheduling of resources can occur if for example the ISO enforces in the IFM certain constraints that result in the commitment of use-limited resources but it turns out that in real-time the congestion addressed by such commitment can be addressed through other procedural practices, or that the constraints are based on contingency conditions whose resolution allows enough time to commit the use limited resources when actual needs for their commitment arise. This principle is reflected in the ISO's BPM for FNM.[13]

3. The ISO may not enforce transmission constraints, including nomograms and contingencies, if it has determined it lacks sufficient visibility to conditions on transmission facilities necessary to reliably ascertain constraint flows required for a feasible, accurate and reliable market solution.

This provision reflects the fact that the ISO lacks sufficient visibility in certain pockets to manage the grid reliably due to lack of telemetry or lack of infrastructure to transmit the telemetry to the control center at the transmission owner and the ISO. In such instances, it is not prudent to enforce these constraints in the ISO market software because the ISO has no ability to discern

---

12 *See* Section 2.1.1 and 2.1.1.2 of the BPM for FNM.

13 *See* Section 2.1.1.3 of the BPM for FNM.

whether their enforcement is accurate and will produce market results that are feasible with respect to actual grid conditions. Therefore, the ISO does not enforce such constraints and instead manages such portions of its grid in close coordination with the transmission owner. If the ISO observes or is able to validate through other information including interaction with the PTO that a constraint that is normally not enforced due to lack of visibility is actually an operational issue, the ISO may begin enforcing such constraint to gain necessary relief from the market until the constraint is no longer jeopardizing reliability.[14]

4. For the duration of a planned or unplanned outage, the ISO may create and apply alternative transmission constraints, including nomograms and contingencies, that may add to or replace certain originally defined constraints.

This provision reflects the principle that specific outages may impact the grid conditions and flows to the extent that lacking an adjustment or modification in the enforcement of certain constraints, the market solution would be severely inconsistent with the actual operations of the grid. Therefore, the ISO engineers and operators must adjust the enforcement of constraints, including nomograms and contingencies, taking into consideration the impacts of known outages and derates. This exercise is conducted prior to the execution of the day-ahead Market and for each market run after that taking into consideration any new information that arises between the markets.[15]

5. The ISO may adjust transmission constraints, including nomograms and contingencies, for the purpose of setting prudent operating margins consistent with good utility practice to ensure reliable operation under conditions of unpredictable and uncontrollable flow volatility consistent with the requirements of Section 7 of the ISO Tariff.

As reflected in the Technical Bulletin, this provision reflects the principle that the system conditions are not static and prudent utility practice requires actions to manage flow may need to begin occurring as the actual flow approach the actual limit to avoid exceeding the limit due to the unpredictable changes in the system that can occur. These changes could reflect energy deliveries from regulating resources, activation of operating reserve, unpredictable variations in load and generation patterns.

The ISO also proposes to state in its tariff that to the extent that particular transmission constraints, including nomograms and contingencies, are unenforced in the operations of the ISO market, the ISO will operate the ISO controlled grid and manage any congestion based on available information

---

[14] *See* Section 2.1.1.1 of the BPM for FNM.

[15] *See* Section 2.1.1.4 of the BPM for FNM.

including the State Estimator solutions and available telemetry to dispatch resources through exceptional dispatch to ensure consistency with the requirements of Section 7. This important provision describes how the ISO will operate the grid and manage congestion in the absence of enforcement in the ISO markets of specific constraints that the ISO must actually observe in physically operating the system.

These proposed revisions incorporate into the tariff not only the principles that govern the ISO's transmission constraint management practices, but also the principles that govern the adjustment and conforming of transmission limits the ISO operators conduct to ensure that the market optimization solution is feasible and consistent with good utility practice. In particular, the ISO proposes to include in item 5 above the guideline that governs adjustments by the ISO operators to ensure prudent operating margins.

B. Status of Stakeholder Process

While the ISO has made significant progress in completing its stakeholder process to address market participant information needs regarding the ISO's management and enforcement of transmission constraints, the ISO and market participants require additional time to finalize this process. To the extent the Commission finds that the current status of the stakeholder process is not in sufficient compliance with Ordered Paragraph (B) of the October 2 Order, the ISO is separately and concurrently submitting a Motion for Extension of Time to allow the ISO and stakeholders additional time to complete the stakeholder process and finalize the provision of information regarding the transmission constraints in the first part of 2010.

The ISO commenced the stakeholder process by providing stakeholders an opportunity to discuss and consider the various manual actions initiated by the ISO for which market participants expressed concern because they asserted that they had no specific information for such actions. This included a discussion of the management of certain transmission constraints or the non-enforcement of others, with which intervenors expressed an interest for further discussion in response to the August 3 filing. In addition, the ISO provided a forum in which the ISO and stakeholders could discuss and explore means of improving market transparency and information sharing.

In its initial issue paper, the ISO attempted to describe the various procedures, guidelines, and processes ISO operators and operations engineers follow in ensuring that the market model is consistent with actual conditions on the grid and that may be necessary for maintaining grid security and reliability. Subsequently, the ISO provided presentation materials that illustrated these procedures and conducted a stakeholder conference call to provide participants and ISO staff an opportunity to discuss these procedures. The ISO believes this

was an important first step toward establishing better understanding of its procedures by market participants and facilitating discussions about how to enhance data and information availability on the ISO's transmission constraint management and enforcement, and their market implications. This allowed the ISO and market participants to narrow the focus to those areas of activity where market participants seek to obtain greater visibility.

The initial issue paper also included a preliminary discussion of areas in which the ISO could provide better visibility into the practices of enforcement of constraints of interest to market participants, based on the ISO's survey and review of practices in other ISO/RTO markets. In particular, the ISO discussed the additional information provided by other ISO's regarding the cause for a binding constraint when one is reported. The ISO already reports the binding constraints for each market and the associated shadow prices for such constraints. However, unlike the other ISOs/RTOs, the ISO does not currently identify the cause for each binding constraint when one is reported, i.e., whether the constraint was binding in the base case condition or due to a specific contingency. As discussed further below, this is one area of interest to market participants that the ISO proposes to enhance as a result of this process.

The Commission also noted in its October 2 Order that the ISO should continue to utilize the stakeholder process to seek ways in which the ISO can provide "(1) either the list of the constraints that are not enforced in the CAISO market or more visibility into how they are established and (2) the list of contingencies that are enforced in the CAISO market process." The ISO has made significant progress in this area through stakeholder engagement. However, it continues to refine the final proposal and in so doing it is conducting an initial feasibility assessment to determine when it can implement any new procedures to make available the information the stakeholders and the ISO agree should be provided to the market.

In this regard, the ISO is developing a draft final proposal that will include additional details to ensure that market participants will have access to the list of all constraints, including nomograms and contingencies that were enforced in the day-ahead market. Specifically, the ISO expects to include in its draft final proposal three new data release elements and several new advance notification requirements, and a commitment for the development of improved network terminology or nomenclature. The three new data release elements are (1) Daily Constraint and Contingency Lists, (2) Binding Constraint Cause Data, and (3) a Conforming Constraint Report.

For the first of these new data release elements, the ISO expects to include in its draft final proposal the release of two constraints lists that would be published twice daily for information associated with the day-ahead market. The Post-Market Constraints List would be published daily at the close of the day-

ahead market at approximately 1300 hours. The Pre-Market Constraints List would be published daily after a preliminary market run that the ISO performs to review issues in preparing for the next day's day-ahead market (known as the D+2 process) at approximately 1800 hours. These lists would include definitions information of all constraints, including contingencies and nomograms and identification if the constraint is enforced in the ISO day-ahead market.

The ISO also anticipates its draft final proposal will include the provision of additional information regarding the cause of a binding constraint in addition to the shadow price information currently provided on its OASIS website. The ISO anticipates providing the cause for each binding constraint by identifying whether the constraint was binding under the base case (base operating conditions relevant to the different markets) or due to contingency conditions. If the constraint was binding due to a contingency, the ISO would identify the associated contingency; otherwise the binding constraint would be attributable to base case (non-contingency) conditions. At this time, the ISO is continuing to evaluate the feasibility of alternative ways in which this information can be provided and anticipates having this assessment for consideration of its upcoming draft final proposal.

Finally, the ISO is also in the process of evaluating the provision of a periodic Conforming Constraint Report that would be issued on a monthly or weekly basis. The Conforming Constraint Report would provide information on activity in the RTM for real-time dispatch as was done in the DMM Report.[16]

The ISO is also evaluating the ability to establish several new advance notification requirements that will inform stakeholders of any significant changes to the ISO's market model and/or new constraints. It should be noted that the ISO must also be responsive to unplanned outages and may need to enforce additional constraint in response to unplanned outages without advance notice. Finally, in response to stakeholders' requests that the ISO use more consistent and meaningful network terminology, the ISO is committed to the development and use of improved network terminology or nomenclature. The ISO will explore the possibility of creating additional data mapping that would correlate the transmission facilities in outage reports with the proposed constraints list. The ISO will strive to evolve the data and nomenclature to use consistent naming conventions and common data elements that could be eventually linked between outage information and other data.

---

[16] Department of Market Monitoring (DMM) Quarterly Report on Market Issues and Performance, October 30, 2009, *Table 5.1 RTD Biased Flowgates and Frequency of Biasing with Additional Statistics* http://www.caiso.com/2457/2457987152ab0.pdf

The milestones associated with this stakeholder initiative are shown in Table 1 below. The goal is to obtain Board approval of the market information provision policy changes in February 2010. This schedule is tentative and dependent on the comments received on the ISO's draft final proposal. The ISO recognizes that the draft final proposal may not address all requests made by participants. However, the ISO believes it is important in this process that participants balance their desire for more extensive information against the time and complexity involved to develop tools and procedures to provide such information. At this time, the ISO believes that its draft final proposal will strike that proper balance based on the feedback it has received thus far.

Table 1
Stakeholder Process on Transmission Constraints

Date	Milestone
Nov. 5, 2009	Issue Paper, Phase 1 Transmission Constraints
Nov. 12, 2009	Conference Call Meeting
Nov. 23, 2009	Comments on Discussion Paper due
Dec. 3, 2009	Straw Proposal -- Proposed Procedures & Tariff Language
Dec. 10, 2009	On-Site Meeting
Dec. 16, 2009	Comments on Straw Proposal due
Dec. 31, 2009	FERC Compliance Filing (High Level Guidelines and Update)
Jan. 6, 2010	ISO Draft Final Proposal Regarding Data Release Policy Changes
Jan. 13, 2010	Conference Call Meeting
Jan. 15, 2010	Comments on Draft Final Proposal due
Feb. 11-12, 2010	Board Meeting and Decision on Data Release Policy

III. Materials Provided in the Instant Compliance Filing

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

Attachment A — Clean ISO Tariff sheets incorporating the red-lined changes contained in Attachment B

Attachment B — Red-lined changes to the ISO Tariff to implement the revisions contained in this filing

Attachment C — Data Release & Accessibility - *Phase 1: Transmission Constraints*, November 5, 2009, Issue Paper

Attachment D — Data Release & Accessibility - *Phase 1: Transmission Constraints*, December 3, 2009, Straw Proposal

IV. Effective Date.

The ISO requests that the Commission approve this compliance filing as submitted to be effective October 2, 2009.

V. Conclusion

The ISO respectfully requests that the Commission accept the instant filing as complying with the directives of the October 2 Order. Please contact the undersigned with any questions concerning this filing.

Respectfully submitted,

Anna A. McKenna /DK

Anthony Ivancovich
Assistant General Counsel
Anna A. McKenna
Senior Counsel
Beth Ann Burns
Senior Counsel

California Independent System
Operator Corporation
151 Blue Ravine Road
Folsom, CA 95630
Tel: (916) 351-4400
Fax: (916) 608-7246
E-mail: amckenna@caiso.com

Attorneys for the California Independent
System Operator Corporation

Attachment A – Clean Sheets

Transmission Constraint Management Compliance Filing

Fourth Replacement CAISO Tariff

ER09-1542-000

December 31, 2009

8.3.3.5 Base Market Model and Ancillary Services Procurement

The Base Market Model is used in the SCUC application, which optimizes the provision of Ancillary Services and Energy in order to meet Ancillary Service requirements and Energy requirements. The Base Market Model models network constraints as described in Section 27.5.1. The Ancillary Services Awards reflect the Ancillary Service Region and Sub-Region definitions and requirements. The Ancillary Service requirements, the definition of Ancillary Service Regions and Ancillary Service Sub-Regions, and any minimum or maximum limit that is used within an Ancillary Service Region or Ancillary Service Sub-Region are all inputs to the CAISO Market Processes.

8.3.4 Certification and Testing Requirements.

The owner of and Scheduling Coordinator for each Generating Unit, System Unit, Dynamic System Resource, or Participating Load for which a Bid to provide Ancillary Services or Submission to Self-Provide Ancillary Services is allowed under the CAISO Tariff, and all other System Resources that are allowed to submit a Bid to provide Ancillary Services under this CAISO Tariff, must comply with the CAISO's certification and testing requirements as contained in Appendix K and the CAISO's Operating Procedures. Each Generating Unit, Dynamic System Resource, and System Unit used to bid Regulation or used to self-provide Regulation must have been certified and tested by the CAISO using the process defined in Part A of Appendix K. Each Dynamic System Resource offering Regulation must comply with the Dynamic Scheduling Protocol in Appendix X. Spinning Reserve may be provided only from Generating Units, System Resources that submit Bids to provide Spinning Reserve from imports, or System Units, which have been certified and tested by the CAISO using the process defined in Part B of Appendix K. Non-Spinning Reserve may be provided from Curtailable Demand, on-demand rights from other entities or Balancing Authority Areas, Generating Units, System Resources that submit Bids to provide Non-Spinning Reserve from imports, or System Units, which have been certified and tested by the CAISO using the process defined in Part C of Appendix K. Voltage Support may only be provided

ARTICLE III – MARKET OPERATIONS

27 CAISO MARKETS AND PROCESSES

In the Day-Ahead and Real-Time time frames the CAISO operates a series of procedures and markets that together comprise the CAISO Markets Processes. In the Day-Ahead time frame, the CAISO conducts the MPM-RRD, an Integrated Forward Market (IFM) and the Residual Unit Commitment (RUC) process. In the Real-Time time frame, the CAISO conducts the Market Power Mitigation and Reliability Requirement Determination, the Hour-Ahead Scheduling Process (HASP), the Short-Term Unit Commitment (STUC), the Real-Time Unit Commitment (RTUC) and the five-minute Real-Time Dispatch (RTD). The CAISO Markets Processes utilize transmission and Security Constrained Unit Commitment and dispatch algorithms in conjunction with a Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 to optimally commit, schedule and Dispatch resources and determine marginal prices for Energy, Ancillary Services and RUC Capacity. Congestion Revenue Rights are available and entitle holders of such instruments to a stream of hourly payments or charges associated with revenue the CAISO collects or pays from the Marginal Cost of Congestion component of hourly Day-Ahead LMPs. Through the operation of the CAISO Markets Processes the CAISO develops Day-Ahead Schedules, Day-Ahead AS Awards and RUC Schedules, HASP Advisory Schedules, HASP Intertie Schedules and AS Awards, Real-Time AS Awards and Dispatch Instructions to ensure that sufficient supply resources are available in Real-Time to balance Supply and Demand and operate in accordance with Reliability Criteria.

27.1 Locational Marginal Prices and Ancillary Services Marginal Prices.

The CAISO Markets are based on: 1) Locational Marginal Prices as provided below in Section 27.1.1 and further provided in Appendix C; and 2) Ancillary Services Marginal Prices as provided below in Section 27.1.2.

27.1.1 Locational Marginal Prices for Energy.

The LMP for Energy at any PNode is the marginal cost of serving the next increment of Demand at that PNode consistent with existing transmission facility Constraints and the performance characteristics of resources. The LMPs calculated in the IFM, the HASP for Scheduling Points, and the RTD are based on

Energy Bid Curves. The LMP at any given PNode is comprised of three cost components: the System Marginal Energy Cost (SMEC); Marginal Cost of Losses (MCL); and Marginal Cost of Congestion (MCC). The IFM calculates LMPs for each Trading Hour of the next Trading Day. The HASP, which is an hourly run of the RTUC with the Time Horizon that starts at the beginning of the next Trading Hour, calculates fifteen-minute LMPs (HASP Intertie LMPs) for that Trading Hour. The simple average of the four fifteen-minute LMPs for the Trading Hour computed at each Scheduling Point produces hourly LMPs for HASP Settlement of Energy at that Scheduling Point. The Real-Time Dispatch runs every five (5) minutes throughout each Trading Hour and calculates five-minute LMPs for the next Dispatch Interval. The CAISO uses the Resource-Specific Settlement Interval LMPs for Settlements of the Real-Time Market. In the event that a Pricing Node becomes electrically disconnected from the market model during a CAISO Market run, the LMP, including the SMEC, MCC and MCL, at the closest electrically connected Pricing Node will be used as the LMP at the affected location.

27.1.1.1 System Marginal Energy Cost.

The System Marginal Energy Cost (SMEC) component of the LMP reflects the marginal cost of providing Energy from a designated reference Location. For this designated reference Location the CAISO will utilize a distributed Reference Bus whose constituent PNodes are weighted in proportions referred to as Reference Bus distribution factors. The SMEC shall be the same throughout the system.

