ALSTON&BIRD LLP

The Atlantic Building
950 F Street, NW
Washington, DC 20004-1404

202-756-3300
Fax: 202-756-3333

Michael Kunselman Direct Dial: 202-756-3395 Email: Michael.Kunselman@Alston.com

November 3, 2008

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

**Re: California Independent System Operator Corporation**
**Docket Nos. ER06-615-___**
**and ER09-____- 000**
**MRTU Tariff Amendment to Adopt Price Cap and Floor**

Dear Secretary Bose:

Pursuant to Section 205 of the Federal Power Act ("FPA"),[1] 16 U.S.C. § 824d, and Section 35.13 of the regulations of the Federal Energy Regulatory Commission ("Commission"), 18 C.F.R. § 35.13 (2007), the California Independent System Operator Corporation ("CAISO") respectfully submits for filing an original and five copies of an amendment to the CAISO's Market Redesign and Technology Upgrade ("MRTU") Tariff. The CAISO submits this filing in order to adopt a price cap and price floor on MRTU market prices for Energy, Residual Unit Commitment ("RUC") capacity and Ancillary Services at MRTU *go live*. Distinct from the bid caps already incorporated into the MRTU Tariff, the price cap and price floor would place a limit on the settlement values of locational marginal prices ("LMPs"), RUC prices and Ancillary Services marginal prices ("ASMPs") in all of the MRTU markets. The proposed price cap and price floor, which will be set at $2,500/MWh and negative $2,500/MWh respectively, will provide a prudent and appropriate layer of protection for market participants against the most extreme price outcomes during the critical initial stages of MRTU operations.

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

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

## I. INTRODUCTION

The CAISO is proposing to adopt a price cap and price floor on MRTU market prices for Energy and Ancillary Services at MRTU *go-live*. Distinct from the *bid* caps already incorporated into the MRTU Tariff, these price caps would place a limit on the LMPs, RUC Prices, and ASMPs in all of the MRTU markets. The price cap ($2,500/MWh) and price floor (negative $2,500/MWh) are being proposed at this time to act as a "safety cap" to prevent potentially severe settlement impacts of extreme prices for Energy, RUC and Ancillary Services that could result from unanticipated and unusual circumstances as the CAISO transitions into MRTU. The CAISO has set the proposed cap and floor levels based on an examination of prices resulting from the MRTU market simulation and its investigations into the root causes of such prices. The CAISO believes that the proposed price cap and floor levels will not dampen economic price signals, while protecting against extreme market outcomes. Moreover, the CAISO will publish the original prices as calculated by the market software prior to applying the cap and floor, as well as any prices that are truncated by the cap or floor, so that the application of the cap and floor will be fully transparent.

In proposing this market protection mechanism, the CAISO emphasizes that the cap and floor will not be a substitute for thorough testing of the MRTU software and correction of any identified problems prior to MRTU *go-live*. If the CAISO finds that the performance of the MRTU software and systems during market simulation and pre-production is not acceptable, the CAISO will ensure that the identified issues are fully resolved and will not use the proposed price cap and price floor as a band-aid in order to maintain the target go-live date. Nor will the CAISO, after MRTU *go-live*, rely on the price cap and floor as a substitute for prompt and thorough investigation into the causes of all extreme prices and the development of appropriate remedies where warranted.

Although the CAISO is not at this time proposing a date-certain for expiration of the price cap and floor, the CAISO commits to re-assess the level of and overall need for the price cap and floor in conjunction with a stakeholder process during the first year of MRTU operation. In addition, the CAISO commits to providing an assessment of the operation of the price cap and floor in the quarterly market performance reports that the CAISO has been directed to file under MRTU. That will enable the CAISO, the Commission and market participants to evaluate the functioning of the price cap on a regular basis and assess what measures are appropriate on a longer-term basis.

## II. DISCUSSION OF NEED FOR PRICE CAP AND FLOOR

### A. Price Caps and Floors are Necessary in Transitioning to MRTU Because Bid Caps Alone Are not Sufficient to Limit Excessive Prices that May Occur

Because bid caps do not always prevent extreme prices under certain operational conditions, the CAISO proposes to put a price cap and floor in place that will carefully balance two objectives. The first objective is to ensure that prices can rise and fall as a natural consequence of supply and demand under MRTU. This is accomplished by setting the cap high enough (and the floor low enough) so that prices can rise, sometimes significantly, in times of supply shortages or other operational constraints, thereby providing effective economic price signals. The second objective is to protect against the most extreme prices that may occur due to highly infrequent operational conditions, or due to factors that may only come into play when the MRTU markets have been launched and begin to result in financially binding prices and schedules.

The policy decision to implement a price cap and floor was driven by the results observed early on in the market simulation process. The market simulation has given the CAISO the opportunity to test the functionality of the MRTU market software and provided market participants the ability to familiarize themselves with the market and test various bidding and procurement strategies. In the context of the market simulation, the CAISO and its market participants have examined and discussed scenarios where real-time interval prices can rise to levels far in excess of the Energy bid cap due to the interactions and impacts of several factors. The CAISO has concluded that the proposed price caps and floor are necessary as the CAISO transitions into MRTU because the existing Energy bid caps and floors do not always limit LMPs beyond excessive amounts.

To put this issue in context, it is important to understand the relationship and distinction between a bid cap and a price cap, particularly in the context of the MRTU markets. A bid cap limits the prices that participants are allowed to submit with their bids (*i.e.* the market input). On the other hand, a price cap limits the LMPs that the CAISO uses for settlement purposes (*i.e.* the market output). The MRTU Tariff, as approved by the Commission, already includes an Energy bid cap at $500 per MWh, which will be increased to $750 after the first year and to $1000 after the second year of operation of the MRTU markets.[2] The Energy bid cap does not, however, set an absolute limit on the actual LMPs that may occur in the markets. LMPs higher than the bid cap (or below the negative $30 bid floor specified in the MRTU Tariff) can occur under MRTU because the cost of serving one additional MWh of demand at a particular location (which is the definition of a marginal energy price) can potentially be higher than the actual submitted bid prices. Therefore, despite the existence of bid caps, prices in excess of the bid caps may occur for various reasons.

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[2] *See* Section 39.6 of the MRTU Tariff.

During market simulation the CAISO and participants have observed and examined the root cause of several cases of what both CAISO and participants considered to be excessive pricing. It is important to note that the CAISO, in consultation with market participants, has purposefully created and tested extreme operational scenarios, such as binding transmission constraints and lack of adequate ramping capability. Under some of these scenarios, LMPs reached prices in excess of the cap level proposed here. Studying those outcomes, the CAISO was able to identify many instances that were caused by software issues and have resolved those particular issues. However, it is still possible that under very extreme operational circumstances, prices could exceed $2,500 per MWh.

For example, when there are binding transmission constraints in the load areas, and the resource whose bid is accepted to relieve that constraint is distant from and not very effective in resolving the constraint from a power flow standpoint, prices have been seen to increase substantially. In such cases, it may take many megawatts of energy from that less effective resource, perhaps at a price up to $500 per MWh, to relieve one megawatt of overload on the constraint. As a result, the LMP on the constraint would be a multiple of the accepted energy bid price from that distant resource and could thereby drive energy LMPs in the area significantly above the energy bid cap. Thus, the bid cap, which is an important feature for limiting the ability of market participants to trigger high prices through their bidding behavior, does not in and of itself limit the impact of transmission congestion and supply conditions which can play a significant role in setting prices.

Similarly, prices well above the bid cap can result when, in association with a congested transmission constraint, the price-setting bid is for demand rather than supply. During market simulation, the CAISO has observed in the Humboldt area a load pocket that contains some internal supply resources where very ineffective load aggregation load point ("LAP") load bids have set the price at levels in excess of $4,500/MWh. If these prices went to settlement they would have resulted in all the generation within the Humboldt area being paid the extremely high price of $4,500/MWh even though the resources were either self-scheduled (*i.e.* price-taker quantity bids with no associated prices), or bids significantly below $4500. Such a windfall scenario is not consistent with the expectations the operators of these resources may reasonably have had nor does it reflect the economics at this particular location. While one could argue that there would probably be little impact to the loads being settled at the resulting LAP price, it is possible that these extreme LMPs in the Humboldt area could cause the PG&E LAP price to be a good deal greater than the other LAP prices.

A third example, in this case one involving extreme negative prices, was observed on the transmission system in the area of the Blythe and Eagle Mountain nodes. In this case, a price of -$3,200/MWh was encountered because of the need to cut self-scheduled ETC imports at Blythe in order relieve the constraint between Blythe and Eagle Mountain, so as to serve load that is part of a Default LAP which straddles the constraint.

Another area of concern observed in the market simulations, which occurs in both the IFM and real-time pre-dispatch, is where energy prices reflect the opportunity cost of providing energy instead of ancillary services, or the opportunity cost of using energy limited resources with binding daily energy limits. High energy prices can also be set by inter-temporal opportunity costs on ramp-constrained units in the IFM, the real-time unit commitment ("RTUC") and the real-time dispatch ("RTD"). For example, in one RTD case, prices were extremely high in one 5-minute interval then low in the following four intervals. This was found to be caused by the fact that one unit was ramp-constrained in the downward direction throughout the first three low-priced intervals, so when dispatched up an additional megawatt to provide energy in the high priced interval, its output remained one megawatt higher in each of the next three intervals even though it would not have been dispatched economically to that level in those intervals. As a result the resource's opportunity cost in the high priced interval reflected its losses in the following three periods, and this high opportunity cost set the incremental cost of meeting load at some locations during the high-priced interval.