27.1.1.2 Marginal Cost of Losses

For all PNodes and Aggregated PNodes in the CAISO Balancing Authority Area, including Scheduling Points, the use of the Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 in the DAM and the RTM processes incorporates Transmission Losses. At each PNode or Aggregated PNode, the Marginal Cost of Losses is the System Marginal Energy Cost multiplied by the Marginal Loss factor at that PNode or Aggregated PNode. The Marginal Cost of Losses at a Location (PNode or APNode) may be positive or negative depending on whether an increase in Demand at that Location marginally increases or decreases the cost of Transmission Losses, using the distributed Reference Bus to balance it. The Marginal Loss factors are determined through a process that calculates the sensitivities of Transmission Losses with respect to changes in injection at each Location in the FNM. For CAISO Controlled Grid facilities outside the CAISO Balancing Authority Area, the CAISO

27.5.1 Network Models used in CAISO Markets

The FNM is a representation of the WECC network model including the CAISO Balancing Authority Area that enables the CAISO to produce a Base Market Model that the CAISO then uses as the basis for formulating the individual market models used to conduct power flow analyses to manage transmission Constraints for the optimization of each of the CAISO Markets.

27.5.1.1 Base Market Model used in the CAISO Markets

Based on the FNM the CAISO creates the Base Market Model (BMM), which is used as the basis for formulating, as described in section 27.5.6, the individual market models used in each of the CAISO Markets to establish, enforce, and manage the transmission Constraints associated with network facilities. The Base Market Model is derived from the FNM by (1) introducing locations for modeling intertie schedules; and (2) introducing market resources that do not currently exist in the FNM due to their size and lack of visibility. In the Base Market Model, External Balancing Authority Areas and external transmission systems are modeled to the extent necessary to support the commercial requirements of the CAISO Markets. For those portions of the FNM that are external to the CAISO Balancing Authority Area, the Base Market Model may model the resistive component for accurate modeling of Transmission Losses, but accounts for losses in the external portions of the market model separately from Transmission Losses within the CAISO Balancing Authority Area. As a result the Marginal Cost of Losses in the LMPs is not affected by external losses. For portions of the Base Market Model that are external to the CAISO Balancing Authority Area, the CAISO Markets only enforce network Constraints that reflect limitations of the transmission facilities and Entitlements turned over to the Operational Control of the CAISO by a Participating Transmission Owner, or that affect Congestion Management within the CAISO Balancing Authority Area or on Interties. External connections are retained between Intertie branches within Transmission Interfaces. Certain external loops are modeled, which allows the CAISO to increase the accuracy of the Congestion Management process. Resources are modeled at the appropriate network Nodes.

The pricing Location (PNode) of a Generating Unit generally coincides with the Node where the relevant revenue quality meter is connected or corrected, to reflect the point at which the Generating Units are connected to the CAISO Controlled Grid. The Dispatch, Schedule, and LMP of a Generating Unit refers to a PNode, but the Energy injection is modeled in the Base Market Model for network analysis purposes at the corresponding Generating Unit's physical interconnection point), taking into account any losses in the non-CAISO Controlled Grid leading to the point where Energy is delivered to CAISO Controlled Grid. Based on the BMM, the market models used in each of the CAISO markets incorporate physical characteristics needed for determining Transmission Losses and model network Constraints within the CAISO Balancing Authority Area, which are then reflected in the Day-Ahead Schedules, AS Awards and RUC Awards, HASP Intertie Schedules, Dispatch Instructions and the LMPs resulting from each CAISO Markets Process. Further, in formulating the market models for the HASP, STUC, RTUC and the RTD processes, the Real-Time power flow parameters developed from the State Estimator are applied to the Base Market Model.

27.5.2 Metered Subsystems

The FNM includes a full model of MSS transmission networks used for power flow calculations and Congestion Management in the CAISO Markets Processes. Network Constraints (i.e. circuit ratings, thermal ratings, etc.) within the MSS, or at its boundaries, that are modeled in the Base Market Model shall be monitored but not enforced in operation of the

CAISO Markets. If overloads are observed in the forward markets, are internal to the MSS or at the MSS boundaries, and are attributable to MSS operations, the CAISO shall communicate such events to the Scheduling Coordinator for the MSS and coordinate any manual Re-dispatch required in Real-Time. If, independent of the CAISO, the Scheduling Coordinator for the MSS is unable to resolve Congestion internal to the MSS or at the MSS boundaries in Real-Time, the CAISO will use Exceptional Dispatch Instructions on resources that have been bid into the HASP and RTM to resolve the Congestion. The costs of such Exceptional Dispatch will be allocated to the responsible MSS Operator. Consistent with Section 4.9, the CAISO and MSS Operator shall develop specific procedures for each MSS to determine how network Constraints will be handled.

27.5.3 Integrated Balancing Authority Areas

To the extent sufficient data are available or adequate estimates can be made for an IBAA, the Base Market Model used by the CAISO for the CAISO Markets Processes will include a model of the IBAA's network topology. The CAISO monitors but does not enforce the network Constraints for an IBAA in running the CAISO Markets Processes. Similarly, the CAISO models the resistive component for transmission losses on an IBAA but does not allow such losses to determine LMPs that apply for pricing transactions to and from an IBAA and the CAISO Balancing Authority Area, unless allowed under a Market Efficiency Enhancement Agreement. For Bids and Schedules between the CAISO Balancing Authority Area and the IBAA, the CAISO will model the associated sources and sinks that are external to the CAISO Balancing Authority Area using individual or aggregated injections and withdrawals at locations in the FNM that allow the impact of such injections and withdrawals on the CAISO Balancing Authority Area to be reflected in the CAISO Markets Processes as accurately as possible given the information available to the CAISO.

27.5.3.3 Process for Establishing a Market Efficiency Enhancement Agreement.

Any entity seeking to negotiate an MEEA with the CAISO may submit a written request to the CAISO. The CAISO and the requesting entity shall negotiate in good faith the terms and conditions of the MEEA. The CAISO shall file any executed MEEA with FERC for review and approval under Section 205 of the Federal Power Act. In the event an MEEA is not executed within 180 days of the initial written request for an MEEA, a requesting entity may invoke the CAISO ADR Procedures under Section 13.

27.5.3.4 Use of Data Provided under a Market Efficiency Enhancement Agreement

Data provided to the CAISO pursuant to an MEEA shall be used for purposes of modeling and pricing Interchange transactions between the CAISO Balancing Authority Area and the relevant IBAA at Scheduling Points specified in the MEEA. The data concerning hourly transactions shall be used solely for pricing MEEA transactions and for the determination of the eligible amounts as specified in the sections above. The configuration of the pricing points for the MEEA, which may include specific distribution factors for the represented resources, established through the negotiation of the MEEA will also be used for the purposes of modeling the resources in the IBAA subject to the MEEA. The CAISO and the MEEA signatory may agree to changes to these configurations over time that do not require the renegotiation of the terms of the MEEA or may agree to static terms until such time the parties re-execute a new MEEA. Such modeling information regarding the location of the resources will be incorporated into the Full Network Model, including the CRR FNM, which is used for all CAISO Markets as further described in Sections 27.3, 27.5.1 and 27.5.6. The FNM and the CRR FNM will not include the hourly transactional data provided pursuant to Section 27.5.3.2, except in such cases where the CAISO and the MEEA signatory have agreed to dynamic changes to the configuration of the modeling of the MEEA resources during the life of the agreement as further provided by the MEEA.

27.5.3.9 Default Designation of External Resource Locations for Modeling Transactions Between the CAISO Balancing Authority Area and an IBAA.

Prior to the establishment of a new IBAA or a change to an existing IBAA, the CAISO will define and publish default Resource IDs to be used for submitting import and export Bids and for settling import and export Schedules between the CAISO Balancing Authority Area and the potential or existing IBAA. These default Resource IDs will specify in the Master File the default associations of Intertie Scheduling Point Bids and Schedules to supporting individual or aggregate injection or withdrawal locations in the FNM. The CAISO will determine the supporting injection and withdrawal locations to allow the impact of the associated Intertie Scheduling Point Bids and Schedules to be reflected in the CAISO Markets Processes as accurately as possible given the information available to the CAISO. The CAISO's methodology for determining such default Resource IDs, as well as the specific default Resource IDs that have been adopted for the currently established IBAAs, are provided in the Business Practice Manuals. Alternative Resource IDs to be used instead of the default Resource IDs will be created and adopted for use in conjunction with Intertie Scheduling Point Bids and Schedules between the CAISO Balancing Authority Area and the IBAA based on a Market Efficiency Enhancement Agreement.

27.5.4 Accounting for Changes in Topology in FNM

The CAISO will incorporate into the FNM information received pursuant to Section 24 for transmission expansion and Section 25 for generation interconnection to account for changes to the CAISO Controlled Grid and other facilities located within the CAISO Balancing Authority Area. This information will be incorporated into the network model data base in which the electrical network model is maintained for use by the State Estimator and which forms the basis for the Base Market Model used by the CAISO Markets. The updated

power system network model will be transferred at periodic model update cycle intervals established by the CAISO and incorporated into the Base Market Model for use in the CAISO Markets. The Business Practice Manual for managing the Full Network Model will describe the information to be provided by Market Participants, the process by which the CAISO incorporates this information in the FNM, and operational details of the FNM. If the CAISO becomes aware of a material error or omission in the FNM, it will make a timely correction of the FNM.

27.5.5 Load Distribution Factors.

The CAISO will maintain a library of system-wide Load Distribution Factors for use in distributing Demand scheduled at the Default LAPs. The system Load Distribution Factors are derived from the State Estimator and are stored in the Load Distribution Factor library, and are updated periodically. For IFM the Load Distribution Factor library uses a similar-day methodology for smoothing the most recent Load Distribution Factors. The similar-day methodology uses data separately for each type of day. More recent days are weighted more heavily in the smoothing calculations. The market application then uses the set of Load Distribution Factors from the library that best represents the Load distribution conditions expected for the market Time Horizon. For the RTM, the State Estimator solution is used as a source for determining Load Distribution Factors. The Load Distribution Factor are also maintained for use for Demand scheduled at Custom LAPs. These custom Load Distribution Factors are not generated from the State Estimator and are fixed quantities representing the characteristics of the Custom LAP.

27.5.6 Management and Enforcement of Constraints in the CAISO Markets

The CAISO operates the CAISO Markets through the use of a market software system that utilizes various information including the Base Market Model, the State Estimator, submitted Bids including Self-Schedules, Generated Bids, and transmission Constraints, including Nomograms and Contingencies transmission and generation Outages. The market model used in each of the CAISO Markets is derived from the most current Base Market Model available at that time. To create a more relevant time-specific network model for use in each of the CAISO Markets, the CAISO will adjust the Base Market Model to reflect Outages and derates that are known and applicable when the respective CAISO Market will operate, and to compensate for observed discrepancies between actual real-time power flows and flows calculated by the market software. Through this process the CAISO creates the market model to be used in each Day-Ahead Market, HASP, and each process of the Real-Time Market. The CAISO will manage the enforcement of transmission Constraints, including Nomograms and Contingencies, consistent with good utility practice, to ensure, to the extent possible, that the market model used in each market accurately reflects all the factors that contribute to actual Real-Time flows on the CAISO Controlled Grid and that the CAISO Market results are better aligned with actual physical conditions on the CAISO Controlled Grid. In operating the CAISO Markets, the CAISO may take the following actions so that, to the extent possible, the CAISO Market solutions are feasible, accurate, and consistent with good utility practice:

(a) The ISO may enforce, not enforce, or adjust flow-based transmission Constraints, including Nomograms and Contingencies, if the CAISO observes that the CAISO Markets produce or may produce results that are inconsistent with observed or reasonably anticipated conditions or infeasible market solutions either because (a) the CAISO reasonably anticipates that the CAISO Market run will identify Congestion that is unlikely to materialize in Real-Time even if the transmission Constraint were to be ignored in all the markets leading to Real-Time, or (b) the CAISO reasonably anticipates that the CAISO Market will fail to identify Congestion that is likely to appear in the Real-Time. The ISO does not make such adjustments to intertie Scheduling Limits.

(b) The ISO may enforce or not enforce transmission Constraints, including Nomograms and Contingencies, if the CAISO has determined that non-enforcement or enforcement, respectively, of such Constraints may result in the unnecessary pre-commitment and scheduling of use-limited resources.

(c) The CAISO may not enforce transmission Constraints, including Nomograms and Contingencies, if it has determined it lacks sufficient visibility to conditions on transmission facilities necessary to reliably ascertain Constraint flows required for a feasible, accurate and reliable market solution.

(d) For the duration of a planned or unplanned Outage, the CAISO may create and apply alternative transmission Constraints, including Nomograms and Contingencies, that may add to or replace certain originally defined Constraints.

(e) The CAISO may adjust transmission Constraints, including Nomograms and Contingencies, for the purpose of setting prudent operating margins consistent with good utility practice to ensure reliable operation under anticipated conditions of unpredictable and uncontrollable flow volatility consistent with the requirements of Section 7.

To the extent that particular transmission Constraints, including Nomograms and Contingencies, are not enforced in the operations of the CAISO Markets, the CAISO will operate the CAISO Controlled Grid and manage any Congestion based on available information including the State Estimator solutions and available telemetry to Dispatch resources through Exceptional Dispatch to ensure the CAISO is operating the CAISO Controlled Grid consistent with the requirements of Section 7.

27.6 State Estimator.

The State Estimator produces a power flow solution based upon the modeled representation of the electrical network and available Real-Time SCADA telemetry. When this solution is applied to the FNM, it provides a reference of system conditions for determining Dispatch Instructions. The State Estimator also provides a reference for Real-Time Load Distribution Factors used to distribute the Real-Time CAISO Forecast of CAISO Demand as well as provide a source of historical data for the LDF library. If the State

each hour of the next Trading Day. RUC Capacity is selected by a SCUC optimization that uses the same Base Market Model used in the IFM adjusted as described in Section 27.5.1 and 27.5.6 to help ensure the deliverability of Energy from the RUC Capacity.

31.5.1 RUC Participation.

31.5.1.1 Capacity Eligible for RUC Participation.

RUC participation is voluntary for capacity that has not been designated as Resource Adequacy Capacity. Scheduling Coordinators may make such capacity available for participation in RUC by submitting a RUC Availability Bid, provided the Scheduling Coordinator has also submitted an Energy Bid for such capacity into the IFM. Capacity from Non-Dynamic System Resources that has not been designated Resource Adequacy Capacity is not eligible to participate in RUC. Capacity from resources including System Resources that has been designated as qualified Resource Adequacy Capacity must participate in RUC. RUC participation is required for Resource Adequacy Capacity to the extent that Resource Adequacy Capacity is not committed following the IFM. System Resources eligible to participate in RUC will be considered on an hourly basis; that is, RUC will not observe any multi-hour block constraints. RUC will observe the Energy Limits that may have been submitted in conjunction with Energy Bids to the IFM. RMR Unit capacity will be considered in RUC in accordance with Section 31.5.1.3. MSS resources may participate in RUC in accordance with Section 31.5.2.3. COG resources are accounted for in RUC, but may not submit or be paid RUC Availability Payments. The ELS Resources committed through the ELC Process conducted two days before the day the RUC process is conducted for the next Trading Day as described in Section 31.7 are binding.

31.5.1.2 RUC Availability Bids.

Scheduling Coordinators may only submit RUC Availability Bids for capacity (above the Minimum Load) for which they are also submitting an Energy Bid to participate in the IFM. The RUC Availability Bid for the Resource Adequacy Capacity submitted by a Scheduling Coordinator must be $0/MW per hour for the entire Resource Adequacy Capacity. If the Scheduling Coordinator fails to submit a $0/MW per hour for

33.2 The HASP Optimization

After the Market Close for the HASP and RTM for the relevant Trading Hour, the Bids have been validated and the MPM-RRD process has been performed, the HASP optimization determines feasible but non-binding HASP Advisory Schedules for Generating Units for each fifteen-minute interval of the Trading Hour, as well as binding hourly HASP Intertie Schedules and binding hourly HASP AS Awards from Non-Dynamic System Resources for that Trading Hour. The HASP may also commit resources whose Start-Up Times are within its Time Horizon. The HASP, like the other runs of the RTUC, utilizes the same SCUC optimization and Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 as the IFM, with the Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 updated to reflect changes in system conditions as appropriate, to ensure that HASP Intertie Schedules are feasible. Instead of clearing against Demand Bids as in the IFM, the HASP clears Supply against the CAISO Forecast of CAISO Demand plus submitted Export Bids, to the extent the Export Bids are selected in the MPM-RRD process. The HASP optimization also factors in forecasted unscheduled flow at the Interties. The HASP optimization produces Settlement prices for hourly imports and exports to and from the CAISO Balancing Authority Area reflected in the HASP Intertie Schedule and for the HASP AS Awards for System Resources.

33.3 Treatment of Self-Schedules in HASP.

The HASP optimization clears Bids, including Self-Schedules, while preserving all priorities in this process consistent with Section 34.10. The HASP optimization does not adjust submitted Self-Schedules unless it is not possible to balance Supply and the CAISO Forecast of CAISO Demand plus Export Bids and manage Congestion using the available Economic Bids, in which case the HASP performs non-economic adjustments to Self-Schedules. The MWh quantities of Self-Schedules of Supply that clear in the HASP constitute a feasible Dispatch for the

34. REAL-TIME MARKET

The RTM is the market conducted by the CAISO during any given Operating Day in which Scheduling Coordinators may provide Real-Time Imbalance Energy and Ancillary Services. The Real-Time Market consists of the Real-Time Unit Commitment (RTUC), the Short-Term Unit Commitment (STUC) and the Real-Time Dispatch (RTD) processes. The Short-Term Unit Commitment (STUC) runs once per hour near the top of the hour and utilizes the SCUC optimization to commit Medium Start, Short Start and Fast Start Units to meet the CAISO Demand Forecast. The CAISO shall dispatch all resources, including Participating Load pursuant to submitted Bids or pursuant to the provisions below on Exceptional Dispatch. In Real-Time, resources are required to follow Real-Time Dispatch Instructions. The Time Horizon of the STUC starts with the third fifteen-minute interval of the current Trading Hour and extending for the next four Trading Hours. The RTUC runs every fifteen (15) minutes and utilizes the SCUC optimization to commit Fast Start and some Short Start resources and to procure any needed AS on a fifteen-minute basis. Any given run of the RTUC will have a Time Horizon of approximately sixty (60) to 105 minutes (four to seven fifteen-minute intervals) depending on when during the hour the run occurs. Not all resources committed in a given STUC or RTUC run will necessarily receive CAISO commitment instructions immediately, because during the Trading Day the CAISO may issue a commitment instruction to a resource only at the latest possible time that allows the resource to be ready to provide Energy when it is expected to be needed. The RTD uses a Security Constrained Economic Dispatch (SCED) algorithm every five minutes throughout the Trading Hour to determine optimal Dispatch Instructions to balance Supply and Demand. Updates to the Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 used in the RTM optimization include current estimates of real-time unscheduled flow at the Interties. The RTD optimization utilizes up to a sixty-five-minute Time Horizon (thirteen (13) five-minute intervals), but the CAISO issues Dispatch Instructions only for the next target five-minute Interval. The RTUC, STUC and RTD processes of the RTM use the same Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 used in the DAM and the HASP, subject to any necessary updates of the Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 pursuant to changes in grid conditions after the DAM has run.

34.1 Inputs to the Real-Time Market

The RTM utilizes results produced by the DAM and HASP for each Trading Hour of the Trading Day, including the combined commitments contained in the Day-Ahead Schedules, Day Ahead AS Awards, RUC Awards, HASP Intertie Schedules, HASP Self-Schedules, HASP Intertie AS Awards and the MPM-RRD that is run as part of the HASP to determine reliability needs and mitigated bids for each relevant Trading Hour. These results, plus the short-term Demand Forecast, Real-Time Energy Bids, Real-Time Ancillary Service Bids, updated Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6, State Estimator output, resource outage and de-rate information constitute the inputs to the RTM processes. Bids submitted in HASP for all Generating Units and Participating Load shall be used in the Real-Time Market.

34.2 Real-Time Unit Commitment.

The Real-Time Unit Commitment (RTUC) process uses SCUC and is run every fifteen (15) minutes to: (1) make commitment decisions for Fast Start and Short Start resources having Start-Up Times within the Time Horizon of the RTUC process, and (2) procure required additional Ancillary Services and calculate ASMP used for settling procured Ancillary Service capacity for the next fifteen-minute Real-Time Ancillary Service interval. The RTUC can also be run with the Contingency Flag activated, in which case the RTUC can commit Contingency Only Operating Reserves. If RTUC is run without the Contingency Flag activated, it cannot commit Contingency Only Operating Reserves. RTUC is run four times an hour, at the following times for the following Time Horizons: (1) at approximately 7.5 minutes prior to the next Trading Hour, in conjunction with the HASP run, for T-45 minutes to T+60 minutes; (2) at approximately 7.5 minutes into the current hour for T-30 minutes to T+60 minutes; (3) at approximately 22.5 minutes into the current hour for T-15 minutes to T+60 minutes; and (4) at approximately 37.5 minutes into the current hour for T to T+60 minutes where T is the beginning of the next Trade Hour. The HASP, described in Section 33, is a special RTUC run that is performed at approximately 7.5 minutes before each hour and has the additional responsibility of: (1) pre-dispatching Energy and awarding Ancillary Services for hourly dispatched System Resources for the Trading Hour that begins 67.5 minutes later, and (2) performing the necessary MPM-RRD for that Trading Hour.

AWE Notice	Alert, Warning or Emergency Notice
Backup CAISO Control Center	The CAISO Control Center located in Alhambra, California.
Backup Meter	A redundant revenue quality meter which is identical to and of equal accuracy to the primary revenue quality meter connected at the same metering point which must be certified in accordance with the CAISO Tariff.
BAID	Business Associate Identification
Balancing Account	An account set up to allow periodic balancing of financial transactions that, in the normal course of business, do not result in a zero balance of cash inflows and outflows.
Balancing Authority	The responsible entity that integrates resource plans ahead of time, maintains load-interchange-generation balance within a Balancing Authority Area, and supports Interconnection frequency in real time.
Balancing Authority Area	The collection of generation, transmission, and loads within the metered boundaries of the Balancing Authority. The Balancing Authority maintains load-resource balance within this area.
Balancing Authority Area Gross Load	For the purpose of calculating and billing Minimum Load Costs, Emission Costs, and Start-Up Costs, Balancing Authority Area Gross Load is all Demand for Energy within the CAISO Balancing Authority Area. Balancing Authority Area Gross Load shall not include Energy consumed by: (a) Station Power that is netted pursuant to Section 10.1.3; and (b) Load that is isolated electrically from the CAISO Balancing Authority Area (*i.e.*, Load that is not synchronized with the CAISO Balancing Authority Area).
Base Case	The base case power flow, short circuit, and stability data bases used for the Interconnection Studies.
Base Market Model	A computer based model of the CAISO Controlled Grid that is derived from the Full Network Model as described in Section 27.5.1 and that, as described further in Section 27.5.6, is used as the basis for formulating the market models used in the operation of each of the CAISO Markets.

Attachment B - Blacklines

Transmission Constraint Management Compliance Filing

Fourth Replacement CAISO Tariff

ER09-1542-000

December 31, 2009

* * *

8.3.3.5 ~~Use of the Full Network~~ Base Market Model and ~~Procurement of~~ Ancillary Services Procurement~~.~~

The ~~Full Network~~Base Market Model is used in the SCUC application, which optimizes the provision of Ancillary Services and Energy in order to meet Ancillary Service requirements and Energy requirements. The ~~Full Network~~Base Market Model models network constraints as described in Section 27.5.1. The Ancillary Services Awards reflect the Ancillary Service Region and Sub-Region definitions and requirements. The Ancillary Service requirements, the definition of Ancillary Service Regions and Ancillary Service Sub-Regions, and any minimum or maximum limit that is used within an Ancillary Service Region or Ancillary Service Sub-Region are all inputs to the CAISO Market Processes.

* * *

27 CAISO MARKETS AND PROCESSES~~.~~

In the Day-Ahead and Real-Time time frames the CAISO operates a series of procedures and markets that together comprise the CAISO Markets Processes. In the Day-Ahead time frame, the CAISO conducts the MPM-RRD, an Integrated Forward Market (IFM) and the Residual Unit Commitment (RUC) process. In the Real-Time time frame, the CAISO conducts the Market Power Mitigation and Reliability Requirement Determination, the Hour-Ahead Scheduling Process (HASP), the Short-Term Unit Commitment (STUC), the Real-Time Unit Commitment (RTUC) and the five-minute Real-Time Dispatch (RTD). The CAISO Markets Processes utilize transmission and Security Constrained Unit Commitment and dispatch algorithms in conjunction with a ~~Full Network Model~~Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 to optimally commit, schedule and Dispatch resources and determine marginal prices for Energy, Ancillary Services and RUC Capacity. Congestion Revenue Rights are available and entitle holders of such instruments to a stream of hourly payments or charges associated with revenue the CAISO collects or pays from the Marginal Cost of Congestion component of hourly Day-Ahead LMPs. Through the operation of the CAISO Markets Processes the CAISO develops Day-Ahead Schedules, Day-Ahead AS Awards and RUC Schedules, HASP Advisory Schedules, HASP Intertie Schedules and AS Awards, Real-Time AS Awards and Dispatch Instructions to ensure that sufficient supply resources are available in Real-Time to balance Supply and Demand and operate in accordance with Reliability Criteria.

* * *

27.1.1.2 Marginal Cost of Losses.

For all PNodes and Aggregated PNodes in the CAISO Balancing Authority Area, including Scheduling Points, the use of the ~~FNM~~ Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 in the DAM and the RTM processes incorporates Transmission Losses. At each PNode or Aggregated PNode, the Marginal Cost of Losses is the System Marginal Energy Cost multiplied by the Marginal Loss factor at that PNode or Aggregated PNode. The Marginal Cost of Losses at a Location (PNode or APNode) may be positive or negative depending on whether an increase in Demand at that Location marginally increases or decreases the cost of Transmission Losses, using the distributed Reference Bus to balance it. The Marginal Loss factors are determined through a process that calculates the sensitivities of Transmission Losses with respect to changes in injection at each Location in the FNM. For CAISO Controlled Grid facilities outside the CAISO Balancing Authority Area, the CAISO shall assess the cost of Transmission Losses to Scheduling Coordinators using each such facility based on the quantity of losses agreed upon with the neighboring Balancing Authority multiplied by the LMP at the PNode of the Transmission Interface with the neighboring Balancing Authority Area. The MCLs calculated for Locations within the CAISO Balancing Authority Area shall not reflect the cost of Transmission Losses on those facilities.

* * *

27.5.1 Network Models used in ~~Description of FNM for~~ CAISO Markets.

The FNM is a representation of the WECC network model including the CAISO Balancing Authority Area that enables the CAISO to produce a Base Market Model that the CAISO then uses as the basis for formulating the individual market models used to conduct power flow analyses to ~~identify~~ manage transmission Constraints for the optimization of each of the CAISO Markets.

27.5.1.1 Base Market Model used in the CAISO Markets

Based on the FNM the CAISO creates the Base Market Model (BMM), which is used as the basis for formulating, as described in section 27.5.6, the individual market models used in each of the CAISO Markets to establish, enforce, and manage the transmission Constraints associated with network facilities. The Base Market Model is derived from the FNM by (1) introducing locations for modeling intertie

schedules; and (2) introducing market resources that do not currently exist in the FNM due to their size and lack of visibility. In the Base Market Model, External Balancing Authority Areas and external transmission systems are modeled to the extent necessary to support the commercial requirements of the CAISO Markets. For those portions of the FNM that are external to the CAISO Balancing Authority Area, the Base Market Model may model the resistive component for accurate modeling of Transmission Losses, but accounts for losses in the external portions of the market model separately from Transmission Losses within the CAISO Balancing Authority Area. As a result the Marginal Cost of Losses in the LMPs is not affected by external losses. For portions of the Base Market Model that are external to the CAISO Balancing Authority Area, the CAISO Markets only enforce network Constraints that reflect limitations of the transmission facilities and Entitlements turned over to the Operational Control of the CAISO by a Participating Transmission Owner, or that affect Congestion Management within the CAISO Balancing Authority Area or on Interties. External connections are retained between Intertie branches within Transmission Interfaces. Certain external loops are modeled, which allows the CAISO to increase the accuracy of the Congestion Management process. Resources are modeled at the appropriate network Nodes. The pricing Location (PNode) of a Generating Unit generally coincides with the Node where the relevant revenue quality meter is connected or corrected, to reflect the point at which the Generating Units are connected to the CAISO Controlled Grid. The Dispatch, Schedule, and LMP of a Generating Unit refers to a PNode, but the Energy injection is modeled in the Base Market Model ~~FNM~~ for network analysis purposes at the corresponding Generating Unit'(s) ~~(at the~~ physical interconnection point), taking into account any losses in the non-CAISO Controlled Grid~~transmission network~~ leading to the point where Energy is delivered to CAISO Controlled Grid~~Demand~~. Based on the BMM, ~~T~~the ~~FNM~~market models used in each of the CAISO markets incorporates physical characteristics needed for determining Transmission Losses and models network Constraints within the CAISO Balancing Authority Area, which are then reflected in the Day-Ahead Schedules, AS Awards and RUC Awards, HASP Intertie Schedules, Dispatch Instructions and the LMPs resulting from each CAISO Markets Process. ~~In operating the CAISO Markets, the CAISO establishes, enforces, and manages the transmission limits and Constraints associated with network facilities modeled in the FNM, as further described in the Business Practice Manuals. For portions of the FNM that are external to the CAISO Balancing Authority Area, the~~

~~CAISO may model the resistive component for accurate modeling of Transmission Losses, but accounts for losses in the external portions of the FNM separately from Transmission Losses within the CAISO Balancing Authority Area, and does not allow such losses to determine the Marginal Cost of Losses in the LMPs that apply to the CAISO Markets. For portions of the FNM that are external to the CAISO Balancing Authority Area, the CAISO only enforces network Constraints that reflect limitations of the transmission facilities and Entitlements turned over to the Operational Control of the CAISO by a Participating TO, or that affect Congestion Management within the CAISO Balancing Authority Area or on Interties.~~ Further, in formulating the market models ~~F~~for the HASP, STUC, RTUC and the RTD processes, the Real-Time power flow parameters developed from the State Estimator are applied to the Base Market Model~~FNM~~.

* * *

27.5.2 Metered Subsystems.

The FNM includes a full model of MSS transmission networks used for power flow calculations and Congestion Management in the CAISO Markets Processes. Network Constraints (i.e. circuit ratings, thermal ratings, etc.) within the MSS, or at its boundaries, that are modeled in the ~~FNM~~ Base Market Model shall be monitored but not enforced in operation of the CAISO Markets. If overloads are observed in the forward markets, are internal to the MSS or at the MSS boundaries, and are attributable to MSS operations, the CAISO shall communicate such events to the Scheduling Coordinator for the MSS and coordinate any manual Re-dispatch required in Real-Time. If, independent of the CAISO, the Scheduling Coordinator for the MSS is unable to resolve Congestion internal to the MSS or at the MSS boundaries in Real-Time, the CAISO will use Exceptional Dispatch Instructions on resources that have been bid into the HASP and RTM to resolve the Congestion. The costs of such Exceptional Dispatch will be allocated to the responsible MSS Operator. Consistent with Section 4.9, the CAISO and MSS Operator shall develop specific procedures for each MSS to determine how network Constraints will be handled.

27.5.3 Integrated Balancing Authority Areas.

To the extent sufficient data are available or adequate estimates can be made for an IBAA, the ~~FNM~~ Base Market Model used by the CAISO for the CAISO Markets Processes will include a model of the IBAA's network topology. The CAISO monitors but does not enforce the network Constraints for an IBAA in running the CAISO Markets Processes. Similarly, the CAISO models the resistive component for

transmission losses on an IBAA but does not allow such losses to determine LMPs that apply for pricing transactions to and from an IBAA and the CAISO Balancing Authority Area, unless allowed under a Market Efficiency Enhancement Agreement. For Bids and Schedules between the CAISO Balancing Authority Area and the IBAA, the CAISO will model the associated sources and sinks that are external to the CAISO Balancing Authority Area using individual or aggregated injections and withdrawals at locations in the FNM that allow the impact of such injections and withdrawals on the CAISO Balancing Authority Area to be reflected in the CAISO Markets Processes as accurately as possible given the information available to the CAISO.

* * *

27.5.3.4 Use of Data Provided ~~to CAISO~~ under a Market Efficiency Enhancement Agreement.

Data provided to the CAISO pursuant to an MEEA shall be used for purposes of modeling and pricing Interchange transactions between the CAISO Balancing Authority Area and the relevant IBAA at Scheduling Points specified in the MEEA. The data concerning hourly transactions shall be used solely for pricing MEEA transactions and for the determination of the eligible amounts as specified in the sections above. The configuration of the pricing points for the MEEA, which may include specific distribution factors for the represented resources, established through the negotiation of the MEEA will also be used for the purposes of modeling the resources in the IBAA subject to the MEEA. The CAISO and the MEEA signatory may agree to changes to these configurations over time that do not require the renegotiation of the terms of the MEEA or may agree to static terms until such time the parties re-execute a new MEEA. Such modeling information regarding the location of the resources will be incorporated into the Full Network Model, including the CRR FNM, which is used for all CAISO Markets as further described in Sections 27.3, 27.5.1 and 27.5.6. The FNM and the CRR FNM will not include the hourly transactional data provided pursuant to Section 27.5.3.2, except in such cases where the CAISO and the MEEA signatory have agreed to dynamic changes to the configuration of the modeling of the MEEA resources during the life of the agreement as further provided by the MEEA.

* * *

27.5.4 Accounting for Changes in Topology in FNM.

The CAISO will incorporate into the FNM information received pursuant to Section 24 for transmission expansion and Section 25 for generation interconnection to account for changes to the CAISO Controlled Grid and other facilities located within the CAISO Balancing Authority Area. This information will be incorporated into the network model data base in which the electrical network model is maintained for use by the State Estimator and which forms the basis for the ~~FNM~~ Base Market Model used by the CAISO Markets. The updated power system network model will be transferred at periodic model update cycle intervals established by the CAISO and incorporated into the ~~FNM~~ Base Market Model for use in the CAISO Markets. The Business Practice Manual for managing the Full Network Model will describe the information to be provided by Market Participants, the process by which the CAISO incorporates this information in the FNM, and operational details of the FNM. If the CAISO becomes aware of a material error or omission in the FNM, it will make a timely correction of the FNM.