Although the CAISO's analyses indicate that the probability that these conditions will arise is very small, particularly in the IFM,[3] the CAISO believes that putting in place a reasonable price cap and floor as a 'damage control" financial settlement mechanism will protect market participants against the unreasonable impacts of any extreme prices that might result from such conditions. In addition, this will enable the CAISO and its stakeholders to study any such price increases and determine whether the prices were caused by something other than the forces of supply and demand, or any software issues that did not reveal themselves in the course of the CAISO's market simulation. In an opinion issued on October 6, 2008, the CAISO's Market Surveillance Committee recognized these concerns and agreed that it would be appropriate to implement a price cap and price floor at MRTU *go-live* to guard against extreme prices, stating that:

> Particularly for the HASP and RTM there are many factors which can lead to LMPs that are many multiples of the offer cap. In general, it will take time and effort to determine whether an extreme price was due to an imperfection in the market design, the exercise of significant unilateral market power, or simply the accurate pricing of multiple binding transmission and operating constraints that represent real physical restrictions. For this reason, we support the ISO setting a damage control

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[3] The possibility that these conditions will arise in the real-time market is greater than in the IFM. Because the RTD determines the dispatches and prices for the upcoming interval by optimizing over a multi-interval time horizon, inter-temporal constraints that affect the dispatch and pricing results in subsequent intervals can have potentially significant impacts on the first interval prices. Such effects have been most notable in Market Simulation when there are tight supply conditions interacting with resource ramping constraints.

maximum and minimum price that is linked to the value of the offer cap and floor during the initial year operation of MRTU.[4]

In developing this proposal, the CAISO considered several other changes to the market optimization to minimize the chance that prices in excess of the cap level would be realized, including using single-interval optimization for the real-time pricing run, relaxing ramping constraints in the RTD, or adopting bidding rules for bidding ramp rates that limits the possibility for resources to exacerbate ramping constraint impacts through their bidding behavior. The CAISO decided that the best option was to monitor instances of extreme prices during the first year with the protection of a $2500 settlement price cap because: (a) it would address all extreme price situations, not just those that the CAISO could identify in advance (b) it would not constrain economic market outcomes under all but the extreme conditions, and (c) it would avoid the need to make significant changes to the market optimization this late in the market simulation process.

### B. The Level of the Price Cap and Price Floor is Reasonable and Will Not Dampen Price Signals

An important feature of the proposed price cap and floor is that they set at a level sufficient to protect against only the most extreme prices without unduly constraining the market's ability to send the appropriate long-run price signals. A key feature of an LMP market is its ability to send locational price signals to attract the needed investment in generation and transmission at the appropriate locations. The price cap and floor proposed here will not interfere with that goal for several reasons.

First, the $2,500 level of the price cap and floor leaves a significant amount of room for prices to rise (or fall, in the case of decremental prices) in cases of operational constraints, supply shortages, or high demand during the market's initial operations. The CAISO decided on the $2,500 value for the cap because the CAISO's analysis of test cases and Market Simulation results to date indicate that $2,500 and negative $2,500 for the price cap would be triggered only under extreme system conditions. As demonstrated through market simulation more than 99% of the nodal prices in the IFM and 99 % of the prices in the Real-Time Market have fallen within the $2500/MWh cap and floor range. Further more nearly 100% of the LAP prices in the IFM and 99% of the LAP prices in the Real-Time Market have fallen within the $2500 cap and floor range. In addition, in the primary parameter tuning test case that has been used for sensitivity analysis of the IFM parameters, the highest observed LMPs were in the range of $2,200 per MWh, except under highly exaggerated grid conditions that were specifically contrived to cause curtailments of different self-schedule types, or under circumstances caused by software anomalies. Under these circumstances, a $2500 price cap is just and reasonable; it will protect against extreme prices without unduly constraining price signals.

Second, the price cap and floor will be implemented only at the settlement phase, and the CAISO will post all pre-cap LMPs on its website. Therefore, all instances of

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[4] The MSC's comments are included with this filing as Attachment D.

prices rising above $2,500/MWh or below -$2,500/MWh will be observed by market participants along with associated price signals. This will facilitate further evaluation of these prices and the circumstances giving rise to them.

Third, upon MRTU *go-live*, the CAISO will be analyzing the impact of the price cap and floor on an ongoing basis, and will propose appropriate adjustments to the cap and floor if necessary. Moreover, the CAISO commits to re-assess both the level of the proposed cap as well as the need for the cap as part of a stakeholder process conducted during the first year of MRTU. This will ensure that market prices that exceed the cap level for valid economic reasons will be realized. Due to the long-run nature of investments in generation and transmission, the CAISO is confident that robust long-run locational price signals will be created under MRTU. In particular, the CAISO commits to providing an assessment of the operation of the price cap and floor in the quarterly market performance reports that the CAISO has been directed to file under MRTU. This will enable the CAISO, the Commission and market participants to evaluate the functioning of the price cap on a regular basis and assess what measures are appropriate on a longer-term basis.

Finally, because the relative volume of MRTU transactions is expected to be much greater in the IFM, where extreme prices are expected to be far less frequent, the volume of transactions to which the price cap would apply is expected to be very small.

### C. Implementation of the Proposed Price Cap/Floor

The CAISO intends to apply the proposed price cap and floor through the price correction mechanism that allows the CAISO to correct prices after the market optimizations have run. Therefore, the price cap and floor will not affect price calculations in the market optimization software itself. Rather, the cap and floor will be applied subsequent to the market runs, after the CAISO has evaluated the prices and identified which prices exceed the cap and floor, but before the prices are transmitted to the settlement process. To ensure transparency of the use of the price cap and floor, the CAISO will publish all uncapped prices as calculated by the market optimizations in conjunction with the normal publication of market results, and will later report any of the capped prices to be used for settlement, pursuant to the price correction provisions already in the tariff in Section 35.6, through which the CAISO is already obligated to report on any corrected prices.

In applying the proposed price cap and floor to LMPs, the CAISO will adjust only the congestion components of any LMPs that are outside the cap/floor range, and will not adjust the system energy or loss components, so that the resulting modified LMPs equal the cap or floor value. To illustrate how this will work, consider the following simple two bus example.

Original Prices:

Bus 1: LMP = $400
SMEC = $500 (System Marginal Energy Cost, the energy component)
Marginal Loss component (MCL) = -$10
Congestion component (MCC) = -$90

Bus 2: LMP = $2600
SMEC= $500
Marginal Loss = +20
Congestion (MCC) = *+$2080*

Adjusted Prices for Price Cap (adjusted values indicated in bold font):

Bus 1: LMP = $400
SMEC=$500
Marginal Loss (MCL) = -$10
Congestion (MCC) = -$90

Bus 2: **LMP = $2500**
SMEC = $500
Marginal Loss (MCL) = +20
**Congestion (MCC) = +$1980**

This example illustrates that while the LMP and energy components can change, the price cap can be applied by simply adjusting the congestion (MCC) component of the LMP to achieve a total LMP of $2,500/MWh when the original LMP is greater than $2,500/MWh. Once the individual LMPs are capped the aggregated prices like LAP and Trading Hubs will be recalculated for settlement purposes based on the capped prices. The CAISO intends to begin applying the proposed price cap and floor to market simulation results so that market participants will have the opportunity to observe how they will work in practice.

### D. The Price Cap is Consistent with Mechanisms in Place in Other RTOs

The CAISO's proposal to adopt a price cap and price floor is consistent with similar mechanisms in place in other organized markets. Most recently, the Commission approved a price cap on energy and ancillary services prices in the new Midwest ISO co-optimized energy and ancillary services market.[5] Specifically, the Commission approved

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[5] *See Midwest ISO,* 122 FERC ¶ 61,172 (2008), *order on reh'g,* 123 FERC ¶ 61,297 (2008); *see also* Docket No. ER07-1372, Filing of the Midwest ISO, Testimony of Roy Jones (September 14, 2007) ("...a rule has been put in place that all prices will be capped at the VOLL.").

a $3,500/MWh hard cap on energy and ancillary services prices in both the day-ahead and real-time markets.[6]

Similarly, PJM has a price cap on Operating Reserves during a maximum generation emergency. The PJM tariff limits the compensation for operating reserves a seller can receive in an hour with an emergency. Specifically, Section 3.2.3(n) of the PJM tariff provides that "Notwithstanding any other provision in this paragraph, the total compensation to a Market Seller on any Operating Day that includes a MaxGen Condition shall not exceed $1,000/MWh during the Specified Hours...."

While PJM's price cap applies only to operating reserves in shortage conditions, the CAISO's proposed price cap is comparable in scope to the MISO price cap because: (1) they both function in tandem with lower *bid* cap levels; (2) they both serve as hard limits on settlement prices in both the day-ahead and real-time market; and (3) both the MISO and CAISO price caps apply uniformly to energy and ancillary services prices.

## III. PROPOSED MRTU TARIFF CHANGES

As noted above, the proposed price cap and floor will act as a limit on the settlement values for LMPs and ASMPs in all of the CAISO's markets. In order to implement the cap and floor, the CAISO is proposing to add new Section 27.1.3 to the MRTU Tariff, which specifies that for Settlements purposes, all LMPs, ASMPs or RUC Availability Prices for the IFM, RUC, HASP and Real-Time Market, as applicable, shall not exceed $2,500/MWh and shall not be less than negative $2,500/MWh. This provision will also provide that all prices actually produced by the software, regardless of the cap, will be posted on the CAISO website. Finally, this provision will state that the CAISO will open a stakeholder process during the first year of operations after the effective date of this provision to assess whether the cap and floor levels should be modified or eliminated entirely.

## IV. STAKEHOLDER PROCESS

The CAISO posted a white paper on September 19, 2008 that described the proposal for imposing a $2,500/MWh price cap and negative $2,500/MWh price floor on the MRTU markets.[7] On September 25, the ISO held a joint MSC/stakeholder meeting where the ISO presented the price cap issue and discussed its merits with the MSC and stakeholders. The CAISO also posted the proposed tariff language on its website on October 29

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[6] *See* Midwest ISO Electric Tariff, Third Revised Volume No. 1, Section 39.2.9(o)("Day-Ahead LMP and Day-Ahead MCP Price Cap. All Day-Ahead LMPs and Day-Ahead MCPs will be capped at the VOLL") and Sections 40.2.15(o) and 40.2.17(n) (containing the same provisions for ex ante and ex post Real Time LMPs, respectively).

[7] This whitepaper is included with this filing as Attachment E.

A number of parties expressed support for the proposal to implement a price cap and floor. For instance, two parties provided written comments supporting the proposed price cap and floor as a prudent protection for market participants from both known and unknown software issues and market flaws. One of these parties further expressed that the price cap and floor will allow the market to send strong price signals while at the same time providing a sanity check on prices by not relying blindly on the market software's optimization scheme.

Two parties expressed opposition to a price cap and floor, stating that the CAISO had not sufficiently documented or justified a need for a price cap and floor. Two other parties, while not opposing the price cap and floor proposal in concept, expressed concerns regarding the appropriate level of the bid floor.

The CAISO understands that there is concern regarding the adoption of a price cap and floor at this time and that more analysis can be conducted to evaluate the impact of a price cap and what the appropriate level should be. The CAISO has mitigated for these concerns by providing a commitment to evaluate the performance on the price cap/floor as the market transitions into MRTU and making any necessary changes both to the existence of the level of the price cap/floor pursuant to such investigation. As discussed above, the CAISO believes that the evidence from market simulation experience supports the adoption of the $2,500 cap and negative $2,500 floor at this time, and only with actual market experience will any further adjustment be appropriate.

## V. EFFECTIVE DATE

Consistent with a decision rendered by the CAISO Governing Board on October 29, 2008, the CAISO requests that the Commission approve the proposed changes in this Amendment to the MRTU Tariff effective as of January 31, 2009, *i.e.*, one day prior to the anticipated implementation date of MRTU, February 1, 2009. However, in the unanticipated event that MRTU is implemented more than 120 days after the submittal of this Amendment, the CAISO requests waiver, pursuant to Section 35.11 of the Commission's regulations (18 C.F.R. § 35.11), of Section 35.3 of the Commission's regulations (18 C.F.R. § 35.3), in order to permit the changes to the MRTU Tariff proposed herein to become effective as of that implementation date. Granting a waiver in this instance would be consistent with the similar waivers of Section 35.3 that the Commission has granted for other MRTU-related filings.

## VI. COMMUNICATIONS

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

Nancy Saracino
General Counsel
Anthony Ivancovich
Assistant General Counsel - Regulatory
Anna A. McKenna
Assistant General Counsel
The California Independent
System Operator Corporation
151 Blue Ravine Road
Folsom, CA 95630
Fax: (916) 608-7246
Tel: (916) 351-4400
E-mail: amckenna@caiso.com

Michael Kunselman
Christopher R. Jones
ALSTON & BIRD LLP
The Atlantic Building
950 F Street, NW
Washington, DC 20004
Tel: (202) 756-3300
Fax: (202) 756-3333
E-mail:
michael.kunselman@alston.com

## VII. SERVICE

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

## VIII. ATTACHMENTS

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

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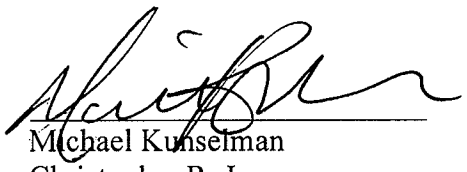
|---|---|
| Attachment A | Revised MRTU Tariff Sheets – Redline |
| Attachment B | Revised MRTU Tariff Sheets – Clean |
| Attachment C | Board Memo on Price Caps |
| Attachment D | MSC Comments on "Uneconomic Adjustment in MRTU Market Optimization," dated October 6, 2008 |
| Attachment E | CAISO Draft Final Proposal on Uneconomic Adjustments in MRTU Market Optimizations, dated September 19, 2008 |

## IX. CONCLUSION

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

Respectfully submitted,



Nancy Saracino
General Counsel
Anthony Ivancovich
Assistant General Counsel - Regulatory
Anna A. McKenna
Assistant General Counsel
The California Independent
System Operator Corporation
151 Blue Ravine Road
Folsom, CA 95630
Fax: (916) 608-7246
Tel: (916) 351-4400
E-mail: amckenna@caiso.com

Michael Kunselman
Christopher R. Jones
ALSTON & BIRD LLP
The Atlantic Building
950 F Street, NW
Washington, DC 20004
Tel: (202) 756-3300
Fax: (202) 756-3333
E-mail
chris.jones@alston.com

Attorneys for the California Independent System Operator Corporation

**Attachment A – Clean Sheets**
**Price Cap Amendment Filing**
**4th Replacement Tariff (MRTU)**
**November 3, 2008**

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.

**27.1.1.3 Marginal Cost of Congestion.**

The Marginal Cost of Congestion at a PNode reflects a linear combination of the Shadow Prices of all binding Constraints in the network, each multiplied by the corresponding Power Transfer Distribution Factor (PTDF). The Marginal Cost of Congestion may be positive or negative depending on whether a power injection (i.e., incremental Load increase) at that Location marginally increases or decreases Congestion.

**27.1.3 Maximum and Minimum CAISO Markets Prices**

For Settlements purposes, all LMPs, ASMPs and RUC Availability Prices for the IFM, RUC, HASP and Real-Time Market, as applicable, shall not exceed $2500 per MWh and shall not be less than negative $2500 per MWh. All prices produced by the CAISO Markets will be posted in accordance with the posting of market results as further provided in Section 6.5. Prices exceeding $2500 or less than negative $2500 will be modified for Settlements purposes pursuant to price correction process in Section 35 and the CAISO will post the results. The CAISO will conduct a stakeholder process during the first year of operation after the effective date of this provision to assess whether and how the maximum and minimum prices for Settlements should be modified or eliminated after the first twelve (12) months of operation.

**27.2 Load Aggregation Points (LAP).**

The CAISO shall create Load Aggregation Points and shall maintain Default LAPs at which all Demand shall Bid and be settled, except as provided in Sections 27.2.1 and 30.5.3.2.

**27.2.1 Metered Subsystems.**

The CAISO shall define specific MSS LAPs for each MSS. The MSS LAP shall be made up of the PNodes within the MSS that have Load served off of those Nodes. The MSS LAPs have unique Load Distribution Factors that reflect the distribution of the MSS Demand to the network Nodes within the MSS. These MSS LAPs are separate from the Default LAPs, and the Load Distribution Factors of the Default LAP do not reflect any MSS Load. As further provided in Sections 11.2.3 and 11.5, MSS Demand is settled either at the price at the Default LAP for MSS Operators that have selected gross Settlement or at the price at the applicable MSS LAP for MSS Operators that have selected net Settlement.

**27.2.2 Determination of LAP Prices.**

**Attachment B – Blacklines**

**Price Cap Amendment Filing**

**4th Replacement Tariff (MRTU)**

**November 3, 2008**

* * *

**27.1.3 Maximum and Minimum CAISO Markets Prices**

For Settlements purposes, all LMPs, ASMPs and RUC Availability Prices for the IFM, RUC, HASP and Real-Time Market, as applicable, shall not exceed $2500 per MWh and shall not be less than negative $2500 per MWh. All prices produced by the CAISO Markets will be posted in accordance with the posting of market results as further provided in Section 6.5. Prices exceeding $2500 or less than negative $2500 will be modified for Settlements purposes pursuant to price correction process in Section 35 and the CAISO will post the results. The CAISO will conduct a stakeholder process during the first year of operation after the effective date of this provision to assess whether and how the maximum and minimum prices for Settlements should be modified or eliminated after the first twelve (12) months of operation.

* * *

# Attachment C

California ISO
Your Link to Power

California Independent
System Operator Corporation

# Memorandum

To: ISO Board of Governors

From: Laura Manz, Vice President, Market and Infrastructure Development

Date: October 20, 2008

**Re:** ***Decision on MRTU Price Cap and Floor***

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***This memorandum requires Board action.***

## EXECUTIVE SUMMARY

Management proposes to adopt a general price cap for the MRTU markets at $2500 and a price floor at -$2500. Management is proposing this mechanism as a safety cap to prevent potential severe settlement impacts that could result from extreme prices for energy, ancillary services and residual unit commitment capacity, but to do so in a manner that does not suppress meaningful economic price signals, including price signals for demand response. The price cap would be put in place to guard against unknown issues and unusual circumstances that could arise due to changes in market participant behavior that result in unreasonable market outcomes. The proposed price cap and floor levels were determined by examining the prices resulting from the MRTU market simulations and set to a level that would allow the proper price signals to flow through to the market while protecting against extreme market outcomes.

These potentially high LMPs at particular locations do not set the price for the entire market but apply only in those specific locations where congestion or tight supply conditions exist. Also, in both the day-ahead and real-time markets, the prices paid by most buyers are averages of the LMPs over large areas. In the real-time market, where these conditions are more likely to arise, the prices paid by buyers are hourly averages of 12 successive five-minute interval prices, so high LMPs in specific intervals are muted in the hourly averages. As a result these real-time prices will often have a limited impact on hourly prices and even less impact on overall revenue requirements, which reflect prices over 8,760 hours per year and averaged across large geographic areas. Lastly, the volume of energy transactions in the real-time market is small compared to the day-ahead market. Despite their small impact on overall revenue requirements, however, these prices play a critically important role in sending the right operational price signals and in guiding transmission, generation and demand response investment.

In proposing this market protection mechanism, Management emphasizes that it will not be a substitute for thorough testing of the MRTU software and correction of any identified problems prior to MRTU go-live. If the ISO finds that the performance of the MRTU software and systems during market simulation and pre-production is not acceptable, the ISO will make sure that the identified issues are fully resolved and will not use the proposed price cap and price floor as a band-aid in order to maintain the target go-live date. Nor will the ISO, after go-live, rely on the price cap and floor as a substitute for prompt and thorough investigation of the causes of all extreme prices and the development of appropriate remedies where warranted.