* * *

27.5.6 Management and Enforcement of Constraints in the CAISO Markets

The CAISO operates the CAISO Markets through the use of a market software system that utilizes various information including the Base Market Model, the State Estimator, submitted Bids including Self-Schedules, Generated Bids, and transmission Constraints, including Nomograms and Contingencies transmission and generation Outages. The market model used in each of the CAISO Markets is derived from the most current Base Market Model available at that time. To create a more relevant time-specific network model for use in each of the CAISO Markets, the CAISO will adjust the Base Market Model to reflect Outages and derates that are known and applicable when the respective CAISO Market will operate, and to compensate for observed discrepancies between actual real-time power flows and flows calculated by the market software. Through this process the CAISO creates the market model to be used in each Day-Ahead Market, HASP, and each process of the Real-Time Market. The CAISO will manage the enforcement of transmission Constraints, including Nomograms and Contingencies, consistent with good utility practice, to ensure, to the extent possible, that the market model used in each market accurately reflects all the factors that contribute to actual Real-Time flows on the CAISO Controlled Grid and that the CAISO Market results are better aligned with actual physical conditions on the CAISO Controlled Grid. In operating the CAISO Markets, the CAISO may take the following actions so that, to

the extent possible, the CAISO Market solutions are feasible, accurate, and consistent with good utility practice:

(a) The ISO may enforce, not enforce, or adjust flow-based transmission Constraints, including Nomograms and Contingencies, if the CAISO observes that the CAISO Markets produce or may produce results that are inconsistent with observed or reasonably anticipated conditions or infeasible market solutions either because (a) the CAISO reasonably anticipates that the CAISO Market run will identify Congestion that is unlikely to materialize in Real-Time even if the transmission Constraint were to be ignored in all the markets leading to Real-Time, or (b) the CAISO reasonably anticipates that the CAISO Market will fail to identify Congestion that is likely to appear in the Real-Time. The ISO does not make such adjustments to intertie Scheduling Limits.

(b) The ISO may enforce or not enforce transmission Constraints, including Nomograms and Contingencies, if the CAISO has determined that non-enforcement or enforcement, respectively, of such Constraints may result in the unnecessary pre-commitment and scheduling of use-limited resources.

(c) The CAISO may not enforce transmission Constraints, including Nomograms and Contingencies, if it has determined it lacks sufficient visibility to conditions on transmission facilities necessary to reliably ascertain Constraint flows required for a feasible, accurate and reliable market solution.

(d) For the duration of a planned or unplanned Outage, the CAISO may create and apply alternative transmission Constraints, including Nomograms and Contingencies, that may add to or replace certain originally defined Constraints.

(e) The CAISO may adjust transmission Constraints, including Nomograms and Contingencies, for the purpose of setting prudent operating margins consistent with good utility practice to ensure reliable operation under anticipated conditions

of unpredictable and uncontrollable flow volatility consistent with the requirements of Section 7.

To the extent that particular transmission Constraints, including Nomograms and Contingencies, are not enforced in the operations of the CAISO Markets, the CAISO will operate the CAISO Controlled Grid and manage any Congestion based on available information including the State Estimator solutions and available telemetry to Dispatch resources through Exceptional Dispatch to ensure the CAISO is operating the CAISO Controlled Grid consistent with the requirements of Section 7.

* * *

31.5 Residual Unit Commitment.

The CAISO shall perform the RUC process after the IFM. In the event that the IFM did not commit sufficient resources to meet the CAISO Forecast of CAISO Demand and account for other factors such as Demand Forecast error, as described in the Business Practice Manuals, the RUC shall commit additional resources and identify additional RUC Capacity to ensure sufficient on-line resources to meet Demand for each hour of the next Trading Day. RUC Capacity is selected by a SCUC optimization that uses the same Base Market Model used in the IFM adjusted as described in Section 27.5.1 and 27.5.6 to help ensure the deliverability of Energy from the RUC Capacity.

* * *

33.2 The HASP Optimization.

After the Market Close for the HASP and RTM for the relevant Trading Hour, the Bids have been validated and the MPM-RRD process has been performed, the HASP optimization determines feasible but non-binding HASP Advisory Schedules for Generating Units for each fifteen-minute interval of the Trading Hour, as well as binding hourly HASP Intertie Schedules and binding hourly HASP AS Awards from Non-Dynamic System Resources for that Trading Hour. The HASP may also commit resources whose Start-Up Times are within its Time Horizon. The HASP, like the other runs of the RTUC, utilizes the same SCUC optimization and ~~FNM~~ Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 as the IFM, with the ~~FNM~~ Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 updated to reflect changes in system conditions as appropriate, to ensure that HASP Intertie Schedules

are feasible. Instead of clearing against Demand Bids as in the IFM, the HASP clears Supply against the CAISO Forecast of CAISO Demand plus submitted Export Bids, to the extent the Export Bids are selected in the MPM-RRD process. The HASP optimization also factors in forecasted unscheduled flow at the Interties. The HASP optimization produces Settlement prices for hourly imports and exports to and from the CAISO Balancing Authority Area reflected in the HASP Intertie Schedule and for the HASP AS Awards for System Resources.

* * *

34. REAL-TIME MARKET.

The RTM is the market conducted by the CAISO during any given Operating Day in which Scheduling Coordinators may provide Real-Time Imbalance Energy and Ancillary Services. The Real-Time Market consists of the Real-Time Unit Commitment (RTUC), the Short-Term Unit Commitment (STUC) and the Real-Time Dispatch (RTD) processes. The Short-Term Unit Commitment (STUC) runs once per hour near the top of the hour and utilizes the SCUC optimization to commit Medium Start, Short Start and Fast Start Units to meet the CAISO Demand Forecast. The CAISO shall dispatch all resources, including Participating Load pursuant to submitted Bids or pursuant to the provisions below on Exceptional Dispatch. In Real-Time, resources are required to follow Real-Time Dispatch Instructions. The Time Horizon of the STUC starts with the third fifteen-minute interval of the current Trading Hour and extending for the next four Trading Hours. The RTUC runs every fifteen (15) minutes and utilizes the SCUC optimization to commit Fast Start and some Short Start resources and to procure any needed AS on a fifteen-minute basis. Any given run of the RTUC will have a Time Horizon of approximately sixty (60) to 105 minutes (four to seven fifteen-minute intervals) depending on when during the hour the run occurs. Not all resources committed in a given STUC or RTUC run will necessarily receive CAISO commitment instructions immediately, because during the Trading Day the CAISO may issue a commitment instruction to a resource only at the latest possible time that allows the resource to be ready to provide Energy when it is expected to be needed. The RTD uses a Security Constrained Economic Dispatch (SCED) algorithm every five minutes throughout the Trading Hour to determine optimal Dispatch Instructions to balance Supply and Demand. Updates to the ~~FNM~~ Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 used in the RTM optimization include current estimates of real-time unscheduled flow at the

Interties. The RTD optimization utilizes up to a sixty-five-minute Time Horizon (thirteen (13) five-minute intervals), but the CAISO issues Dispatch Instructions only for the next target five-minute Interval. The RTUC, STUC and RTD processes of the RTM use the same ~~FNM~~ Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 used in the DAM and the HASP, subject to any necessary updates of the ~~FNM~~Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 pursuant to changes in grid conditions after the DAM has run.

34.1 Inputs to the Real-Time Market.

The RTM utilizes results produced by the DAM and HASP for each Trading Hour of the Trading Day, including the combined commitments contained in the Day-Ahead Schedules, Day Ahead AS Awards, RUC Awards, HASP Intertie Schedules, HASP Self-Schedules, HASP Intertie AS Awards and the MPM-RRD that is run as part of the HASP to determine reliability needs and mitigated bids for each relevant Trading Hour. These results, plus the short-term Demand Forecast, Real-Time Energy Bids, Real-Time Ancillary Service Bids, updated ~~FNM~~ Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6, State Estimator output, resource outage and de-rate information constitute the inputs to the RTM processes. Bids submitted in HASP for all Generating Units and Participating Load shall be used in the Real-Time Market.

* * *

CAISO Tariff Appendix A

Master Definitions Supplement

* * *

Base Market Model	A computer based model of the CAISO Controlled Grid that is derived from the Full Network Model as described in Section 27.5.1 and that, as described further in Section 27.5.6, is used as the basis for formulating the market models used in the operation of each of the CAISO Markets.

* * *

Attachment C

Issue Paper

Data Release & Accessibility

Phase 1: Transmission Constraints

November 5, 2009

Data Release & Accessibility in ISO Markets

Table of Contents

1. Introduction

With the start up of the California Independent System Operator Corporation's (the ISO) new market system based on Locational Marginal Pricing (LMP) on April 1 of this year, stakeholders have expressed a desire for the release of additional information that would enable them to better understand market results and participate more effectively in the ISO markets. In response the ISO committed to conduct a stakeholder process to explore the issue of data release and accessibility in ISO markets, and to implement appropriate enhancements to its current data provision practices. This issue paper is intended to initiate discussion with stakeholders regarding the specific types of information they would like the ISO to provide and the potential enhancements the ISO should consider implementing.

The Data Release & Accessibility Initiative will consist of three phases:

- Phase 1: Transmission Constraints (the topic of this issue paper),
- Phase 2: Convergence Bidding Information Release (issue paper expected to post before Thanksgiving), and
- Phase 3: Other types of market data to support well-functioning, competitive ISO spot markets, including Price Discovery and Outage Information.

This issue paper focuses on information related to transmission constraints; specifically, it addresses the question of what additional visibility can be provided to market participants regarding the ISO's management of transmission constraints and the impacts of network conditions and the ISO's constraint management practices on market results. On October 2, 2009, the Federal Energy Regulatory Commission (FERC) issued an order (129 FERC ¶ 61,009 (2009) (October 2 Order)) in Docket No. ER09-1542-000, requiring the ISO to convene a stakeholder process with an aim to address concerns raised by parties in that proceeding regarding what additional transparency and visibility can be provided with respect to the ISO's transmission constraint enforcement practices to account for system conditions in managing the limits of the transmission system. In addition, FERC directed the ISO to consider in this stakeholder process ways in which the ISO can provide (1) the list of the constraints that are not enforced in ISO markets and (2) the list of contingencies that are enforced in ISO markets. Finally, FERC also directed the ISO, "through its stakeholder processes, to develop guidelines for its constraint management process, and, within 90 days of issuance of this order, submit tariff sheets setting forth those principles that significantly affect rates, terms or conditions."

The ISO had originally intended to structure its *Data Release & Accessibility* initiative as a single comprehensive process to consider all types of market information needed to support the efficiency of its spot markets. As a result of this order and the directive that the ISO commence the stakeholder process as expeditiously as possible, however, the ISO determined that the best course of action was to segment the *Data Release & Accessibility* initiative in three phases. The first phase will focus on directives of the *October 2 Order* so that the ISO may meet the near term December 31, 2009 deadline for a compliance filing. The second phase will address the concerns raised by market participants regarding convergence bidding data release. Phase 3 will consider any other types of market information that would be appropriate and feasible for the

ISO to provide to market participants to foster market efficiency and competitiveness, including Price Discovery and Outage Information.

Phase 1: Develop Guidelines on ISO's Constraint Management Process.

This first phase will address FERC's specific directives in its *October 2 Order*.

Constraint Enforcement Practices: What additional information and visibility can be provided with respect to the ISO's transmission constraint enforcement and practices to account for system conditions in managing the limits of the transmission system?

Constraint & Contingency Lists: Determine how the ISO can provide the list of (1) enforced and unenforced constraints and (2) active contingencies.

Tariff Guidelines on Constraint Management: Develop high level guidelines for the ISO's constraint management process to be included in the ISO tariff in compliance with FERC's *October 2 Order*.

This discussion paper is the first step in the ISO's stakeholder process to explore Phase 1 of the ISO's *Data Release and Accessibility* initiative. Its purpose is to identify issues and, where appropriate, discuss possible approaches to address such issues. This paper will be followed by a conference call on November 12, 2009. After the call, stakeholder comments on Phase 1 issues are requested by November 23, 2009 to the Data Release & Accessibility Project Mailbox, Phase1TC@caiso.com

2. Process and Proposed Timetable

The following timeline is for the stakeholder process and FERC filing related to Phase 1. The timing for implementation of the data release developed in Phase 1 will be determined later in this process. Specific timelines for Phase 2 and 3 will be released with the issue papers for those phases. At this time the ISO anticipates completing the stakeholder processes for Phases 2 and 3 in the first quarter of 2010.

Phase 1 Timetable

Tentative Date	Milestone
November 5, 2009	Publish Issue Paper
November 12, 2009	Stakeholder Conference Call
November 23, 2009	Due Date for Stakeholder Comments
On or before December 3, 2009	Publish data release proposal and draft constraint management tariff language
December 10, 2009	On-Site Stakeholder Meeting
December 16, 2009	Stakeholder comments on data release proposal and draft tariff language
December 31, 2009	FERC Compliance Filing in ER09-1542-000

3. Phase 1: Overview & Objectives

The ISO's current transmission constraint management practices are described in parts in several areas including the tariff, the Business Practice Manuals (BPMs), Technical Bulletins, and in various operating procedures. As noted above, in an effort to complete the directives in FERC's *October 2 Order* as expeditiously as possible, the first phase of the *Data Release and Accessibility* initiative will focus on determining what additional data or information can be provided to ISO market participants regarding the ISO's transmission constraint enforcement and management practices to account for system conditions in managing the limits of the transmission system. In Section 4 of this paper, we provide a description of the ISO's current practices in this area. This section is intended to provide the lay of the land so that the ISO and its stakeholders can productively discuss what additional information is needed and may be provided regarding its transmission constraint enforcement and practices.

In an effort to enhance visibility into the ISO constraint enforcement, in Phase 1, the ISO will also resolve the more discrete task of determining how the ISO can provide the (1) list of enforced and unenforced constraints and (2) the list of active contingencies. This directly addresses the issue raised by stakeholders previously and reflected in the *October 2 Order* requesting that the ISO address "ways in which the CAISO can provide (1) either the list of the constraints that are not enforced in the CAISO market or more visibility into how they are established and (2) the list of contingencies that are enforced in the CAISO market process." In

Section 5, the ISO discusses the provision of the constraint and contingency enforcement information for ISO markets.

In addition, with regard to binding constraints, the ISO has conducted a preliminary review of the other ISO/RTO practices in this area and provides a summary in section 6 of this paper. While the practices vary, as discussed further in Section 6 below, the ISO has determined that in addition to providing the shadow price associated with a binding constraint for any given market interval, as the ISO does on its OASIS, other ISOs/RTOs also provide additional information regarding the cause for the binding constraint. For example, if a constraint becomes binding in the market contingency analysis the applicable contingency is identified.

Finally, while this issue is not directly related to the *Data Release and Accessibility*, in Phase 1, the ISO will also address the development of high-level guidelines regarding its transmission constraint management to be included in its tariff. In its *October 2 Order* FERC concluded that it would be "impractical to list in the tariff all instances in which the CAISO will relax, enforce, or manually adjust constraints, [but that] it is reasonable for the tariff to include the general guidelines explaining the CAISO's constraint management practices" (p.18).

In summary, in the Phase 1 stakeholder process the ISO intends to discuss and resolve the following three items:

Constraint Enforcement Practices: Determine what additional information and visibility can be provided with respect to the ISO's transmission constraint enforcement and practices to account for system conditions in managing the limits of the transmission system.

Constraint & Contingency Lists: Determine how the ISO can provide (1) the list of enforced and unenforced constraints and (2) the list of active contingencies.

Tariff Guidelines on Constraint Management: Develop high-level guidelines that describe the ISO's constraint management processes and include the appropriate level of detail in the tariff.

This issue paper discusses the first two items; the third item will be included in the next paper the ISO releases for Phase 1.

4. Constraint Enforcement Practices

Determine what additional information and visibility can be provided with respect to the ISO's transmission constraint enforcement and practices to account for system conditions in managing the limits of the transmission system.

4.1. Description of Current ISO Constraint Enforcement Practices

Over the past year, in preparation for the start of its new market, the ISO responded to requests for additional information regarding the ISO's transmission constraint enforcement and management under LMP-based markets. However, several market participants have expressed, in various forums at the ISO and with the FERC, the need for additional information and visibility regarding the ISO's transmission constraint enforcement and its practices for accounting for system conditions in managing transmission system limits.

The ISO operates its day-ahead and real-time markets through the use of a market software system that calculates and mitigates transmission congestion, establishes load and resource schedules and dispatch instructions, procures ancillary services and calculates LMPs and ancillary service marginal prices (ASMPs). The market system utilizes various inputs to model the physical transmission grid, associated flows and congestion, and interconnected load and generation resources. In order to properly function, the market software requires a model of the physical transmission network, one that provides a detailed and accurate representation of the physical power system on which the energy scheduled by the ISO markets will flow. This underlying representation of the power system is provided through the Full Network Model (FNM). The purpose and development of the FNM is described in significant detail in the business practice manual (BPM) for Management of the Full Network Model which can be found here: https://bpm.caiso.com/bpm/bpm/version/000000000000004.

It is important to understand the relationship between the FNM and the market software. The FNM is essentially a network topology data set that is a crucial *input* to the market optimization software, but it is not software, and does not perform any of the required optimization or market clearing functions of the market software. In particular, the FNM does not enforce or manage transmission constraints, it simply represents the constraint in a data format that the market software can use to perform its congestion and constraint management functions. Thus, the FNM is a snapshot of the CAISO Controlled Grid and that snapshot is in data set form, which exists in a large text file and a series of data tables.

The FNM used in the ISO markets undergoes a major update or release every six to eight weeks; these are the "DB-xx" releases with which most market participants will be familiar. While each of the ISO markets runs daily and uses essentially the same, current FNM release, there are continual changes to the physical network occurring due mainly to outages and derates of transmission facilities, and these changes must be incorporated into the market network model

data set that is provided to the market software in order to ensure that the resulting market schedules are feasible and the market prices accurately reflect current system conditions. Therefore, the market network model actually used in each ISO market run is based on the current DB-xx FNM release and is then tailored by the ISO to accurately reflect real-time characteristics of the transmission network.