Finally, if the proposed price cap is adopted, Management proposes to re-assess the need for this mechanism in conjunction with a stakeholder process during the first year of MRTU operation, to determine whether the price cap and floor should be modified or eliminated after the first year.

## MOTION

***Moved, that the ISO Board of Governors approves the proposed rule changes regarding the establishment of a price cap and floor for all energy, residual unit commitment capacity, and ancillary services in the ISO markets under the Market Redesign and Technology Upgrade, as detailed in the memorandum, dated October 20, 2008, and***

***Moved, that the ISO Board of Governors authorizes Management to make all of the necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the proposed price cap and floor for the ISO markets under the Market Redesign and Technology Upgrade.***

## ISSUE STATEMENT

Management is proposing a general price cap and price floor for all energy, residual unit commitment capacity and ancillary services in the MRTU markets. MRTU already includes a bid cap (initially set at $500 per MWh) that limits the values of key inputs to the market – the prices that participants are allowed to submit with their bids. In contrast, a price cap would limit the values of key outputs of the market – the locational market prices (LMPs) and ancillary service marginal prices (ASMPs) used for settlement. The energy bid cap does not set an absolute limit on the actual LMPs that may occur in the markets. LMPs higher than the bid cap (or more negative than the -$30 bid floor specified in the MRTU Tariff) can occur in the ISO transmission network because the cost of serving one additional MWh of demand at a particular location – which is the definition of a marginal energy price – can be higher than the actual submitted bid prices. This may occur, for example, when there are binding transmission constraints in the area of the load, and the resource whose bid is accepted to relieve that constraint is very distant from and not very effective in relieving the constraint. In such cases it may take many MWh of energy from the resource, perhaps at up to $500 per MWh, to relieve one MW of overload on the constraint. As a result the price on the constraint would be a multiple of the accepted energy bid price and could drive energy LMPs in the area above the energy bid cap. Early in the MRTU design process stakeholders discussed this possibility on a conceptual basis, and in the course of the current

stakeholder and market simulation processes, the ISO staff has presented and discussed several examples to illustrate this and similar scenarios that may cause high prices. Thus the bid cap, which is an important feature for limiting the ability of market participants to trigger high prices through their bidding behavior, does not in itself affect transmission congestion and supply conditions which play a separate role in setting prices.

In the MRTU market simulation, the ISO staff and market participants have examined and discussed similar scenarios where LMPs can rise above the energy bid cap due to the interactions and impacts of inter-temporal constraints, congestion constraints and tight supply conditions. These scenarios reflect conditions that have little probability of actually taking place, particularly in the integrated forward market. The probability that these inter-temporal constraints will arise in the real-time market is greater than in the integrated forward market because in the real-time market dispatches and prices for the upcoming intervals are optimized over a multi-interval time horizon, which can have significant impacts on the first interval prices. Such effects have been most notable in market simulation when there are tight supply conditions interacting with resource ramping constraints.

Management proposes an overall price cap and price floor to serve as a "safety cap," analogous to "circuit breaker" mechanisms that are used in some financial markets to limit the impact of extreme and unforeseen pricing results. In proposing this mechanism, Management believes that it will rarely be utilized but that it is still prudent simply because it is not possible for market simulation or other testing processes to investigate all possible circumstances that could lead to extreme results. It is important to emphasize that the occurrence of extreme prices does not necessarily indicate that the market software is performing incorrectly. Particularly in the real-time market, the interaction of multiple constraints with the need to instruct supply resources to different operating levels every five minutes to follow changes in load can cause high and volatile prices in particular areas of the grid that may persist for only a few five-minute intervals.

It is also important to recognize that in both the day-ahead and real-time markets, high LMPs at particular locations do not set the price for the entire market but apply only in those locations where congestion or tight supply conditions exist. In both the day-ahead and real-time markets, the prices paid by most buyers in the market are averages of the LMPs over large areas, which mitigate the impact of individual high LMPs. In addition, in the real-time market the prices paid by buyers are hourly averages of 12 successive five-minute interval prices, so any high LMPs in certain intervals are muted in the hourly averages. As a result these prices will often have a limited impact on hourly prices and even less impact on overall revenue requirements, which are spread across 8,760 hours per year and averaged across large geographic areas. In addition, the volume of energy transactions in real-time market, where these conditions may arise more frequently, is small compared to the day-ahead market. At the same time, despite their small impact on overall revenue requirements, these prices play a critically important role in sending the right operational price signals and in guiding transmission and generation investment.

Even though such prices may be the result of correct software performance and accurate modeling of constraints, market participant behavior can be expected to change in unpredictable ways which could produce unpredictable results once the markets transition from a market simulation environment where no financial settlement is at stake to a fully functional market where all transactions are financially binding.

Further tuning of the software may be necessary to adjust for unintended market outcomes produced by the MRTU software. Therefore, to guard against unintended market outcomes having an overly adverse impact on market participants, Management is proposing a price cap and price floor for the initial implementation of the MRTU software.

Specifically, Management proposes the following:

1. A symmetric price cap and price floor of +$2500 per MWh and -$2500 per MWh respectively;
2. The price cap and price floor would apply to both the day-ahead integrated forward market and the real-time market;
3. The price cap and price floor would apply to ancillary service marginal prices (ASMPs) and prices for residual unit commitment (RUC) capacity, as well as to LMPs for energy; and
4. Management will open a stakeholder process during the first year of operation of the MRTU markets to assess whether the price cap and floor should be modified or eliminated after the first 12 months.

Management believes that this mechanism will act as a safety cap to prevent severe settlement impacts that could result from extreme prices for energy and ancillary services, but at the same time is high enough to not suppress meaningful economic price signals. The proposed cap and floor levels are appropriate as market simulation results have shown that nearly all day-ahead market prices and the vast majority of real-time prices have been within the price cap range management is proposing.

This market protection mechanism is not in any way designed to be a substitute for thorough testing of the MRTU software and correction of any identified problems prior to or after MRTU *go-live*. If the ISO finds that the performance of the MRTU software and systems during market simulation and pre-production is not acceptable, the ISO will not *go-live* with MRTU until the identified issues are fully resolved. Furthermore, the ISO will not use the proposed price cap and price floor as a band-aid in order to maintain the target *go-live* date. Nor will the ISO, after *go-live*, rely on the price cap and floor as a substitute for prompt and thorough investigation of the causes of all extreme prices and the development of appropriate remedies where warranted. Management does not intend this market protection mechanism to reduce the importance of promptly and diligently investigating the causes of all extreme prices to determine whether they are legitimately due to the interaction of actual market conditions, or are the result of flaws or loopholes in the market rules or the software, or manipulative behavior by market participants. The ISO has established internal processes to conduct such investigations and identify corrective actions where needed.

## POSITIONS OF THE PARTIES

The ISO posted a white paper on September 19, 2008 that described the company's proposal for imposing a $2500 price cap and -$2500 price floor on the MRTU markets. On September 25th the ISO held a joint Market Surveillance Committee (MSC)/Stakeholder meeting where the ISO presented the price cap issue and discussed its merits with the MSC and stakeholders.

A number of stakeholders have expressed concern about extreme prices, particularly in the real-time market, that have occurred during market simulation. Often time these prices have been significantly above the MRTU bid cap and below the MRTU bid floor. The MSC recommended in their opinion adopted on October 6th that the ISO continue to analyze the cause and overall market impact of future extreme Market Simulation prices. The MSC stressed that it is important not to set the price cap and floor too low which would suppress valid economic signals of the value of energy, especially from flexible generation units, and limit the incentive to determine the underlying cause of these high prices. Several stakeholders at the September 25th meeting agreed with this sentiment in arguing against imposing a price cap. The MSC expressed that although they are sympathetic to this argument, they believe that it would be imprudent at the start of MRTU for the ISO not to have a damage control price cap and price floor set significantly above the ISO bid cap and bid floor.

Western and Pacific Gas and Electric (PG&E) provided written comments supporting the proposed price cap and floor as a prudent protection for market participants from both known and unknown software uses and market flaws. PG&E further expressed that the price cap allows the market to send strong price signals while at the same time provides a sanity check on prices by not relying blindly on the market software optimization.

Southern California Edison (SCE) commented that this is a major policy issue which should not be addressed in the uneconomic adjustments forum because it has major policy implications that need additional discussions with stakeholders. SCE believes that the caps may mask serious market defects and encourages the ISO to focus its efforts on ensuring that the model produces reasonable prices before implementing price caps.

Western Power Trading Forum (WPTF) expressed concern about the implementation of a price cap and floor. There concern is based on: (1) 2006 MSC and FERC deliberations which recognized that while bids were capped, nodal prices were not capped and would reflect the price of serving demand in constrained areas while being based on capped/mitigated bids. WPTF argues that the ISO's price cap proposal reverses this approach. (2) The rationale for the ISO's approach is based on limited information and is not well documented. It raises concerns about the reliability, stability and configuration of the MRTU software. (3) There is no evidence of market power or no other indication that constraining prices is appropriate. Dynegy also argued that changes to the bid cap structure are unsupported and premature. Finally, Citigroup & EPIC both expressed concerns about the appropriate bid floor.

While the ISO understands these concerns, Management believes that the proposed price cap and floor are at levels that will not alter the original bid cap design structure except under extreme circumstances. The price cap will contain severe settlements impacts during times of unintended extreme prices due to potential structural problems with the market software or underlying design.

## MANAGEMENT RECOMMENDATION

Management recommends that the Board approve the motion to adopt a $2500 price cap and -$2500 price floor for the MRTU markets as a just and reasonable measure to protect against potential extreme prices.