Even with the daily adjustments to the FNM to reflect current outages and derates, the resulting market network model is still only a data set snapshot of the grid at a particular point in time and cannot by itself guarantee that the market software results will accurately reflect all the factors that contribute to actual real-time flows on the ISO grid consistent with good utility practice. The ISO, therefore uses, other tools, practices and applications for managing network and resource constraints to produce market results that better align with real-time physical conditions on the grid. These tools, practices and applications are what is referred to as the transmission constraints setting and management practices and is the area of activity that the ISO believes stakeholders seek to have greater visibility.

Section 2.1.1 of the BPM for FNM provides a detailed description of these practices and the principles that guide the actions the ISO operators and operating engineers will take in preparing the market network model for the market optimization software. In that document, we indicate that there are several instances in which it is not appropriate for the IFM/RTM Systems (*i.e.*, the market optimization software that is used in running the energy and ancillary services in the Day-Ahead Market (DAM), which includes the Integrated Forward Market (IFM) and the Residual Unit Commitment (RUC), and the Real-Time Market (RTM), which includes the Hour Ahead Scheduling Process (HASP), and the Real-Time Dispatch)) to enforce all constraints that are specified in the raw FNM. For example, for grid facilities where there is insufficient visibility to ensure the accuracy required for congestion management through the IFM/RTM System, the constraints will not be enforced by the market software. In these cases the operators will examine all available information, including State Estimator solutions, reliability tools, and available telemetry, to operate the system. For such circumstances the operators will follow the relevant ISO operating procedures[1] where applicable.

The BPM for FNM and the ISO Operating Procedure M-401[2] provide additional information on a process through which on any given day the ISO staff reviews the results of power flow analyses run (1) for the next Trading Day (D-1, within the DAM process), (2) for one day past the next Trading Day (D+2), and (3) for two days out past the next Trading day (D+3). This process is intended to allow the ISO to validate the market network model, including any changes to topology or ratings due to planned or forced outages, and evaluate the feasibility and reliability implications of market commitments and schedules. This process also allows the ISO

---

[1] CAISO operating procedures define constraints other than thermal limits of individual network branches, and state the conditions in which the constraints are valid, including variation by season, time of day, temperature, wind speed, existence of outages, market time horizon, etc.

[2] M-401 Day Ahead Market Operating Procedure, http://www.caiso.com/docs/2000/07/19/20000719153531504O.pdf

to consider any of the factors described further below that may require changes to the enforcement status of certain constraints or contingencies.

While described more fully in the BPM for the FNM, below are the five main guidelines that describe what transmission limits (flowgates, constraints, nomograms, or intertie limits) are generally not enforced in one or more of the ISO Market processes:

(1) Facilities that Lack Sufficient Telemetry and Visibility

> "Certain transmission facilities lack sufficient telemetry to provide accurate data for market dispatch and pricing purposes [which] ... may lead to spurious congestion or infeasible schedules. The CAISO therefore generally *does not* enforce constraints on the facilities where there is not sufficient telemetry and visibility. This applies to many facilities below 115 kV and to a small number of facilities at 115kV, but does not apply to any of the facilities above 115 kV."[3]

(2) Intertie Constraints

> "Each intertie between the CAISO and an adjacent Balancing Authority Area has both a flow limit and a scheduling limit. ... The CAISO Markets are operated on a flow-based congestion management design, whereas the joint scheduling practices with neighboring Balancing Authorities continue to be based on enforcement of the scheduling limits. ... The CAISO ... does not enforce intertie flow limits in the DAM and will continue to rely only on the scheduling limits for congestion management in the DAM.[4] ... The CAISO does, however, enforce flow limits in real-time for WECC rated interties as required by WECC, and monitors the actual real-time intertie flows to identify any situations where enforcing and/or adjustment of a flow limit that was not enforced would be appropriate based on actual conditions, and can turn on an intertie flow limit if necessary. [However,] adjustment to the flow limit may be necessary to account for differences in actual flow and flows resulting from market schedules ...."[5]

---

[3] *See* BPM for FNM at p.15.

[4] There are some exceptions to this general rule. Intertie scheduling limits are enforced either through an Intertie Constraint (ITC) or a Market Scheduling Limit (MSL). Market Scheduling Limits are a flow based intertie constraint that completely encircles one or more Scheduling Points, while an Intertie Constraints a mathematically constraint limit the net energy, ancillary services scheduled from one or more Scheduling Points while also accounting for Existing Transmission Rights. In some instances, if the a Scheduling Point participates in more than one intertie scheduling limit and therefore is already associated with one ITC the ISO will use an Market Scheduling Limit to ensure that the intertie scheduling limit is adhered to.

[5] *See* BPM for FNM at p.16.

(3) Management of Use Limited Resources

"Enforcement of certain constraints and contingencies in the DAM may result in the start-up of one or more use-limited resources, such as combustion turbines (CTs) and hydro facilities located in the area of the affected constraints, in anticipation that the contingency or other event causing the constraint to bind would occur in real time. … The CAISO, therefore, does not enforce certain constraints and contingencies in the Day-Ahead Market, but will enforce them in the RTM and utilize operating procedures if necessary to commit and dispatch the use-limited resources only when needed."[6]

(4) Management of Transmission Outages

"Planned transmission outages present another situation where there is a need for the ISO to exercise judgment as to whether to enforce a contingency-based constraint. … The CAISO may determine that alternative constraints should be applied instead of the originally defines ones for the duration of the planned outage work."[7]

(5) Lessons from Market Results

"Market solutions may demonstrate that enforcement of certain constraints repeatedly produces inaccurate results either because they frequently indicate congestion in the markets that is not materializing in real time (i.e., false positives), or because they tend not to register congestion in the markets but become congested in real time (i.e., false negatives). For the false positive cases, CAISO engineering staff compares actual flow data against the flows implied by market schedules and assesses whether modeling improvements can reduce the observed discrepancies. If this is not possible the CAISO may stop enforcing such constraints in the markets while continuing to monitor their associated real-time flows, so that if unscheduled congestion becomes an issue the CAISO can resume enforcing the constraints in the markets. For the false negative cases, CAISO engineering staff assesses the possibility of improving the model, but in these cases if improvements cannot be found the CAISO continues to enforce the constraints in the markets to avoid exacerbating potential schedule infeasibilities. In either situations, the CAISO may utilize an adjustment to a constraint limit as a preferable third alternative to either turning the constraint completely off or enforcing it at its normal limit."[8]

---

[6] *See* BPM for FNM at p.16.

[7] *See* BPM for FNM at p.17.

[8] *See* BPM for FNM at p.17.

4.2. Specific ISO Constraint Enforcement Practices

There are several categories or types of transmission constraints specific to the ISO: (1) flowgates, (2) nomograms in ISO Operating Procedure M-405 Nomograms, corridors, and Contingencies, (3) any temporary nomograms used to reflect specific outages, and (4) all intertie limits, which include Intertie Constraints (ITCs) and Market Scheduling Limits (MSLs). At the interties, there are flow-based constraints and scheduling limit constraints. Scheduling limit constraints (or ITCs) are constraints that limit the quantity of scheduled energy and ancillary service at one or more Intertie Scheduling Points, also taking into consideration the Existing Rights. MSLs are flow based intertie constraints.

Several distinctions can be made between enforced and unenforced constraints. An unenforced constraint is not considered in the optimization dispatch solution even if the constraint's limit is reached or exceeded and, therefore, will not lead to the redispatch of resources. Essentially, an unenforced constraint does not exist in the market network model. In contrast, an enforced constraint is modeled and considered in the optimization, which may lead to a different resource commitment and/or dispatch than would have been dispatched had the constraint not been enforced. When a constraint results in a different economic dispatch than what would have been dispatched had the constraint not been enforced, the constraint is considered to be "binding," and such binding constraints may affect prices.

The ISO operators and operating engineers review the list of potentially enforceable and unenforced constraints for use in market runs and determine if any constraint enforcement adjustments are necessary in the D+2 and D+3 timeframes. These practices are further described in the FNM BPM in Section 2.1.1 Overview of Constraint Enforcement in the IFM/RTM System.

4.2.1 General Principles for Transmission Constraint Enforcement Practices

Below are a set of general principles that illustrate the elements the ISO enforces, with exceptions as noted further below:

- Normal ratings are enforced all the time with exceptions as noted below.
- Emergency ratings are enforced during market contingency runs with exceptions noted in the next section. ISO Procedure M-405 defines a list of base contingencies that are activated all the time as default. Additional contingencies can be defined and activated in addition to the base contingencies where appropriate, mostly for specific planned or forced outages as captured in the Scheduling and Logging for ISO of California (SLIC) ticket or changes to current topology.
- All Internal Major path limits (corridors) are enforced.
- All Internal Branch Groups (corridors) are enforced.

- Certain 70 kV and lower voltage transmission lines and transformers where appropriate (*i.e.*, where there is telemetry) are enforced.

- All Nomograms in ISO Operating Procedure M-405 *Nomograms, TCORS, & Contingencies*.

- Any temporary nomograms or contingencies used for specific outages.

- All intertie limits (MSLs). Only MSL's that do not have a companion ITC enforced will be enforced.

- All Intertie Constraint (ITC) are enforced.

The following illustrates the types of transmission constraints that are generally unenforced:

- Lines and transformers that are not under the ISO direct control, such as merchant non-utility generation tie lines and step up transformers.

- Lines, transformers, and other ratings outside the CAISO Balancing Authority Area, that are not part of the CAISO Controlled Grid.

- Flow limits across the ISO boundary, in market runs where compensating injections are not calculated or where actual boundary flows are not matching market calculated flows and an Intertie Scheduling Limit is established.

- 70 kV and lower lines and transformers that lack sufficient telemetry. There are also certain 115 kV lines and transformers where telemetry is not available and, therefore, are not enforced.

- When the ISO's practices for conforming transmission constraints conflicts between monitoring normal ratings vs. emergency ratings.[9]

- When real-time temperature adjusted ratings are used for certain lines and transformers.

- Competing Branch Groups or constraints in which the most limiting constraint will be enforced and sufficiently mitigate linear or non parallel constraints.

---

[9] When a conforming adjustment is made to a transmission element, the percentage adjustment will apply to both the normal and emergency rating. As a result in some cases when trying to make a conforming adjustment to a market emergency limit to reflect a expected flow impact of a contingency, the same conforming adjustment applied to the normal limit causes the transmission element to bind prematurely than actual conditions warrant.

- Select nomograms in the Day-Ahead Market where effective generation may be use limited.

4.3. ISO Practice of Managing Transmission Constraints by Adjusting Transmission Limits

Market participants and stakeholders have expressed concern over insufficient visibility to the ISO operators' practices for adjusting market transmission system limits. ISO operators make adjustments for (1) conforming transmission limits to achieve greater alignment between the energy flows calculated by the market software and those observed or predicted in real-time operation across various paths, and (2) setting prudent operating margins consistent with good utility practice to ensure reliable operation under conditions of unpredictable and uncontrollable flow volatility. In conforming transmission limits the operators and operating engineers seek in part to compensate for the time lag, inherent in the structure of the five-minute real-time dispatch, between first detecting imminent congestion and the response of resources to dispatch instructions. In setting reliability margins, the operators seek to ensure that the market software produces a solution that is reliable and consistent with good utility practice within the general state of the system including potentially unpredictable flow variability and changing congestion patters. The term "biasing" has previously been used to refer to both these practices, but with this issue paper the ISO adopts the preferred term "conforming transmission limits" for the first category because it more accurately reflects the true intent and nature of this practice. The second category we will refer to simply as setting reliability margins.

In response to stakeholders' concerns about transparency, the ISO published a technical bulletin describing the principles that drive these practices conforming transmission limits to better align market flows with actual flows and setting reliability margins.[10] In the technical bulletin these two primary categories of transmission limit adjustment were further broken down by the following four objectives:

- Where real-time market flows are not consistent with actual flows.
- Align calculated market flows with measurable or predictable actual flows.
- Accommodate mismatch due to inherent design differences of DAM, Real-Time Unit Commitment (RTUC) and the Real-Time Dispatch (RTD) runs (such as the time lag between detecting a real-time flow issue and realizing the result of a resource's response to an RTD dispatch instruction).
- Allow reliability margins for certain flowgates.

[10] The technical bulletin was posted on July 2, 2009 and can be found at http://www.caiso.com/23ea/23eae8aef980.pdf.

- Adjust margins for flowgates impacted by telemetry issues.

As explained in the technical bulletin, the act of adjusting transmission limits for any of the purposes discussed above is not a feature new to the LMP-based ISO markets. Conforming transmission limits and setting reliability margins in the market model are prudent and necessary operating practices that were used even under the prior zonal market design. The technical bulletin discusses the differences between the previous zonal market versus the new LMP market with respect to how adjustments to transmission limits affects market results. A key difference is that under the zonal market, the intra-zonal constraint margins were managed through the out-of-sequence real-time dispatches rather than through the market optimization. Consequently, the zonal prices did not reflect the impact of such practices, which were instead reflected in the costs of out-of-sequence dispatching.

In contrast, under the current LMP market design, the nodal prices capture the impact of the actions taken by ISO operators to adjust transmission limits. The advantage of this is that once the ISO operators adjust the relevant transmission limits in the market software, the dispatch instructions issued to manage congestion are generated through the market optimization as opposed to having to rely on non-market operator actions, and therefore the costs are reflected in prices and recovered through the energy settlement. One result of this new relationship between adjustments and market results – prices, schedules, dispatches and awards – has been the additional interest on the part of market participants for visibility into how these practices affect market outcomes. Therefore, the ISO is taking this opportunity to explore what kind of information market participants require in order to have better visibility into the principles behind conforming and margin setting practices and how these actions affect market outcomes.

To provide a framework for this discussion, below is an outline of how transmission limits are conformed and reliability margins are set. The reasons for such actions are more fully discussed in the technical bulletin mentioned above. Here we provide a simple structure so that participants in this discussion can better identify the data that may be made available and for what purpose.

What is adjusted?

- The ISO does not adjust scheduling limits.

- Margins for purposes of conforming limits are only applied to market operating limits for certain branch groups (flowgates/transmission interfaces).

Guidelines for adjusting limits.

- Where real-time market flows are not consistent with actual flows.

- Flowgates that consistently bind in the real-time market and are conformed in the real-time market may also need to be biased in the day-ahead market. But this is not always the case and varies depending on the type of constraints that become binding in the real

time market. If the constraints that bind in the real-time are of the nature that does not consistently appear in the day-ahead market also, the ISO does not translate its real-time conforming practice into the DAM. For example, if it is it is evident that almost all the constraints that were conformed in real-time were actually "conformed up," which means that it was necessary to conform the limit to relieve the otherwise fictitious congestion that the real-time market would have caused, the ISO would not then conform the DAM limits. On the other hand, if the congestion repeatedly appears in DAM, the operating engineers evaluate the validity of this information and may recommend conforming the constraints or unenforce constraints, as appropriate, to better align the DAM results with actual conditions.

- Each constraint is unique and may require different margins when conforming in the DAM based on experiences in the real-time.

- The adequate level of adjustment in the DAM is based on the measureable or predictable difference between actual flows (from telemetry) in the real-time and DAM estimated flows. Review of historical and DAM flow differences inform this process and impact the degree to which the limits are conformed.

- Whether to conform any particular limit is based in part on the conditions leading to flow differences and their interplay with reserves or regulation management and the level of scheduled intermittent resources.

5. Constraints & Contingency Lists

Determine how the ISO can provide (1) the list of enforced and unenforced constraints, and (2) the list of active contingencies.

Currently, the ISO provides a complete list of enforced and unenforced constraints and contingencies in the data it provides under non-disclosure agreement in the Congestion Revenue Rights FNM (CRR FNM). However, because the CRR FNM is released on a timetable to support the monthly and annual CRR release processes, the information regarding transmission constraints and contingencies available in the CRR FNM is not always fully consistent with the enforced and unforced constraints or active contingencies in the DAM or RTM in actual operation.

In this exercise, the ISO seeks to explore more fully the data required and the format, granularity and frequency of feasible data provision by the ISO. These factors are important because they will determine whether, how and when the ISO can provide any additional visibility to these elements. The ISO has not yet conducted a feasibility assessment regarding potential data release approaches given that the full scope of parameters have not been identified. Therefore, any proposed information discussed below is for the purpose of exploring market participants' preferences regarding these parameters, which the ISO can then use as the basis for assessing what may or may not be feasible within the time frame this data is needed. We ask that

stakeholders keep this in mind as they fashion their requests and understand that there will likely be tradeoffs between the volume and complexity of a data release approach versus the time and difficulty involved in creating the systems to provide the desired data.

The CRR FNM data files contain a list of constraints and contingencies for the CAISO Balancing Authority area and the CAISO Controlled Grid, where the latter includes transmission elements outside the ISO Authority Area. Of the ten or so files provided in the CRR data package, several are briefly described here:

1. PTI Raw Data File contains a complete list of network branches in the FNM base case.

2. Monitored Facility data file (*MPDATA_MonFac_.xls)*, starting with DB41, contains the CRR thermal branch limits (normal and emergency). Prior to DB41, the file included both a list of network branch constraints that are enforced, as well as a complete list of enforce and unenforced flowgate constraints.

3. Interface Definitions and Limits files (*MPDATA_Interface_definitions.xls* and *MPDATA_Interface_limits.xls)* contain the list of corridor and nomogram constraints enforced. These are Branch group and Nomogram Constraint Definitions and Limits.

4. Contingency data file (*MPDATA_Contingency data file*.xls) contains the list of contingencies that is consistent with ISO Operating Procedure M-405; however, changes will occur between the CRR process and DAM/RTM due to planned outages or prolonged forced outages which require or identify constraints or contingencies based upon the modeled system.

5.1. List of Constraints

Stakeholders are seeking greater visibility into the actual constraints that are and are not enforced in the ISO markets. Some stakeholders contend that a lack of transparency regarding market processes prevents a clear understanding of market results. In an effort to explore the scope of data and information needed, we ask that while we explore the type of data that may be provided, stakeholders specify in their comments more precisely the specific content, format, and frequency of the desired data transmittal from the ISO to market participants. As already noted, the ISO currently provides a somewhat similar data package to market participants on a monthly basis. Stakeholders may want to express their preferences in terms modifications they would propose to the CRR data package. To be clear, we do not intend to limit stakeholders to the CRR data package, but simply offer the suggestion that it may be helpful to use that package as a reference for identifying additional needs.

To the extent possible, stakeholders are encouraged to draw on the practices of other ISOs in this area and are invited to share in their comments any knowledge they have of how the other ISOs/RTOs convey comprehensive lists of constraints and contingencies to their market participants, if at all. Describe the content, format, and frequency of these data transmissions. Clearly describe any desired modifications from these practices.

At this time, the ISO does not have a specific proposal in mind that addresses all data requirements that may be identified as it seeks first to determine more precisely what data is needed by market participants. The ISO asks that market participants keep in mind that as various forms of data are explored through this process, some may be more difficult to implement than others. As the ISO evaluates specific requests or proposals, it will endeavor to share anticipated implementation requirements so that it may guide the decisions regarding what type of and when additional visibility may be provided.

Two possible approaches to consider are:

Creation of a Daily All Constraints List. This would include a list of all enforced and unenforced constraints (All Constraints List) for a given day of the day ahead market. Recognizing that the CRR data cannot reflect changes in the enforcement status of constraints on a daily basis, the ISO seeks to explore whether the provision of the actual daily constraints list would be helpful. Currently, the ISO does not have the ability to simply provide this data and needs to explore the feasibility and implementation requirements of providing such information. This may depend on the level of granularity requested and frequency with which the data is provided. This information would be extracted directly from the inputs used for the specific day-ahead market. Therefore, it would provide the complete list of constraints and contingencies enforced or not enforced for the given market. It is not possible to provide such information for the real-time market because of the time granularity of the real-time market intervals (i.e., every five minutes). However, because such conditions do not vary significantly between the DAM and RTM, it is questionable whether such information would provide any incremental value. The all constraints list would be provided after the day-ahead market schedules are posted for each day.

Creation of a Default Constraint List and an Incremental Daily Change Report. This would be an alternative to the daily All Constraints List. A default list of enforced and unenforced constraints could be prepared for portal publication and would occur each time a new DB-XX is produced and implemented in the ISO markets, i.e., every six to eight weeks. This approach would also require that a daily incremental change list be prepared relative to the default list, which the ISO's initial thinking suggests could be administratively burdensome.

5.2. List of Contingencies

The ISO currently provides a list of contingencies for the CRR process in the CRR FNM data package. The data provided in the CRR FNM data package represents those contingencies that are normally enforced in the market contingency analysis and those that have associated operating procedures, but due to the static nature of the CRR FNM data set cannot provide information on changes to contingency enforcement status due to daily market conditions or the status of scheduled or forced outages. As events transpire or system conditions changes contingency analysis may determine or identify other limiting components. ISO operators are required to ensure system reliability and would take appropriate actions to enforce and or unenforce constraints that more accurately represent current system conditions.

Stakeholders are encouraged to address the same questions with respect to contingency information that were posed in the constraints section of this paper above.

Similar to the constraints list, the ISO seeks to explore whether a possible data set consisting of the a daily All Contingencies List that are active in any given market would be appropriate, as opposed to a Default Contingency List accompanied by daily incremental changes to the default list. The daily All Contingencies List would include all active and inactive contingencies for a given day or hour, similar in concept to the contingency file supplied in the CRR FNM data package. Similar to the All Constraints List, this would be provided after the day-ahead market closes and only for the day-ahead market.

5.3. Constraint and Contingency Documentation

In conjunction with either of the constraint and contingency approaches described above, some additional supporting information may be required to make the constraint and contingency lists useful to market participants. For example, although the CRR FNM data package does contain constraint and contingency information, there can be some name changes introduced in the market network model that are not consistent with the names used in the CRR FNM, and for which the ISO would need to provide a means to translate between the two. Stakeholders are encouraged to comment on constraint and contingency nomenclature, point out inconsistencies, and suggest improvements where applicable.

Identification of Nomograms: The CRR FNM data package contains transmission related nomograms but does not contain any generation nomogram information, nor does it contain the shorter-term Nomogram/ Branch ID names and definitions shown on OASIS under Prices > Nomogram/Branch Shadow Prices. This discrepancy reflects the more granular timeframe of the DAM/RTM. The ISO seeks feedback as to whether, in addition to the constraints and contingencies lists described above this information would also be necessary. Stakeholders should specify whether this is needed and with what frequency and in what format.

6. Information on Binding Constraint and Cause

A number of other ISOs provide data on monitored constraints, as well as the associated contingencies in the event that a constraint becomes binding under contingency conditions. In contrast, ISO provides the shadow price and identifies the binding constraint but does not provide the cause for a constraint was binding or a description of the associated contingency where applicable. The following is a brief presentation of market transmission constraint information provided by CAISO, MISO, NYISO, ISO-NE, and PJM.

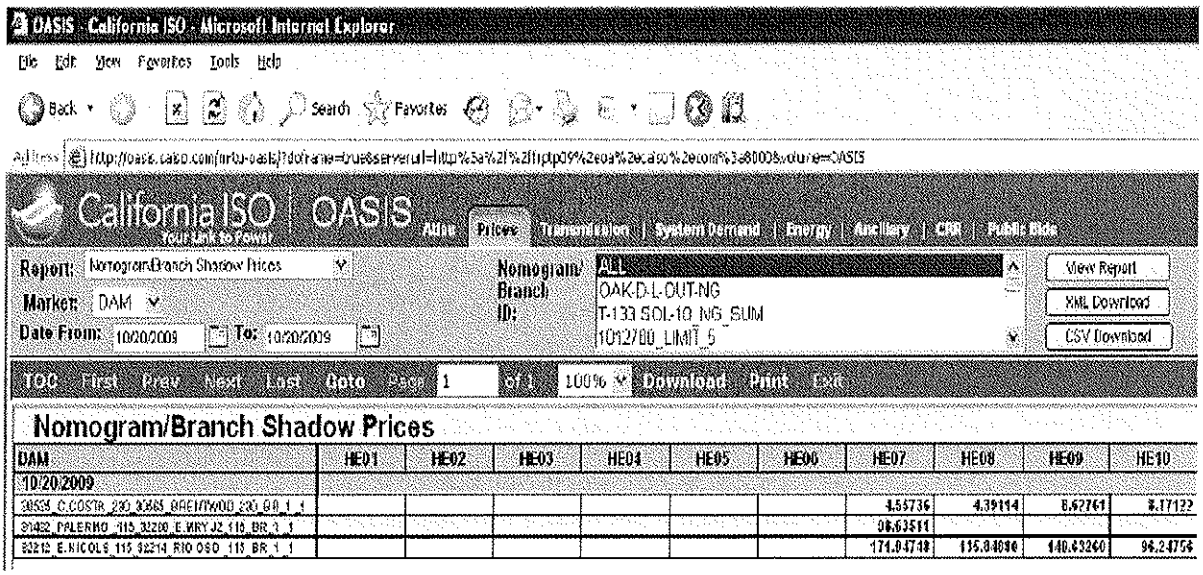
In order to provide information that is comparable to that provided by other ISOs/RTOs, the ISO would provide the cause for each binding constraint by identifying whether the constraint was binding under the base case (no outages or derates) or due to contingency conditions. If the constraint was binding due to a contingency, the ISO would identify the associated contingency; otherwise the binding constraint would be attributable to base case (non-contingency) conditions. Public access to this information would be provided through OASIS, similar to the binding constraints and shadow prices, but a revised format would be required to include a potential

contingency or base case description field for each hour or interval in which a constraint binds. An implementation timeline for the provision of this additional information has yet to be determined. However, stakeholders are encouraged to comment on this approach, suggest alternatives and/or state their preferred content and format for a binding constraint report.

6.1. PJM Contingency Data

Unlike the other ISOs, CAISO only reports monitored single line facilities, as shown in Table 1 below. Although hard to see in the screenshot, the constraint shown in the first line of the CAISO data from OASIS is "30525_C.COSTA _230_30565_BRENTWOD_230_BR_1 _1." This is a 230 kV line from Contra Costa to Brentwood, which was binding during several hours on 10/20/2009. Bus number (30525 and 30565) and some breaker (BR_1_1) information are provided. However, the reason for the constraint is not provided. We do not know what facility is associated with the Binding element – the contingency.

Table 1
CAISO Nomogram/Branch Shadow Prices



This can be compared to the PJM Day-Ahead Transmission Constraints information in Table 2 below. PJM provides an additional data field, "Contingency Facility" as shown in the far right column, and a description, "Day Ahead Congestion Event," in the middle column. The "Monitored Facility" is the constraint and the "Contingency Facility" is the facility associated with that binding element or constraint. The "Day Ahead Congestion Event" description informs the reader that the Cherry Valley-Silver Lake 345 kV line was out and affected the Monitored Facility with bus number 12204 at 138 kV.

Table 2
PJM Day-Ahead Transmission Constraints

Date	Start Hour	End Hour	Dura-tion	Day Ahead Congestion Event	Monitored Facility	Contingency Facility
10/20/2009	1	24	24	12204 138 KV 12204 2 L/O 345L15616 Cherry Valley-Silver Lake 345 kV Line	12204 138 KV 12204 2	345L15616 Cherry Valley-Silver Lake 345 kV Line
10/20/2009	1	7	7	66 E FRN345 KV 6607 L/O DUMONT WILTON CENTER 765KV LINE (L11215)	66 E FRN345 KV 6607	DUMONT WILTON CENTER 765KV LINE (L11215)
10/20/2009	24	24	1	66 E FRN345 KV 6607 L/O DUMONT WILTON CENTER 765KV LINE (L11215)	66 E FRN345 KV 6607	DUMONT WILTON CENTER 765KV LINE (L11215)
10/20/2009	6	6	1	83 GLIDD138 KV 15627 Z1 L/O 345L15616 Cherry Valley-Silver Lake 345 kV Line	83 GLIDD138 KV 15627 Z1	345L15616 Cherry Valley-Silver Lake 345 kV Line
10/20/2009	1	7	7	AEP-DOM L/O Pruntytown-Mt. Storm (510) 500 kV line	AEP-DOM	Pruntytown-Mt. Storm (510) 500 kV line

Source: http://www.pjm.com/markets-and-operations/energy/day-ahead.aspx

6.2. MISO Contingency Data

Similar to PJM, MISO

In the event of a contingency constraint, MISO's Binding Constraints Report Definitions provides a Contingency Description supplying the reason a constraint was needed. The index table below provides the field names used in the report. The Identifier (Row) "D" in Table 4 provides a brief description of the contingency. In the event the constraint is a non-contingency constraint, then no data will be present in the Contingency Description field.

Table 4 rows A through F correspond to six columns in Table 3, where Table 3 shows a portion of the MISO Binding Constraint Report for the Real-Time Market.

Table 3 - MISO Real Time Binding Constraints Report

MidwestISO
Energizing the Heartland

Binding Constraints Report - Real-Time Market
Market Date: 10/19/2009
Publish Date: 10/20/2009

Flowgate NERC ID	Constraint Name	Branch Name (Branch Type / From CA / To CA)	Contingency Description	Hour of Occurrence	Preliminary Shadow Price
522	EFrankfort_Crete345_to_Dumont_WiltonCenter765	EFRNKFRT 45L6607 1 (LN/CE/CE)	WILTON CENTER-DUMONT 765 (11215)	01	($4.69)
	MECALW34_IAFI_IAFIIA_FA11_1_1	IAFI IAFIIA_FA11_1 1 (LN/ALTW/ALTW)	FLOYD_EMERY161	01	($243.97)
510	Mareng_PValley138_to_CherryValley_SilverLake345	12204LIN 38L12204_2 1 (LN/CE/CE)	CHERRY VALLEY-SILVER LK 345R(15616	01	($892.38)
9160	ONT_NYIS	INTF STLAWRE1 SAUND_MOSES_1 A (LN/ONT/NYISO); STLAWRE1 SAUND_MOSES1_1 A (LN/ONT/NYISO); BECK2 BECK_BNIAG_3_1 A (LN/ONT/NYISO); BECK2 BECK_ANIAG_3_1 A (LN/ONT/NYISO); BECK2 BECK2GPACKAR_1 A (LN/ONT/NYISO); BECK2 BECK2GNIAG_3_1 A (LN/ONT/NYISO)		01	($66.58)
15597	Palisades_Argenta_2_to_Palisades_Roosevelt345	ARGENTA ARGENPALIS34_2 1 (LN/CONS/CONS)	PALISADES-ROOSEVELT 345 (346)	01	($66.66)
	ALEWP61_ARPIN_ARP_SGL_AR	ARPIN ARP_SGL AR (LN/ALTE/ALTE)	ARPIN-ROCKY RUN 345 (W-8) *	02	($33.60)

Source: http://www.midwestmarket.org/mkt_reports/rt_bc/20091020_rt_bc.pdf

Table 4 - MISO Binding Constraints Report Definitions

Identifier (#)	Field Name	Definition/Description/Calculation
A	Flowgate NERC ID	The NERC ID of the Flowgate that the constraint is occurring on. For the Real-Time market, the NERCID of the flowgate the constraint is occurring on may be blank.
B	Constraint Name	The name of the constraint.
C	Branch Name (BranchType/FromCA/ToCA)	The name of the facility, piece of equipment, or transformer (Branch) that is involved in the constraint along with the Branch Type, the From CA, and the To CA. Multiple Branch Names may be listed in this field.
D	Contingency Description	The reason a constraint was needed. If no data is present for the Contingency Description, then the Constraint is a non Contingency Constraint.
E	Hour of Occurrence	The hour ending during which the constraint was bound for the Real-Time Market.
F	Preliminary Shadow Price	The sum of all preliminary Ex-post Shadow Prices for each Real-Time 5 minute interval occurring in the hour divided by 12, the total number of 5 minute intervals in an hour.

6.3. NYISO Contingency Data

NYISO Day-Ahead Market limiting constraint and shadow price information is provided. A sample of posted information for April 15th Day-Ahead Market is shown in Table 5. Shadow prices are provided in the data field call "Constraint Cost ($)" and are available for both DAM and RTD. "Limiting Facility" is the monitored facility/limiting element. The "Contingency" column provides the contingency when there is a contingency constraint.

Table 5
NYISO Limiting Constraints and Shadow Prices

Time Stamp	Time Zone	Limiting Facility	Facility PTID	Contingency	Constraint Cost($)
10/20/2009 0:00	EDT	GREENWD 138 VERNON 138 1	25337	TWR:GOETHALS 22, 21,A2253	-0.02
10/20/2009 0:00	EDT	CENTRAL EAST - VC	23330	BASE CASE	8.27
10/20/2009 0:05	EDT	DUNWODIE 345 SHORE_RD 345 1	25091	SPRNBRK-EGRDNCTR-Y49	423.07
10/20/2009 0:05	EDT	GREENWD 138 VERNON 138 1	25337	TWR:GOETHALS 22, 21,A2253	-0.02
10/20/2009 0:10	EDT	DUNWODIE 345 SHORE_RD 345 1	25091	SPRNBRK-EGRDNCTR-Y49	51.48
10/20/2009 0:10	EDT	GREENWD 138 VERNON 138 1	25337	TWR:GOETHALS 22, 21,A2253	-0.02
10/20/2009 0:10	EDT	SPRNBRK 345 EGRDNCTR 345 1	25105	BASE CASE	23.77
10/20/2009 0:20	EDT	SPRNBRK 345 EGRDNCTR 345 1	25105	BASE CASE	11.59

Source: http://www.nyiso.com/public/market_data/power_grid_data/limiting_constraints.jsp

6.4. ISO-NE Contingency Data

ISO-NE provides binding constraint information here, http://www.iso-ne.com/markets/hst_rpts/hstRpts.do?category=Hourly#anchor2 Three types of constraint reports are provided: Day-Ahead Constraints, Preliminary Real-Time Constraints, and Final Real-Time Constraints in separate reports. Table 6 provides an example report showing the monitored facility/limiting element listed under "Constraint Name" and the contingency element listed under "Contingency Name".

Table 6
ISO-NE Day Ahead Binding Constraints

Day-Ahead Binding Constraints Report for 10/15/2009 Report generated Wed Oct 14 16:11:06 2009			
Local Date Date	Hour Ending HE	Constraint Name Name	Contingency Name Name
10/15/2009	1	Node_Highgate_Import	Generic Constraint
10/15/2009	8	REBEL_HL_66-2BHE_A_LN	Actual
10/15/2009	9	REBEL_HL66-2BHE A LN	Actual
10/15/2009	10	REBEL_HL_66-2BHE_A_LN	Actual
10/15/2009	11	REBEL_HL_66-2BHE_A_LN	Actual
10/15/2009	12	REBEL_HL66-2BHE A LN	Actual
10/15/2009	13	REBEL_HL66-2BHE A LN	Actual
10/15/2009	14	REBEL_HL_66-2BHE_A_LN	Actual
10/15/2009	15	REBEL_HL_66-2BHE_A_LN	Actual
10/15/2009	16	REBEL_HL_66-2BHE_A_LN	Actual
10/15/2009	17	REBEL_HL_66-2BHE_A_LN	Actual
10/15/2009	18	REBEL_HL_66-2BHE_A_LN	Actual
10/15/2009	19	REBEL_HL66-2BHE A LN	Actual
10/15/2009	20	REBEL_HL66-2BHE A LN	Actual
10/15/2009	21	REBEL_HL66-2BHE A LN	Actual
10/15/2009	22	REBEL_HL_66-2BHE_A_LN	Actual

7. Constraint Management Guidelines

What are our high level guidelines for our constraint management process and what detail should we include in the tariff.