# Attachment D

**Comments on "Uneconomic Adjustment in the MRTU Market Optimizations"**

**by**
**Frank A. Wolak, Chairman**
**James Bushnell, Member**
**Benjamin F. Hobbs, Member**
**Market Surveillance Committee of the California ISO**

October 6, 2008

## 1. Introduction

This opinion comments on the California Independent System Operator's (ISO) proposal for making uneconomic adjustments in the MRTU market optimizations. In a previous opinion we expressed our support for the ISO's use of penalty parameters in these optimizations in order to honor priorities among self-schedules, existing transmission rights (ETCs), transmission ownership rights (TORs), ancillary services requirements, and the relaxation of the physical characteristics of the transmission network in order to obtain feasible day-ahead schedules and real-time operating levels.[1] Since receiving Board approval in July to make a tariff change to allow the use of uneconomic adjustments before exhausting all economic bids to avoid unreasonable scheduling results in the day-ahead and real-time markets under MRTU, the ISO has clarified a number of aspects of its uneconomic adjustment policies which we comment on here.

This opinion is based on the document, "CAISO Draft Final Proposal on Uneconomic Adjustments in the MRTU Market Optimizations," dated September 19, 2008. We have also participated in a several joint MSC/Stakeholder meetings where these issues were discussed. The most recent meeting on September 25, 2008 dealt the following six issues, which we consider in this opinion:

1. Setting real-time 5-minute interval prices based on the Energy Bid Cap when there is supply shortfall;
2. Using the Energy Bid Cap as the pricing run parameter on transmission constraints that are relaxed in the scheduling run;
3. Adopting an energy price cap and price floor to limit potentially extreme LMPs that can arise due to the interaction of multiple constraints;
4. Enforcing in the reliability procurement mechanism provided by Residual Unit Commitment (RUC) any Energy Limits submitted in the DAM for use-limited resources;
5. Providing financial "firmness" to holders of existing rights if their submitted, valid IFM self-schedules are unbalanced by Uneconomic Adjustment in the IFM; and
6. Maintaining the Uneconomic Adjustment parameter values in the BPMs, and the process whereby the parameter values may be revised.

[1] "Uneconomic Adjustment Policy for Market Redesign and Technology Upgrade (MRTU) for Locational Marginal Pricing Scheduling and Pricing Runs," June 30, 2008, available at http://www.caiso.com/1ff1/1ff1e451278c0.pdf

Although we support the ISO's proposal for the majority of these issues, we believe that several of the ISO's proposals could benefit from further stakeholder input. We note these issues below and provide some suggestions for improving the ISO's proposal.

**2. Real-Time Five-Minute Interval Prices When There is a Supply Shortfall**

We support the ISO's proposal to use the energy offer cap as the pricing parameter on the energy balance equation in the pricing run for the real-time market. This will ensure that the energy component of the real-time locational marginal prices will at least equal the offer cap when there is a supply shortfall in the real-time market. Allowing prices to rise to at least the offer cap rather than setting the market price equal to the last accepted economic offer will provide strong incentives for suppliers to offer to supply energy during periods when a supply shortfall is likely to occur. Under these circumstances suppliers will be eligible to earn prices in excess of the variable costs without submitting offer prices above the variable costs of their generation units.

A similar economic argument could be made for the case of pricing of ancillary services (A/S). However, the ISO is proposing that the penalty parameter (or "shadow price") for violating the AS requirements in the pricing run be set to zero on implementation of MRTU. If setting prices at least equal to the offer cap where there are supply shortfalls is viewed as acceptable for energy, we question why it is not viewed as appropriate for ancillary services. We understand that the degree to which A/S is procured locally and the extent of market power suppliers are able to exercise in the A/S markets are relevant issues that may imply different treatment of the market for A/S from that for energy

We note that this policy for A/S has ramifications for energy market prices because the two sets of products will be procured simultaneously in a co-optimized fashion in the day-ahead integrated forward market (IFM). This means that the scheduling and pricing software will take generation units with A/S offers out of the energy market if those same generation units can provide needed ancillary services at lower cost, and vice-versa. Thus market power exercised in the A/S markets could "spill over" into the energy market if it were indeed more severe in the A/S.

It appears to us that the current ISO proposal, with a zero penalty price for ancillary services procurement, does not solve this market power problem in the A/S markets and creates other potential problems. If there is in fact more market power exercised in the A/S market than in the energy market, this will still impact the energy market through higher bid prices for A/S, regardless of the parameter value. If the exercise of market power in the A/S market is not a serious concern, then the lack of a non-zero penalty parameter will depress A/S prices during periods of true scarcity of A/S when there is adequate energy to meet demand, which is a time when ancillary services prices should signal the need for A/S supply. In contrast, a mechanism that sets the pricing run penalty price for A/S at $150/MW would result in a $150/MW price of the A/S with a supply shortfall. It is also important to note that the ISO's zero penalty price approach could produce A/S prices significantly above the $150/MW penalty price without A/S

scarcity conditions, if a high offer price for A/S is accepted and the generation unit accepted to provide the A/S has a offer price for energy substantially lower than the market-clearing prices of energy which implies a substantial opportunity cost of supplying A/S.

In light of these concerns, we believe that a superior approach to this issue would be to address the market power concerns more directly through a lower offer cap for ancillary services of $150/MW, combined with a penalty parameter for procurement of A/S in the pricing run set at that same offer cap. If there is market power, it will be better mitigated by the lower offer cap and the pricing run penalty price at this offer cap. If there is true scarcity, firms will be able to earn prices above their offer caps without having to submit offers at the level of the offer cap.

### 3. Pricing Parameter on Transmission Constraints Relaxed During Scheduling Runs

Another element of the ISO's proposal is to set the pricing-run penalty parameter for transmission constraints at the offer-cap in the pricing run. As the ISO notes, however, this proposal is not without potentially adverse consequences to market efficiency. For example, a larger spread between the scheduling run penalty parameter and the pricing run penalty parameter (relative to previous ISO proposal) can lead to lower locational marginal prices (LMPs) during hours when transmission constraints are relaxed in the scheduling run, relative to hours when these constraints were not binding at their original limits or were relieved economically without triggering constraint relaxation.

This type of seemingly perverse outcome stems from the employment of different penalty prices in the scheduling and pricing runs. As we noted in our previous opinion on these issues, the use of a separate scheduling and pricing run distorts the prices coming out of this dual process and masks the true marginal costs of the choice of scheduling run parameters. For this reason, if the ISO does adopt a relatively low pricing parameter on transmission constraints, we strongly urge the ISO to be prepared to raise this penalty price if these kinds of perverse market outcomes become a persistent reality.

### 4. Adopting an Energy Price Cap and Price Floor

A number of stakeholders have expressed concern about extremely high hour-ahead scheduling process (HASP) prices and real-time market (RTM) five-minute interval prices that have occurred with a non-trivial frequency during Market Simulation. These prices are many multiples above the MRTU offer cap and many multiples below the MRTU offer floor. The two principal explanations offered by the ISO for these extremely high and low prices are low ramp rates set by market participants on their generation units and the use of a multi-period look-ahead in the real-time pricing process, although we cannot rule out these extreme prices occurring because of demand fluctuations when all suppliers submit the maximum ramp rate possible for their generation units.

We recommend that the ISO continue to analyze the cause and overall market impact of future extreme Market Simulation prices, including the extent to which they can be traced to these two aspects of MRTU. Re-running a representative sample of cases from these future

price spikes with the ramp rates for all generation units reset to their maximum rate will allow an assessment of the extent to which the use of significantly lower ramp rates is causing these high prices. If feasible, the ISO should also experiment with various ways to simulate the elimination the multiple interval look-ahead in the real-time market to determine if this is causing extreme prices in the RTM, and if ramping constraints are binding in later intervals and truly imposing high (marginal) costs in the current five-minute pricing interval. The frequency of these extreme prices in the RTM during Market Simulation makes it imperative that the ISO determine if these two factors are the cause of future extreme prices before the start of MRTU.

We also recommend consideration of external restrictions on the range of ramps rates allowed to be offered into the market. We note that the current rules allow for a level of flexibility in setting ramp rates well beyond that seen in other ISO/RTO markets. Although the ISO currently limits ramp rate changes from one operating range to next operating range to be no more than a 10 to 1 ratio, we believe that serious consideration should be given to much tighter restrictions on ramp rate changes across operating ranges and on the set of feasible ramp rate levels, at least for a transition period. Units with significant ramping constraint considerations, such as combined cycle gas turbine (CCGT) units, could be given additional flexibility. However there is little reason to offer the level of flexibility needed by CCGT units to all market participants. A better understanding of the interaction of ramping constraints with the market simulation results would help in determining the importance of imposing additional restrictions.

This experience with Market Simulation points out an important consideration in moving forward with MRTU. Particularly for the HASP and RTM there are many factors which can lead to LMPs that are many multiples of the offer cap. In general, it will take time and effort to determine whether an extreme price was due to an imperfection in the market design, the exercise of significant unilateral market power, or simply the accurate pricing of multiple binding transmission and operating constraints that represent real physical restrictions. For this reason, we support the ISO setting a damage control maximum and minimum price that is linked to the value of the offer cap and floor during the initial year operation of MRTU. The magnitudes of the cap and floor should be adjusted upwards as the offer cap on the ISO's market is increased.

We believe that is important not to set these caps and floor too low and suppress valid economic signals of the value of energy, especially from flexible generation units, and limit the incentive to determine the underlying cause of these high prices. Several stakeholders at the September 25 meeting argued against imposing a price cap for precisely these reasons. Although we are sympathetic to this argument we believe that it would be imprudent at the start of MRTU for the ISO not to have a damage control price cap and price floor set at many times the ISO offer cap and offer floor.

However, it is important that this mechanism not be viewed as a substitute for thorough testing and understanding of the prices resulting from the market simulation process. If there are flaws in market software, market design, or new serious potential for the exercise of unilateral market power, a $2500 cap would not prevent serious cost consequences to rate-payers.

## 5. Energy Limitations in Residual Unit Commitment Market

We support the ISO's clarification to enforce energy limitations on generation units taken in the residual unit commitment (RUC) process. This proposal is consistent with the two major goals of implementing a LMP market: (1) obtaining feasible generation schedules, and (2) pricing all relevant operating constraints. If generation units are scheduled in the RUC process to operate longer than they are physically capable of operating, this would violate the first goal of implementing an LMP market. Ignoring these constraints in the pricing process violates the second rationale for an LMP-based market.

## 6. Providing Financial Firmness to Holders of Existing Transmission Rights

A major concern of holders of TORs and ETCs is whether the ISO's uneconomic adjustment policies would fully honor the scheduling priorities implied by these rights. The specific raised by ETC holders is that if ETC/TOR Custom Load Aggregation Point (CLAP) load is not scheduled using the same granularity as non-ETC loads, ETC/TOR scheduling priority could not be ensured for the load side of their self-schedules. This outcome occurs because the majority of load is scheduled at the Default Load Aggregation Points (DLAPs), which cover much larger geographic areas than the CLAPs and therefore would be much less effective in relieving a binding transmission constraint in the area of a CLAP load. This can result in larger day-ahead adjustments for CLAP load that use ETCs or TORs. In order for the ISO to honor the scheduling priorities of ETCs and TORs within the current MRTU design, one side of a day-ahead ETC or TOR schedule must sometimes be adjusted in the day-ahead integrated forward market (IFM) despite the fact that this imbalance is subsequently remedied in the HASP or RTM. The downside of this process is that it can subject the ETC or TOR holder to real-time congestion costs, under-scheduling penalties, and other charges for participating in the HASP or RTM.

The ISO proposes to mitigate the financial risks to ETC/TOR holders due to unbalanced IFM adjustments of submitted valid self-schedules. Specifically, the ISO's IFM can adjust one side of a balanced day-ahead self-schedule that uses an ETC or TOR. As noted above, in order to honor the scheduling priority of that ETC or TOR, the ISO will attempt to make room for the side of the transaction curtailed in the day-ahead market in the HASP or RTM. The ISO proposes to provide what it calls the "perfect hedge" treatment for both the day-ahead and subsequent HASP or RTM market participation by refunding any congestion charges in these markets that are borne by the ETC or TOR holder. The current ISO proposal does not contemplate refunding any under-scheduling penalties or other charges causes by the day-ahead curtailment and subsequent HASP or RTM market participation.

During the September 25 meeting representatives of ETC/TOR holders in the San Francisco Bay area presented a proposal to honor their scheduling priority. This proposal calls for scheduling and settling ETC/TOR CLAP loads using the DLAP load distribution factors (LDFs) rather than using the CLAP LDFs. This would make it more straightforward to use penalty parameters to enforce ETC/TOR scheduling priorities using consistent pricing run penalty parameters for ETC/TOR and DLAP load. Although there are many details of this

proposal that must be worked out, we believe that it is worthy of further consideration and discussion between stakeholders and the ISO because it appears to limit the need for the more complicated multiple market scheduling and pricing process implicit in the ISO proposal.

We also encourage the ISO to assess the risk of significant under-scheduling penalties to ETC or TOR holders as well as other costs unrelated to congestion that would arise if ETC/TOR schedules are cut in the IFM. If potentially significant, then mitigation of those risks through waiver of such penalties or similar measures should be considered. We understand the ISO is currently considering other solutions to deal with these problems. We support these efforts because ETC and TOR holders are exposed to other risks besides the real-time price under the current ISO proposal.

## 7. Maintaining Uneconomic Adjustment Parameters in Business Practices Manual

As stated in our previous opinion on the uneconomic adjustment process, we support giving the ISO considerable discretion to alert the values of the penalty parameters without resorting to a tariff change, particularly due the first year of MRTU. For the reasons cited in our previous opinion, we support the ISO proposal for putting the values of the penalty parameters in the business practices manuals and allow them to be changed quickly in response to the needs of the ISO system operators.

## 8. Concluding Comments

As discussed above, we generally support the ISO's proposals for addressing the issues in its uneconomic adjustment proposals. However, we believe there are three major areas worthy of further consideration. The first is the rationale for and level of the price cap on the ISO's real-time energy market. The second is our proposed imposition of a $150/MW value for the A/S offer cap as well as the pricing run penalty price for A/S balance equation. Third is the process the ISO will use to ensure full compliance with the terms of their ETC and TOR contracts.

# Attachment E

California ISO
Your Link to Power

California Independent
System Operator Corporation

# CAISO Draft Final Proposal on Uneconomic Adjustments in the MRTU Market Optimizations

**September 19, 2008**

**Department of Market and Product Development**

# Draft Final Proposal on Uneconomic Adjustments in the MRTU Market Optimizations

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# Draft Final Proposal on Uneconomic Adjustments in the MRTU Market Optimizations

## 1. Introduction

This paper provides the California Independent System Operator's (CAISO's) "draft final" proposals on several issues related to Uneconomic Adjustments in the Market Redesign and Technology Upgrade (MRTU) markets which have been under discussion with stakeholders for the past few months. The concept of "draft final" means that the proposals described herein reflect what CAISO staff believes to be the most effective and practical solutions to the outstanding issues and expects to present to its Board at the October Board meeting, but this does not preclude further modifications of the proposals if warranted after discussion at the September 25th joint CAISO stakeholder and Market Surveillance Committee meeting and any further comments submitted by stakeholders. Shortly after the October Board meeting, the CAISO intends to file Tariff changes at the Federal Energy Regulatory Commission (FERC) to implement the Board-approved proposals. In the late-October FERC filing the CAISO will also fulfill its outstanding compliance requirement regarding the load aggregation point (LAP) Demand Clearing provisions of the MRTU Tariff (Section 31.3.1.3).

It is important to understand that the proposals described herein do not represent the end of the entire effort referred to as "Parameter Tuning." As we have stated throughout, CAISO staff will continue to run and analyze test cases and examine Market Simulation results in the process toward identifying MRTU start-up values for all the Uneconomic Adjustment parameters. The CAISO intends to implement the start-up parameter values in the MRTU software at least 45 days before market go-live, so that all participants may conduct their pre-production efforts with the parameters configured as they will be at go-live. The CAISO will therefore conduct additional stakeholder discussions related to the parameter values after the October FERC filing.

This draft final proposal addresses the following topics:

1. Setting real-time 5-minute interval prices based on the Energy Bid Cap when there is supply shortfall;
2. Using the Energy Bid Cap as the pricing run parameter on transmission constraints that are relaxed in the scheduling run;
3. Adopting an energy price cap and price floor to limit potentially extreme LMPs that can arise due to the interaction of multiple constraints;
4. Enforcing in the reliability procurement mechanism provided by Residual Unit Commitment (RUC) any Energy Limits submitted in the DAM for use-limited resources;
5. Providing financial "firmness" to holders of existing rights if their submitted, valid IFM self-schedules are unbalanced by Uneconomic Adjustment in the IFM; and
6. Maintaining the Uneconomic Adjustment parameter values in the BPMs, and the process whereby the parameter values may be revised.

# 2. Proposed Process and Timetable

The following are the key dates and milestones remaining in the stakeholder process on Uneconomic Adjustments leading up to the late October FERC filing. These dates do not include any additional activities to discuss the further tuning of the parameter values, for which specific activities and dates will be provided at a later time.

F. 9/19 Publication of CAISO Draft Final Proposal

Th. 9/25 Joint Market Surveillance Committee (MSC) / CAISO stakeholder meeting

F. 10/3 Stakeholder written comments due

F. 10/17 Publication of final CAISO proposal with Board documents

Tu/W 10/28-29 CAISO Board meeting

F. 10/31 FERC filing

Additional dates for stakeholder review of draft tariff language for the FERC filing will be provided at a later time.

# 3. Discussion of CAISO Proposals

## 3.1. Setting real-time 5-minute interval prices based on the Energy Bid Cap when there is supply shortfall

At the July 30 joint MSC/CAISO stakeholder meeting we discussed how the MRTU Real-Time Dispatch (RTD) sets five-minute interval prices when there is a supply shortfall, i.e., when the CAISO load forecast cannot be met by available supply. In real time the load forecast is entered in the RTD as a set of fixed locational values – unlike demand in the Integrated Forward Market (IFM) which is submitted as economic bids and self-schedules which can be reduced to clear against offered supply. As a result, supply shortfall in the RTD results in relaxation of the energy balance constraint using a pre-set scheduling run parameter (currently set to $6500), and the resulting shortfall quantity is then sent to the pricing run and associated with a pricing run parameter (originally set to $1500) for the purpose of setting the RT interval prices. Following the July 30 discussion, CAISO staff agreed to consider alternative values for the pricing run parameter associated with relaxation of the energy balance constraint, to consider stakeholder comments on this topic, and then provide a recommendation.

CAISO considered three main options for how to set real-time five-minute interval prices when there is supply shortfall.

The three options considered were:

(a) Energy Bid Cap as pricing parameter on energy balance slack variable;

(b) Last accepted economic bid (last economic signal), which is obtained by setting $0 price on the energy balance slack variable;

(c) Something higher than Energy Bid Cap as pricing parameter on energy balance slack variable, such as the $1500 value originally proposed.

The CAISO proposes to adopt option (a), the Energy Bid Cap, for the following reasons.

First, using the Energy Bid Cap will result in pricing outcomes that remain fairly consistent irrespective of whether operators decide to utilize Contingency Only Reserves to supplement the real-time (RT) energy market under non-contingency conditions. The MRTU tariff provides that when there is supply shortfall in the RTD such that the 5-minute interval load forecast cannot be met, operators have discretion to utilize Contingency Only Operating Reserves to provide additional energy even if a contingency has not occurred, but with their energy offer prices set to the Energy Bid Cap. Because the use of these reserves is at operator discretion, the CAISO believes that using the Energy Bid Cap as the pricing parameter on the energy balance slack will minimize any discrepancies in RT prices that may reflect how the operators acted on this decision. If the operators decide to use the Contingency Only Reserves, then some of these reserves will be used at Bid Cap offer prices to meet the energy shortfall. If however, the operators decide not to use the Contingency Only Reserves, then RT prices could be significantly lower if there were no economic bids in the range of the Energy Bid Cap. In such cases, using the Energy Bid Cap as the pricing run parameter will have a comparable affect on prices.