Proposed high level guidelines on CAISO constraint management practices will be posted for stakeholder comment on or before December 3, 2009.

8. Glossary of Terms

- **Biasing**: The practice of adjusting values that are utilized as inputs in the market optimization process to augment the solution in terms of reliability, system security, and good business practices or in response to changes not accounted that are the result of software timing. This practice is generally referred in this document as Adjustments of Transmission Constraints.

- **Binding**: A level as a percentage or attributed value of a system operating limit at which the market software considers dispatch or redispatch of resource schedules to control the overall flow beyond a transmission gate or established cut plane (Transmission Corridor, Branch Group, Nomogram) which best describes system operating limits, engineering studies guide or interconnection reliability operating limit.

    - **MISO Tariff, First Revised Sheet No. 92**
      General Provisions, Definitions
      1.52 Binding Transmission Constraints: A transmission constraint that causes a change in the dispatch or commitment of one or more Electric Facilities to avoid exceeding, or to relieve, the constraint limit.

- **Congestion**: A characteristic of the transmission system produced by a binding Constraint to the optimum economic dispatch to meet Demand such that the LMP, exclusive of Marginal Cost of Losses at different Locations of the transmission system, is not equal."
  Source: CAISO Tariff Appendix A, Master Definitions Supplement, Substitute Third Revised Sheet No. 850.

- **Constraints**: Physical and operational limitations on the transfer of electrical power through transmission facilities. Source: CAISO Tariff Appendix A, Master Definitions Supplement, Substitute Third Revised Sheet No. 851.

    - **Unenforced** – a constraint is not permitted to redispatch resources or considered in the optimization dispatch solution even if the constraint's binding limit is reached or exceeded. Constraint does not exist in the market.

- **Enforced** – a selected constraint is considered and may require resource schedules based upon an optimized solution to be adjusted to within the constraints limits when the associated binding limit has been exceeded.

    - **Constraint Enforcement** - CAISO determines if a constraint is correct, and or if any constraint enforcement is necessary based on D+2 or D+3 studies. CAISO determines the constraint is unexplained and should be un-enforced for the market run and time allows for the DAM to be re-run, Un-enforce the element that is causing the constraint and re-run the applicable portion of market.

- **Contingency**: A potential Outage that is unplanned, viewed as possible or eventually probable, which is taken into account when considering approval of other requested Outages or while operating the CAISO Balancing Authority Area. Source: CAISO Tariff Appendix A, Master Definitions Supplement, Substitute Third Revised Sheet No. 851.

- **Contingency Management** - CAISO Operating Engineers will identify any contingency that should be enforced in both the Day Ahead and Real Time markets based on studies, outages and operating conditions. CAISO dispatchers may choose to enforce a contingency in real time based on real- time operating conditions.

- **Corridors** – All individual lines and transformers that can be used for constructing nomograms and all the operating limits for all the major paths in the form of straight MW values that can be constrained by thermal, voltage or stability limitations.

- **Flowgate – MISO Tariff, General Provisions, Definitions: 1.235 Flowgate:** A representative modeling of a facility or group of facilities that may act as a constraint to power transfer on the Bulk Electric System.

    - Predetermined set of constraints on the Transmission System that are expected to experience loading problems in real-time (PDF page 24). Flowgates are facilities or groups of facilities that may act as significant constraint points on the system. As such, they are typically used to analyze or monitor the effects of power flows on the bulk transmission grid (PDF page 1475).

      Source: MISO, Open Access Transmission, Energy and Operating Reserve Markets Tariff (ASM Tariff), Sheet 2304, PDF page 24,
      http://www.midwestmarket.org/publish/Document/1d44c3_11e1d03fcc5_-7cf50a48324a

- **Nomograms** – A set of operating or scheduling rules which are used to ensure that simultaneous operating limits are respected, in order to meet NERC and WECC reliability standards, including any requirements of the NRC. (ISO Tariff, Third Revised Sheet No. 905)

Attachment D

Straw Proposal

Data Release & Accessibility

Phase 1: Transmission Constraints

December 3, 2009

Data Release & Accessibility in ISO Markets

Table of Contents

1. Introduction

This California ISO straw proposal builds on the 11/5 issue paper and the 11/23 stakeholder comments[1] submitted in Phase 1 of the Data Release & Accessibility Initiative on Transmission Constraints.[2] The purpose of this straw proposal is to present a specific proposal for stakeholder review and comment in advance of the 12/10 onsite meeting at the ISO in Folsom, California.

The 12/10 onsite meeting is scheduled from 10:00 AM to 4:00 PM. Most of the meeting will be devoted to Phase 1 Transmission Constraint issues, while to last two hours will focus on Phase 2 Convergence Bidding Information Release.

The Data Release & Accessibility Initiative consists of three phases:

- Phase 1: Transmission Constraints (the topic of this straw proposal),
- Phase 2: Convergence Bidding Information Release (issue paper posted on 12/3), and
- Phase 3: Other types of market data to support well-functioning, competitive ISO spot markets, including Price Discovery and Outage Information. (issue paper expected to post on or before 12/31).

The focus of Phase 1 is on the development of guidelines and the provision of information to market participants regarding the ISO's constraint management practices. More specifically, the issue paper outlined the following three areas:

- **Constraint Enforcement Practices:** What additional information and visibility can be provided with respect to the ISO's transmission constraint enforcement practices to account for system conditions in managing the limits of the transmission system?

- **Constraint and Contingency Lists:** Determine how the ISO can provide the list of (1) enforced and unenforced constraints and (2) active contingencies.

- **Tariff Guidelines on Constraint Management:** Develop high level guidelines for the ISO's constraint management process to be included in the ISO tariff in compliance with FERC's *October 2 Order*.

---

[1] On 11/23, 20009, twelve (12) sets of comments were submitted by stakeholders on the 11/5 issue paper: Calpine, Citigroup-Barclays-RBS (Joint Parties), DC Energy, Dynegy, JP Morgan, Morgan Stanley, PG&E, Powerex, RRI, SCE, Shell, and WPTF. All stakeholder comments are available at http://www.caiso.com/244c/244cae3b46bb0.html

[2] Data Release & Accessibility Initiative, Phase 1 Transmission Constraints, http://www.caiso.com/244c/244cae3b46bb0.html

2. Process and Proposed Timetable

The first three milestones for Phase 1, as shown below, are complete. As noted in the issue paper:

> "... the timing for implementation of the data release developed in Phase 1 will be determined later in this process. Specific timelines for Phase 2 and 3 will be released with the issue papers for those phases. At this time the ISO anticipates completing the stakeholder processes for Phases 2 and 3 in the first quarter of 2010."

Phase 1 Timetable

Tentative Date	Milestone
November 5, 2009 - **DONE**	Publish Issue Paper
November 12, 2009 - **DONE**	Stakeholder Conference Call
November 23, 2009 - **DONE**	Due Date for Stakeholder Comments
December 3, 2009	**Straw Proposal:** Publish data release proposal and draft constraint management tariff language
December 10, 2009	On-Site Stakeholder Meeting
December 16, 2009	Stakeholder comments on data release proposal and draft tariff language
December 31, 2009	FERC Compliance Filing in ER09-1542-000

For submitting comments on Phase 1 of the Data Release & Accessibility Initiative the project mailbox is Phase1TC@caiso.com.

3. Constraint Enforcement Practices

Determine what additional information and visibility can be provided with respect to the ISO's transmission constraint enforcement practices to account for system conditions in managing the limits of the transmission system.

3.1. Changes in Constraint Management

Nearly all stakeholders requested that changes in how constraints are managed occur with advance market notice. Many stakeholders strongly support the decision to manage every possible aspect of the system in the IFM. However, market participants note that unnoticed changes in constraint management can create significant and unexpected price movements that do not seem to match current conditions.

ISO Proposal regarding Changes in Constraint Management:

With regard to advance notice, the constraint and contingency proposal described in Section 4 of this paper will result in increased transparency and notice. Some of the key provisions of this approach are described here:

1. A new Full Network Model (FNM) is dropped into production generally every 4 to 8 weeks. To the extent feasible, the ISO will issue a Market Notice ten (10) days before implementation of a new FNM Database in the market software.

2. If the list of changes is different when the model is deployed, an unlikely but possible event, to the extent feasible, the ISO will issue a Market Notice on the Trade Day the model goes into effect.

3. If once a Market Notice is provided and the deployment date changes, the ISO will provide a new Market Notice with the revised date. In some instances, the ISO has needed to model the deployment date for various reasons, including but not limited to, a change required in the model, a software issue, a new issue is raised in end-to-end testing or events on the real-time grid.

4. In some instances, primarily due to operating issues, the ISO may need to add a new constraint or contingency into the model in between FNM Database builds. To the extent possible, the ISO will notify participants in advance if additional changes will be made to the topology. These types of change are changes that are highly likely to become a permanent change in the next FNM Database build. The ISO will make every effort to provide participants with the ten days advance notice prior to deployment into production. However, in some instances the event that requires the new constraint or

contingency may not provide such lead time due to reliability issues. In the case where the ISO cannot provide ten days notice, the ISO will provide notice to the participants as soon as possible outlining the new constraint or contingency.

3.2. Management of Transmission Outages

A number of stakeholders raised outage information questions. SCE stated that the outage data currently posted on OASIS lacks sufficient information to accurately model outages for market participants. Releasing the PSSE raw files will save significant amount of time and effort for market participants to perform market analysis (SCE p.1). It is not possible to release daily PSSE[3] raw files because that would provide clear insight into market participant bid information. The PSSE raw file of the model is made available only as part of the CRR data release. The CRR data release is only for FNM Database builds and is available only with a time lag from actual deployment of the FNM into production. To obtain such data, participants must go through the CRR data release process.

The Joint Parties requested a list of transmission line, capacitor, reactor, breaker, and transformer outages, including facility name(s), line: location to and from; time: to and from; phase: submitted, accepted, in-progress, ended (p.2). The release of outage information will be addressed in the Phase 3 issue paper due out before year end 2009.

3.3. Network Terminology or Nomenclature

Several stakeholders requested that the ISO use more consistent and meaningful network terminology. DC Energy notes that, in the NYISO market, facilities are provided with a unique identifier that is integrated across both outage and constraint management systems. If a facility is down for outage work, the outage file indicates that that facility is not available; if the same facility has an enforced limit element in the published constraint file, that same number is used in the outage posting. DC Energy encourages the ISO to look for similar linkages and build similarly robust and integrated systems. DC Energy urges the ISO to develop consistent and intuitive formatting for the data that it releases (p.1).

RRI Energy makes a similar recommendation: Terminology used to describe the status of each element of the network should be defined and consistently used, and the list of interfaces, branch groups, nomograms, and any other elements and constraints should make clear the relationship between what's published regarding the Full Network Model, and what's published regarding market results (p.1).

Some stakeholders have asked about the nomenclature used for temporary nomograms. In its comments on the issue paper, Calpine mentioned a temporary nomogram: "... many constraints

[3] PSSE refers to the Siemens software product, **P**ower **S**ystem **S**imulator for **E**ngineering (PSSE), http://www.energy.siemens.com/hq/en/services/power-transmission-distribution/power-technologies-international/software-solutions/pss-e.htm

that have been actively monitored by CAISO for months, and even binding in the past, and currently posted on CAISO oasis are not in the FNM either, e.g., the "1012780_limit_5" nomogram as shown in the screenshot," (Calpine, p.3). The seven digit number, "1012780" corresponds to an outage logged in SLIC (Scheduling and Logging for ISO of California).

The ISO will explore the possibility of creating additional data mapping that would correlate the transmission facilities in the outage report with the constraints list. The ISO will strive to evolve the data and nomenclature to use consistent naming conventions and common data elements that could be eventually linked between outages information and other data. The process to coordinate the data will occur over a longer period of time and will likely occur in incremental steps.

4. Constraint & Contingency Lists

Determine how the ISO can provide (1) the list of enforced and unenforced constraints, and (2) the list of active contingencies.

Once this or a similar proposal is finalized, the ISO will conduct an implementation feasibility assessment, including determining business and software requirements, system impact, development, testing, and deployment, to determine the best way to automate the delivery of the constraint and contingency information.

4.1. List Approaches

As noted in the issue paper, stakeholders are seeking greater visibility into the actual constraints that are and are not enforced in ISO markets, as well as the list of active contingencies. Section 5.1 of the issue paper outlined two possible approaches for the provision of constraint information: (1) the Daily All Constraints List or (2) the Default Constraint List and an Incremental Daily Change Report, which are both described below. Under either option, the list would be applicable to the Day Ahead Market. At this time it is not possible to provide such information for the real-time market because of the time granularity of the real-time market intervals (i.e., every five minutes). As noted in the issue paper and reiterated here, between the two options below the ISO has a preference for the Daily All Constraints List as it would, among other things, be less administratively burdensome.

1. **Creation of a Daily All Constraints List**. This would include a list of all enforced and unenforced constraints (All Constraints List) for a given day of the Day Ahead Market. ... This information would be extracted directly from the inputs used for the specific day-ahead market. Therefore, it would provide the complete list of constraints and contingencies enforced or not enforced for the given market. ... The all constraints list would be provided after the day-ahead market schedules are posted for each day.

2. **Creation of a Default Constraint List and an Incremental Daily Change Report.** This would be an alternative to the daily All Constraints List. A default list of enforced and unenforced constraints could be prepared for portal publication and would occur each

time a new DB-XX is produced and implemented in the ISO markets, i.e., every six to eight weeks. This approach would also require that a daily incremental change list be prepared relative to the default list, which the ISO's initial thinking suggests could be administratively burdensome.

With regard to contingencies, Section 5.2 of the issue paper described an approach for the provision of contingency information, which is essentially the same in concept as the Daily All Constraints List described above.

In the 11/23 stakeholder comments on the issue paper, two parties (PG&E and SCE) expressed a preference for the Daily All Constraints List approach, while two parties said either approach would be acceptable (Dynegy and Powerex). J.P. Morgan preferred of the Default Constraint List and an Incremental Daily Change Report approach.

4.2. ISO Proposal: Creation of a Daily All Constraints List (Option #1)

The ISO proposes to create a Daily All Constraints List, which is described above under Option #1. The constraint and contingency list information is illustrated in Tables 1 through 4 of Attachment A to this Straw Proposal. This proposal is only for information associated with the Day Ahead Market.

As noted below, three of the four data tables will be published daily at the close of the Day Ahead Market. However, the Transmission Corridor Constraints data table will be made available with each model build.

Table 1: Flowgate Constraints
To Be Published Daily at Close of Market

Table 2: Transmission Corridor Constraints
To Be Made Available with Each Model Build

Table 3: Nomogram Constraints
To Be Published Daily at Close of Market

Table 4: List of Transmission Contingencies
To Be Published Daily at Close of Market

Table 1 provides the name of the flowgate. Type of flowgate: line, transformer, phase shifter holding the controlling flow, series device (capacity reactor), or transmission corridor. Enforcement status and competitive constraint flags (yes/no) are also provided.

Table 2 provides the name of the branch group. Equipment Type: line or transformer. Station name, voltage level, and equipment name are also provided.

Table 3 provides the nomogram name, the resource name, the coefficient, the corridor name, the flowgate, and the station name. Enforcement status and competitive constraint flags (yes/no) are also provided.

Table 4 provides the contingency title, enforcement status flag (yes/no), zone, Equipment Station, Equipment Voltage, PTI[4] From Bus Number, PTI From Bus kV, PTI To Bus Number, PTI To Bus kV, PTI Circuit ID, and Equipment Status.

5. Information on Binding Constraint and Cause

The issue paper presented binding constraints report information for other ISOs. A number of other ISOs provide data on monitored constraints, as well as the associated contingencies in the event that a constraint becomes binding under contingency conditions. In contrast, ISO provides the shadow price and identifies the binding constraint but does not provide the cause for a constraint that was binding or a description of the associated contingency where applicable.

Powerex strongly encouraged the CAISO to adopt best practices from other RTO/ISOs, and recommended an OASIS posting showing each binding constraint and whether it occurred for the base case or a specific defined contingency. Powerex stated that PJM provides good information in real-time, as constraints occur and then, at the end of the day, summarizes the information on all constraints that occurred (p.2). Dynegy would like the CAISO to provide the time, the duration, the congested facility, the facility whose contingency caused the congestion (if applicable) and the congestion shadow price consistent with the information provided by PJM, the MISO and NYISO (p.4). SCE supports the ISO's proposal to provide to market participants the information on the cause and the associated contingency when applicable for binding constraints as other ISOs currently release.

SCE proposes the format in Figure 1 for shadow prices of binding constraints. The format of the monitored description and contingency description can be the same as the current format for binding constraints. for example: 33252_POTRERO3_20.0_33204_POTRERO _115_XF_G3 (p.4):

Table 5: SCE Proposed Binding Constraint & Contingency Report Format

Constraint ID	Constraint Name	Monitored Description	Contingency ID	Contingency Description	HE1	HE2	HE3	...	HE24
999	Line 1 L/O Xfmr 4	Line 1	888	Xmfr 4			21		
1234	IPPDCADLN_BG	IPPDCADLN_BG		Base Case		5			

[4] PTI refers to Siemens Power Technologies International (Siemens PTI), http://www.energy.siemens.com/hq/en/services/power-transmission-distribution/power-technologies-international/

The ISO agrees that this type of information should be provided to market participants. At this time, the ISO is exploring how this data can be provided.