Second, the CAISO proposal is most consistent with how energy is priced in the IFM when there is insufficient supply to serve self-scheduled demand. In that IFM situation, the tariff specifies that self-scheduled demand will be priced the Energy Bid Cap in the pricing run (corresponding to a range of values in the scheduling run to effect the various scheduling priorities specified for the IFM in tariff section 31.4).

It is important to understand, however, that setting the pricing run parameter to the Energy Bid Cap does not prevent prices from going above the Energy Bid Cap. CAISO has discussed examples in this stakeholder process and in the Market Simulation process that demonstrate how prices can exceed bid cap levels even with purely economic solutions, i.e., absent any Uneconomic Adjustments, for example due to the effects of transmission constraints.

Some additional considerations are presented in the following table.

| Option | Pro | Con |
|---|---|---|
| (a) Energy Bid Cap as pricing parameter | Consistent with IFM, where curtailment of self-scheduled load is priced at Bid Cap.<br>Consistent with tariff policy to utilize Contingency Only AS for energy with bids at Bid Cap when energy supply is short. | |
| (b) Last economic signal ($0 as pricing parameter) | Consistent with methodology for startup AS pricing (non-scarcity pricing) when there is AS supply shortage. | Since decision to use Contingency Only reserves to meet supply shortfall in RTD is at operator discretion, the price outcome would hinge on this operator decision. Prices could be artificially low if operators do not use CO reserves to meet shortfall. |
| (c) Higher than Energy Bid Cap (e.g., $1500) | Provides strongest price signal of energy scarcity. | Ability of demand to respond to RT scarcity price signals is very limited at present.<br>Broad opposition to any pricing parameters beyond Bid Cap based on expectation that CAISO would not administratively trigger |

| | | |
|---|---|---|
| | | "scarcity" prices above Bid Cap at startup. |

## 3.2. Using the Energy Bid Cap as the pricing run parameter on transmission constraints that are relaxed in the scheduling run

The July 23 CAISO proposal indicated a value of $1500 for the pricing run parameter to be used in association with internal transmission constraints (not inter-tie constraints) that are relaxed in the Day Ahead and Real Time markets. This value was adopted for consistency with Section 31.3.1.3 of the MRTU Tariff, which specified a level of three times the Energy Bid Cap to be used for setting prices when a transmission constraint is relaxed in the IFM to address a LAP Demand Clearing problem. As a result of discussions with stakeholders at the July 30 meeting, CAISO staff agreed to revisit this value and, in consideration of the comments submitted by stakeholders as well as the ongoing assessment of the analysis cases, respond to the recommendation to use the $500 Energy Bid Cap instead.

The CAISO now proposes that the $500 Energy Bid Cap apply to this pricing run parameter, in the RTPD and RTD, and possibly in the IFM as well. The proposal to adopt the Energy Bid Cap is based on the following considerations. First, the Energy Bid Cap is consistent with the commonly-held expectation, noted in the previous section, that CAISO would not set pricing parameter values in such a way as to trigger what might be construed as "scarcity prices" higher than the Energy Bid Cap. Second, in those unlikely cases where the last economic signal before relaxing the constraint is relatively low, say in the range of the Bid Cap, the pricing run parameter will not artificially inflate the shadow price of the constraint. This is explained more fully below.

The CAISO has some reservations about moving from the current $1500 value for this pricing parameter in the IFM to the Energy Bid Cap because the lower $500 Energy Bid Cap can have unintended consequences. For example, we have observed in the IFM that using a value lower than $1500 can cause LMPs to fall in the area of a constraint when the constraint is relaxed, thus sending price signals that do not reflect system operational needs and that exacerbate inconsistencies between scheduling and pricing. Test results show that with a greater difference between the transmission constraint penalty prices in the scheduling and pricing runs – i.e., $5000 and $500 respectively, versus $5000 and $1500 – the pricing run can produce LMPs that are lower during dispatch intervals when transmission constraints are relaxed, than in hours when the constraints are enforced at their original limits. In other words, prices should tend to rise as less effective economic bids must be used to relieve the constraint, and should remain at a comparable level when the constraint is relaxed, but the test results indicate the prices actually fall when the constraint is relaxed due to the ten-to-one difference between the scheduling and pricing run parameters. This may result in uplift payments when LMPs in the pricing run do not match bid prices that were used in the scheduling run, or incentives to deviate from the final IFM schedules.

The mention of the constraint shadow price above warrants some additional explanation. As stated in the previous section, it is equally important with regard to transmission constraints to understand that setting the pricing run parameter to the Energy Bid Cap does not prevent LMPs from going above the Energy Bid Cap, which can occur even if no transmission constraints are relaxed. In the case of internal transmission constraints, the $5000 scheduling run parameter will direct the market to accept economic bids at the Energy Bid Cap that are at least 10 percent effective on a congestion constraint before relaxing the constraint. This means that there could

be a shadow price on the constraint approaching $5000 before constraint relaxation occurs. If it turns out that the last economic signal before relaxing the constraint is higher than the pricing run parameter value of $500, then the pricing run will set the constraint shadow price at the last economic signal value, not at $500. The benefit of using $500 rather than $1500 for the pricing run parameter is that if the last economic signal is $500 or less, then the shadow price will be $500, whereas with a $1500 pricing parameter value the constraint shadow price will be $1500 whenever the last economic signal is $1500 or less.

Finally, it is important to point out that for a transmission constraint that is part of a network, having a shadow price that approaches the $5000 constraint relaxation parameter does not mean that there must be LMP differentials of that magnitude. The high shadow price on the constraint will affect LMPs in the neighborhood, but actual LMPs will not rise to the same level in a meshed network because the flows to and from any given pricing node will travel over multiple lines, and typically only a fraction of the flows to and from any node will be over the constrained line. CAISO will provide further explanation and examples to illustrate this at the September 25 meeting.

## 3.3. Adopting an energy price cap and price floor to limit potentially extreme LMPs that can arise due to the interaction of multiple constraints

In the context of Market Simulation, CAISO and the participants have examined and discussed scenarios where real-time interval prices can rise above the Energy Bid Cap due to the interactions and impacts of inter-temporal constraints, congestion constraints and tight supply conditions. Our analyses indicate, however, that the probability that these conditions will arise is very small, particularly in the integrated forward market.

The possibility that these conditions will arise in the real-time market is greater than in the IFM. Because the RTD determines the dispatches and prices for the upcoming interval by optimizing over a multi-interval time horizon, inter-temporal constraints that affect the dispatch and pricing results in subsequent intervals can have potentially significant impacts on the first interval prices. Such effects have been most notable in Market Simulation when there are tight supply conditions interacting with resource ramping constraints.[1]

In both the IFM and the RTM high LMPs at particular locations do not set the price for the entire market but apply only in those locations where congestion or tight supply conditions exist. In both the IFM and the RTM, the prices paid by most buyers in the market are averages of the LMPs over large areas, which mutes the impact of individual high LMPs. In addition, in the RTM the prices paid by buyers are hourly averages of 12 successive five-minute interval prices, so any high LMPs in certain intervals are muted in the hourly averages. As a result these prices will often have a small impact on hourly prices and even less impact on overall revenue requirements, which are spread across 8,760 hours per year and averaged across large geographic areas. In addition, the volume of energy transactions in real-time market, where these conditions may arise more frequently, is small compared to the day-ahead market. At the same time, despite their small impact on overall revenue requirements, these prices play a

[1] An example illustrating this phenomenon can be found on slides 10-18 of the presentation available at: http://www.caiso.com/2016/201678cf236c0.pdf

critically important role in sending the right operational price signals and in guiding transmission and generation investment.

After carefully considering several options for addressing this concern, the CAISO proposes to adopt a price cap at $2500 and price floor at -$2500 for the hourly Energy LMPs in the IFM, the hourly inter-tie LMPs in the HASP, and the five-minute interval LMPs in the RTD. These cap and floor values would apply to Ancillary Services Marginal Prices (ASMPs) as well as to Energy LMPs.

In considering this issue, it is important to understand the distinction between a bid cap and a price cap, particularly in the context of the MRTU markets. A bid cap limits the values of key inputs to the market – the prices that participants are allowed to submit with their bids, whereas a price cap limits the values of key outputs of the market – the LMPs used for settlement. The MRTU Tariff already includes an Energy Bid Cap at $500 per MWh, which pursuant to FERC order will be increased to $750 after the first year and to $1000 after the second year of operation of the LMP markets. The Energy Bid Cap does not, however, set an absolute limit on the actual LMPs that may occur in the markets. LMPs higher than the bid cap (or more negative than the -$30 bid floor specified in the MRTU Tariff) can occur in the CAISO transmission network because the cost of serving one additional MWh of demand at a particular location – which is the definition of a marginal energy price – can be higher than the actual submitted bid prices. This may occur, for example, when there are binding transmission constraints in the area of the load, and the resource whose bid is accepted to relieve that constraint is very distant from and not very effective on the constraint. In such cases it may take many MWh of energy from the resource, perhaps at up to $500 per MWh, to relieve one MW of overload on the constraint. As a result the price on the constraint would be a multiple of the accepted energy bid price and could drive energy LMPs in the area above the energy bid cap. Early in the MRTU design process stakeholders discussed this possibility on a conceptual basis, and in the course of the current stakeholder and Market Simulation processes, CAISO has presented and discussed several examples to illustrate this and similar scenarios that may cause high prices. Thus the bid cap, which is an important feature for limiting the ability of market participants to trigger high prices through their bidding behavior, does not in itself affect transmission congestion and supply conditions which play a separate role in setting prices.