6. Constraint Management Guidelines

What are our high level guidelines for our constraint management process and what detail should we include in the tariff.

The ISO's proposed Transmission Constraint Management guidelines are shown in Attachment B to this Straw Proposal.

California ISO
Your Link to Power

Attachment A to the Straw Proposal:

Illustrative Constraint & Contingency Lists

Data Release & Accessibility

Phase 1: Transmission Constraints

December 3, 2009

Overview

The California ISO proposes to provide the following constraint and contingency list information in the formats illustrated in the following tables. This proposal is described in more detail in the 12/3/2009 Straw Proposal on Phase 2 Convergence Bidding Information Release, which is part of the Data Release & Accessibility Initiative.

Table 1: Flowgate Constraints
To Be Published Daily at Close of the Day Ahead Market

Table 2: Transmission Corridor Constraints
To Be Made Available with Each Model Build

Table 3: Nomogram Constraints
To Be Published Daily at Close of the Day Ahead Market

Table 4: List of Transmission Contingencies
To Be Published Daily at Close of the Day Ahead Market

Table 1
Flowgate Constraints
To Be Published Daily at Close of the Day Ahead Market

Name of Flowgate	Type	Enforce	Competitive
1XXX1_STATIONA _VL.X_ 1XXX2_STATIONB_VL.Y_BR_1 _1	LINE	Yes	Yes
1XXX3_STATIONC _VL.X_ 1XXX4_STATIOND_VL.Y_BR_2 _1	LINE	Yes	No
1XXX5_STATIONE _VL.X_ 1XXX6_STATIONF_VL.Y_BR_1 _1	LINE	No	Yes
1XXX7_STATIONG _VL.X_ 1XXX8_STATIONH_VL.Y_BR_2 _1	LINE	No	No
1XXX1_STATIONA _VL.X_ 1XX10_STATIONA _VLL_XF_1	XFMR	Yes	Yes
1XXX3_STATIONC _VL.X_ 1XX13_STATIONC _VLL_XF_1	XFMR	Yes	No
1XXX5_STATIONE _VL.X_ 1XX15_STATIONE _VLL_XF_1	XFMR	No	Yes
1XXX7_STATIONG _VL.X_ 1XX17_STATIONG _VLL_XF_1	XFMR	No	No
	PHSH	No	No

LEGEND	
LINE	Individual transmission line between two stations
XFMR	Transformer in station transforming from one voltage level to another
PSHH	Phase shafter holder controlling flow
SERD	Series device (capacity, reactor)
TCOR	Transmission Corridor

Table 1
Flowgate Constraints
To Be Published Daily at Close of the Day Ahead Market

Name of Flowgate	Type	Enforce	Competitive
11XX1_STATIONX _115_11XX2_STATIONX_115_PS_1			
99XX1_STA-STB_VLL_99XX2_STB-STA_VLL_BR_1 _1	SERD	Yes	No
MARKETSCHLIMITA_MSL	TCOR	Yes	Yes
MARKETSCHLIMITB_MSL	TCOR	Yes	No
MARKETSCHLIMITC_MSL	TCOR	No	Yes
MARKETSCHLIMITD_MSL	TCOR	No	No
BRANCHGRPA_BG	TCOR	Yes	Yes
BRANCHGRPB_BG	TCOR	Yes	No
BRANCHGRPC_BG	TCOR	No	Yes
BRANCHGRPD_BG	TCOR	No	No
BRANCHA_NG	TCOR	No	No

Table 2
Transmission Corridor Constraints
To Be Made Available with Each Model Build

Branch Group Name	Equipment Type	Station Name	Voltage Level	Equipment Name
MARKETSCHLIMITA_MSL	LINE	STATIONX	500	15XX1_STATIONX_500_ 1XX1_EXTSUBA_500_BR_1 _1
MARKETSCHLIMITA_MSL	LINE	STATIONX	500	15XX1_STATIONX_500_ 1XX1_EXTSUBA_500_BR_2 _1
MARKETSCHLIMITA_MSL	LINE	STATIONY	500	16XX2_STATIONY_500_2XXX1_EXTSUBB_500_BR_1 _1
MARKETSCHLIMITA_MSL	XFMR	EXTSUBB	500	2XXX2_EXTSUBB_500_ 2XXX12_EXTSUBB_230_XF_1
MARKETSCHLIMITB_MSL	LINE	NOWHERE	500	15XX1_NOWHERE_500_ 16XX1_NOWHWST_500_BR_1 _1
MARKETSCHLIMITB_MSL	LINE	NOWHERE	500	15XX1_NOWHERE_500_ 16XX1_NOWHWST_500_BR_2 _1
MARKETSCHLIMITB_MSL	LINE	SMWHERE	230	24XX1_SMWHERE _230_19XX1_SMWHEAST _230_BR_1 _1
MARKETSCHLIMITB_MSL	LINE	SMWHERE	230	24XX1_SMWHERE _230_19XX1_SMWHEAST _230_BR_2 _1
MARKETSCHLIMITC_MSL	LINE	EASTSUB	500	34XX1_EASTSUB_500_ 34X11_NOEASTSB_500_BR_1 _1
MARKETSCHLIMITC_MSL	LINE	EASTSUB	500	34XX1_EASTSUB_500_ 34X11_NOEASTSB_500_BR_2 _1
MARKETSCHLIMITC_MSL	XFMR	EASTSUB	230	34XX1_EASTSUB_500_ 3XX1_EASTSUB_230_XF_1
MARKETSCHLIMITD_MSL	LINE	RADIALSB	230	4X10_RADIALSB_500_ 4X21_EXTSUBC_500_BR_1 _1
BRANCHGRPA_BG	XFMR	INTERNSB	230	6XX4_INTERNSB_230_24XX7_INTERNSB_115_XF_1
BRANCHGRPA_BG	XFMR	INTERNSB	230	6XX4_INTERNSB_230_24XX7_INTERNSB_115_XF_2
BRANCHGRPA_BG	LINE	MTNSUB	230	18XX0_MTNSUB_230_ 6XX1_DSRTSB_230_BR_2 _1

Table 2
Transmission Corridor Constraints
To Be Made Available with Each Model Build

Branch Group Name	Equipment Type	Station Name	Voltage Level	Equipment Name
BRANCHGRPA_BG	LINE	MTNSUB	230	18XX0_MTNSUB_230_ 6XX1_DSRTSB_230_BR_2 _1
BRANCHGRPB_BG	LINE	OCEANSB	230	9XX1_OCEANSB _230_ 9XX2_NRBYSB _230_BR_1 _1
BRANCHGRPB_BG	LINE	SEASIDE	230	9XX3_SEASIDE _230_ 6XX6_LOSTSB_230_BR_1 _1
BRANCHGRPC_BG	LINE	VERTXSB	230	8XX8_VERTXSB_230_ 6XX6_GALAXYSB_230_BR_1 _1
BRANCHGRPC_BG	LINE	ZENITHSB	230	8XX7_ZENITHSB_230_ 9XX7_UVERSSB _230_BR_1_1
BRANCHGRPD_BG	LINE	SLINESB	230	19XX9_SLINESB_230_19XX8_SLINESB _60_XF_1
BRANCHA_NG	XFMR	SMLTNLD	115	31XX8_SMLTNLD_115_31XX7_SMLTNLD_60_XF_3
BRANCHA_NG	XFMR	SMLTNLD	115	31XX6_SMLTNLD_115_31XX5_SMLTNLD_230_XF_4

Table 3
Nomogram Constraints
To Be Published Daily at Close of the Day Ahead Market

Nomogram Name	Resource Name	Coefficient	Corridor Name	Flowgate	Station Name	Enforced	Competitive
T-XXX SOL-XX_NG_SUM		0.3	CORRIDOR1_NG1	3XXX2_ESTTNSB_115_32XX0_DNTNSB_115_BR_1 _1	ESTNSB	Yes	No
T-XXX SOL-XX_NG_SUM		1	CORRIDOR2_NG2	3XXX8_WSTNSB_115_32XX0_DNTNSB_115_BR_2 _1	WSTNSB	Yes	No
G-XXX	STEAM_7_UNIT 1	1				No	No
G-XXX	STEAM_7_UNIT 2	1				No	No
G-XXX	HYDRO_7_UNIT 3	1				No	No

Table 4
List of Transmission Contingencies
To Be Published Daily at Close of the Day Ahead Market

Title	Enforced	Zone	Equipment Station	Equipment Voltage	PTI From Bus Number	PTI From Bus kV	PTI To Bus Number	PTI To Bus kV	PTI Circuit ID	Equipment Status
mTC1-SUNNY-CLOUDY	Yes	TAC-1	SUNNYSB	115	32XX1	115	31XX1	115	' 1'	OP
mTC1-SUNNY-CLOUDY	Yes	TAC-1	SUNNYSB	115	32XX1	115	31XX1	115	2'	OP
mTC1-SUNNY-CLOUDY	Yes	TAC-1	CLOUDYSB	115	31XX1	115	32XX1	115	' 1'	OP
mTC1-SUNNY-CLOUDY	Yes	TAC-1	CLOUDYSB	115	31XX1	115	32XX1	115	2'	OP
mTC2-OUTAGE-SPECIAL	No	TAC-2	BRDGSB	115	39XX1	115	37XX1	115	' 1'	OP
mTC2-OUTAGE-SPECIAL	No	TAC-2	BRDGSB	60	39XX2	115	37XX2	115	' 1'	CL
mTC2-OUTAGE-SPECIAL	No	TAC-2	TRBWTR	115	37XX1	115	39XX1	115	' 1'	OP
mTC2-OUTAGE-SPECIAL	No	TAC-2	TRBWTR	50	37XX2	115	39XX2	115	' 1'	CL

California Independent System Operator Corporation

Draft Proposed tariff Language – Transmission Constraint Management

December 3, 2009

27.5.1 Network Models used in ~~Description of FNM for~~ CAISO Markets.

27.5.1 Full Network Model

The FNM is a representation of the WECC network model including the CAISO Balancing Authority Area that enables the CAISO to produce a Base Market Model that the CAISO then uses as the basis for formulating the individual market models used to conduct power flow analyses to ~~identify~~manage transmission Constraints for the optimization of each of the CAISO Markets.

27.5.1.1 Base Market Model used in the CAISO Markets.

Based on the FNM the CAISO creates the Base Market Model (BMM), which is used as the basis for formulating, as described in section 27.5.6, the individual market models used in each of the CAISO Markets to establish, enforce, and manage the transmission Constraints associated with network facilities. The Base Market Model is derived from the FNM by: 1) simplifying portions of the FNM that are external to the CAISO Balancing Authority Area; 2) introducing locations for modeling intertie schedules; and 3) introducing market resources that do not currently exist in the FNM due to their size and lack of visibility. In the Base Market Model, External Balancing Authority Areas and external transmission systems are modeled to the extent necessary to support the commercial requirements of the CAISO Markets. For those portions of the FNM that are external to the CAISO Balancing Authority Area, the Base Market Model may model the resistive component for accurate modeling of Transmission Losses, but accounts for losses in the external portions of the market model separately from Transmission Losses within the CAISO Balancing Authority Area. As a result the CAISO Markets do not allow the external losses to determine the Marginal Cost of Losses in the LMPs. For portions of the Base Market Model that are external to the CAISO Balancing Authority Area, the CAISO Markets only enforce network Constraints that reflect limitations of the

transmission facilities and Entitlements turned over to the Operational Control of the CAISO by a Participating Transmission Owner, or that affect Congestion Management within the CAISO Balancing Authority Area or on Interties. External connections are retained between Intertie branches within Transmission Interfaces. Certain external loops are modeled, which allows the CAISO to increase the accuracy of the Congestion Management process. Resources are modeled at the appropriate network Nodes. The pricing Location (PNode) of a Generating Unit generally coincides with the Node where the relevant revenue quality meter is connected or corrected, to reflect the point at which the Generating Units are connected to the CAISO Controlled Grid. The Dispatch, Schedule, and LMP of a Generating Unit refers to a PNode, but the Energy injection is modeled in the Base Market Model ~~FNM~~ for network analysis purposes at the corresponding Generating Unit's ~~(s) (at the~~ physical interconnection point~~)~~, taking into account any losses in the non-CAISO Controlled Grid ~~transmission network~~ leading to the point where Energy is delivered to ~~Demand~~CAISO Controlled Grid. Based on the BMM, ~~T~~the ~~FNM~~ market models used in each of the CAISO markets incorporate~~s~~ physical characteristics needed for determining Transmission Losses and model~~s~~ network Constraints within the CAISO Balancing Authority Area, which are then reflected in the Day-Ahead Schedules, AS Awards and RUC Awards, HASP Intertie Schedules, Dispatch Instructions and the LMPs resulting from each CAISO Markets Process. ~~In operating the CAISO Markets, the CAISO establishes, enforces, and manages the transmission limits and Constraints associated with network facilities modeled in the FNM, as further described in the Business Practice Manuals. For portions of the FNM that are external to the CAISO Balancing Authority Area, the CAISO may model the resistive component for accurate modeling of Transmission Losses, but accounts for losses in the external portions of the FNM separately from Transmission Losses within the CAISO Balancing Authority Area, and does not allow such losses to determine the Marginal Cost of Losses in the LMPs that apply to the CAISO Markets. For portions of the FNM that are external to the CAISO Balancing Authority Area, the CAISO only enforces network Constraints that reflect limitations of the transmission facilities and Entitlements turned over to the~~

~~Operational Control of the CAISO by a Participating TO, or that affect Congestion Management within the CAISO Balancing Authority Area or on Interties.~~ Further, in formulating the market models f~~F~~or the HASP, STUC, RTUC and the RTD processes, the Real-Time power flow parameters developed from the State Estimator are applied to the Base Market Model~~FNM~~.

New Definition:

Base Market Model:

A computer based model of the CAISO Controlled Grid that is derived from the Full Network Model as described in Section 27.5.2 and that, as described further in Section 27.5.6, is used as the basis for formulating the market models used in the operations of each of the CAISO Markets.

NEW Tariff Section:

27.5.6 Management and Enforcement of Constraints in the CAISO Markets

The CAISO operates the CAISO Markets through the use of a market software system that utilizes various information including the Base Market Model, the State Estimator, submitted Bids including Self-Schedules, Generated Bids, and transmission Constraints, including Nomograms and Contingencies transmission and generation Outages. The market model used in each of the CAISO Markets is derived from the most current Base Market Model available at that time. To create a more relevant time-specific network model for use in each of the CAISO Markets, the CAISO will adjust the Base Market Model to reflect Outages and derates that are known and applicable when the respective CAISO Market will operate, and to compensate for observed discrepancies between actual real-time power flows and flows calculated by the market software. Through this process the CAISO creates the market model to be used in each Day-Ahead Market, HASP, and each process of the Real-Time Market. The CAISO will manage the enforcement of transmission Constraints, including Nomograms and Contingencies, consistent with good utility practice, to ensure, to the extent possible, that the market model used in each market accurately reflects all the factors that contribute to actual Real-Time flows on the CAISO Controlled Grid and that the CAISO Market results

are better aligned with actual physical conditions on the CAISO Controlled Grid. In operating the CAISO Markets, the CAISO may take the following actions so that, to the extent possible, the CAISO Market solutions are feasible, accurate, and consistent with good utility practice:

1. The ISO may enforce, not enforce, or adjust transmission Constraints, including Nomograms and Contingencies, if the CAISO observes that the CAISO Markets produce or may produce results that are inconsistent with observed or reasonably anticipated conditions or infeasible market solutions either because (a) the CAISO reasonably anticipates that the CAISO Market run will identify Congestion that is unlikely to materialize in Real-Time even if the transmission Constraint were to be ignored in all the markets leading to Real-Time, or (b) the CAISO reasonably anticipates that the CAISO Market will fail to identify Congestion that is likely to appear in the Real-Time.

2. The ISO may enforce or not enforce transmission Constraints, including Nomograms and Contingencies, if the CAISO has determined that non-enforcement or enforcement, respectively, of such Constraints may result in the unnecessary pre-commitment and scheduling of use-limited resources.

3. The CAISO will not enforce transmission Constraints, including Nomograms and Contingencies, if it has determined it lacks sufficient visibility to conditions on transmission facilities necessary to reliably ascertain Constraint flows required for a feasible, accurate and reliable market solution.

4. For the duration of a planned or unplanned Outage, the CAISO may create and apply alternative transmission Constraints, including Nomograms and Contingencies, that may add to or replace certain originally defined Constraints.

5. The CAISO may adjust transmission Constraints, including Nomograms and Contingencies, for the purpose of setting prudent operating margins consistent with

good utility practice to ensure reliable operation under anticipated conditions of unpredictable and uncontrollable flow volatility consistent with the requirements of Section 7.

To the extent that particular transmission Constraints, including Nomograms and Contingencies, are not enforced in the operations of the CAISO Markets, the CAISO will operate the CAISO Controlled Grid and manage any Congestion based on available information including the State Estimator solutions and available telemetry to Dispatch resources through Exceptional Dispatch to ensure the CAISO is operating the CAISO Controlled Grid consistent with the requirements of Section 7.

CERTIFICATE OF SERVICE

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

Dated at Washington, D.C. this 31st day of December, 2009.

Daniel Klein

Daniel Klein