As noted above, there is a small probability that these conditions will arise, and when they do, MRTU market design provisions moderate their impact on market participants. At the same time, our analyses of test cases and Market Simulation results to date indicate that +/- $2500 for the price cap and floor values allows a reasonable range for economic market outcomes under all but extreme system conditions. In the primary parameter tuning test case that has been used for sensitivity analysis of the IFM parameters, the highest observed LMPs were in the range of $2200 per MWh, except under highly exaggerated grid conditions that were specifically contrived to cause curtailments of different self-schedule types. Even under such conditions in those test cases, prices in the $2200 range occurred only at a specific location at the end of a line whose capacity has been significantly reduced and whose limited capacity was relaxed by Uneconomic Adjustment to relieve congestion. Thus, in the event of severe constraints in the IFM, LMPs can approach the limits of this range, but would not be expected to exceed this range. The CAISO believes, therefore, that setting such limits would not dampen meaningful economic outcomes and price signals. Moreover, from the perspective of market impacts, when extreme prices occur in the IFM due to binding transmission constraints they tend to occur only in the area of the binding constraint. In contrast, the settlement prices that are charged to most of the load in the CAISO system are average prices over large areas (the so-called Default LAPs which correspond to the service territories of the three IOUs). The effects of a few high

LMPs in a particular area are smoothed out in calculating the large-area average settlement prices.

Although CAISO does not expect the +/- $2500 limits even to be approached much less become binding in the IFM except under extraordinary conditions, there is greater likelihood of more extreme prices occurring in the RTM. In contrast to the IFM there are important characteristics of the RTM that make it more susceptible to more extreme and volatile prices, including:

- Optimization over a sequence of five-minute intervals rather than a sequence of hours, such that resource ramping capabilities become more critical in meeting five-minute changes in the load trajectory and therefore ramping constraints have stronger impacts in limiting inter-interval resource movements;
- A fixed or "inelastic" physical quantity of demand, which is continually being forecasted based on telemetered values of actual load on the grid and which therefore must be served and cannot be reduced in the event of tight supply (short of declaring staged emergency conditions); and
- Fixed interchange quantities between the CAISO and adjacent Balancing Authority Areas, which have been set in the HASP and are not available for dispatch in the RTD to help relieve any constraints.

That said, there are significant design features in the RTM that will moderate any settlement impacts of extreme five-minute interval prices. First, the five-minute interval LMPs above the Bid cap are unlikely to persist for many of the twelve intervals in an hour. As a result the integrated hourly real-time prices used for load settlement will tend to be substantially below any extreme five-minute interval LMPs. Second, high five-minute interval LMPs will typically appear at specific grid locations, and hence the averaged hourly Default LAP prices paid by most buyers are not greatly affected. Third, the MWh volumes transacted in the real-time market are usually substantially less than in the IFM, so the volume of market exposure to real-time prices is much less than in the IFM. Today the real-time market transacts only three to five percent of the total volume of energy that flows in any given hour. The size of this market is designed to remain small under MRTU, which encourages load-serving entities to schedule most of their energy in the IFM. Thus, the CAISO believes that the market impact of extreme interval prices will be small.

After considering these factors, the CAISO has concluded that a price cap and floor of +/- $2500 helps protect ratepayers in those instances where multiple constraints interact to push LMPs at certain locations and in certain intervals to extreme levels. This protection results from the small likelihood that these prices will occur in combination with the moderating effects of the large Default LAPs and the averaging of five-minute interval LMPs into hourly settlement prices for load.

In developing this proposal CAISO considered the following options:

(a) Retain multi-interval optimization for the RTD scheduling run, but use single-interval optimization for the RTC pricing run;

(b) Relax ramping constraints in the RTD, either in the pricing run alone, or in both the scheduling run and the pricing run;

(c) Adopt a general price cap and floor that limits RTD prices for five-minute intervals at specific locations to the range from -$2500 per MWh to +$2500 per MWh;

(d) Adopt bidding rules for bidding ramp rates that limits the possibility for resources to exacerbate ramping constraint impacts through their bidding behavior.

CAISO proposes to adopt option (c).

| Option | Pro | Con |
|---|---|---|
| (a) Single-interval optimization in pricing run | Sets current interval prices based only on actual binding dispatches (since dispatches in subsequent intervals are subject to change) | Will exacerbate discrepancies between SR and PR<br>Requires nontrivial software modification |
| (b) Relax ramping constraints, either in pricing run only, or in both scheduling and pricing run | Would eliminate ramping constraints as a cause of extreme price outcomes | If relaxed in SR, will lead to infeasible schedules and dispatches.<br>If relaxed in PR only, will exacerbate discrepancies between SR and PR. |
| (c) General price cap and floor on five-minute interval prices at specific locations in the +/- $2500 range | Addresses all extreme price situations, not just ones we identify in advance<br>The range of acceptable prices is large enough not to constrain economic market outcomes under all but extreme conditions | |
| (d) Define bidding rules for ramp rates | Would limit ability of resources to trigger extreme prices by bidding low ramp rates | May fail to address problem if extreme prices are due to coincidence of constraints and are not exacerbated by ramp rate bidding<br>Will likely be complicated to define, and require software changes to implement |

## 3.4. Enforcing in the reliability procurement mechanism provided by Residual Unit Commitment (RUC) any Energy Limits submitted in the DAM for use-limited resources

CAISO does not expect stakeholders to view this as an Uneconomic Adjustment policy issue, and does not expect it to be controversial. We are presenting it in this paper because it does represent a change to an important tariff provision and we believe that market participants who may not have followed the issue in Market Simulation will want to be aware of it. CAISO intends to include this change in its tariff clean-up filing at the end of October.

The current version of MRTU Tariff Section 31.5.1.1 states that the Energy Limits submitted to the IFM in association with the energy bids of use-limited resources will not be enforced in RUC. In the course of recent Market Simulation cases CAISO found this provision to be problematic, which on the face of it seems obvious. If a resource is truly limited to a certain maximum MWh quantity for the next 24-hour period, then if RUC selects that resource for a quantity of MWh which when added to its IFM energy schedule exceeds its 24-hour limit, then the RTM cannot realistically expect to utilize the resource for those MWh above the limit and has clearly under-procured. Tracing back the record on this particular tariff provision, CAISO discovered that it was added in response to a FERC compliance requirement and was probably distorted in the process due to a typo (accidental inclusion of an inappropriate "not"). CAISO therefore intends to correct this tariff section to indicate that Energy Limits for use-limited resources will be enforced in RUC, so that the total of a resource's IFM energy schedule and its RUC designation do not exceed the limit. CAISO has recently run Market Simulation test cases with such energy limits enforced, and found that the software appropriately respects the energy limits in the IFM and RUC.

A remaining question to be considered is the appropriate value for the scheduling run parameter on these Energy Limits. Currently the parameter value being used in the RUC Scheduling Run is $1000, which has not led to any inappropriate results to date. CAISO will continue to assess the performance of this parameter value and will include it in subsequent discussions of the parameter values with stakeholders.

## 3.5. Providing financial "firmness" to holders of existing rights if their submitted, valid IFM self-schedules are unbalanced Uneconomic Adjustment in the IFM

Several of the parties who hold existing rights have expressed a concern that some portion of their valid submitted self-schedules may be exposed to market congestion charges in the event that they are subject to Uneconomic Adjustment in the IFM. Although self-schedules submitted under these existing rights must be balanced when they are submitted, the market software does not adjust these self schedules in a balanced supply-demand manner when it utilizes them for Uneconomic Adjustment, but just adjusts whichever side of the schedule is most effective in relieving the constraint. When that occurs, the accepted balanced portion of the self-schedule gets the Perfect Hedge settlement which exempts the schedule from congestion charges, whereas any excess of load over supply, or vice versa, would be subject to settlement at IFM prices. Earlier this year the SAIC review of the CAISO MRTU Tariff and software identified an inconsistency, namely, that the Tariff says that under Uneconomic Adjustment in the IFM, ETC and TOR self schedules will be subject to balanced supply and demand adjustments.

The ETC/TOR parties identified another concern with the Uneconomic Adjustment approach, which is in fact a consequence of (1) the use of large Default LAPs for scheduling and settling most of the load in each of the IOU service territories, compared to (2) the requirement for existing rights holders to schedule and settle their load at the actual physical location for which its contractual rights are specified, typically a Custom LAP which is a small subset of a Default LAP. The practical result of this approach is that ETC load may actually get lower scheduling priority than non-ETC load, i.e., is more likely to be curtailed if there is a binding transmission constraint in the area of the ETC load. When such a constraint binds, the effectiveness of 1 MW reduction in D-LAP demand will typically be an order of magnitude less than the effectiveness of 1 MW reduction in ETC load in the area of the constraint, thus making it more likely that the ETC load will be curtailed while the D-LAP load is unaffected. The parties claim that this violates

the tariff priority structure for ETC and TOR Uneconomic Adjustment and thus violates the requirement to honor the ETCs.

Both the concerns expressed by the rights holders as well as the discrepancy found by SAIC apply to the IFM only, not to the RTM. The provision to apply balanced supply and demand adjustments appears in the relevant section for the IFM (Tariff Section 31.4), but not in the section on the RTM (Section 34.10). This makes sense, because the requirement for rights holders to submit balanced self-schedules to exercise their rights applies only to the IFM. In the RTM these entities may submit additional supply self-schedules if their contractual rights so allow, but there are no provisions and no need to self-schedule demand in the RTM (including HASP) because the Perfect Hedge calculation will balance the accepted self-scheduled supply against the final measured demand for the entity scheduling the existing rights.

CAISO acknowledges the validity of the concerns expressed by the existing rights holders. For purposes of this discussion it is useful to distinguish two different Uneconomic Adjustment scenarios: (a) reduction in the supply side of an ETC self-schedule, and (b) reduction in the demand side. CAISO believes that supply-side reductions in ETC/TOR self-schedules will be extremely rare, and will occur only in conjunction with substantial reductions in the physical transmission capacity that would be utilized by the existing rights self-schedule. CAISO staff's analysis, based on both its own test cases created for the Parameter Tuning effort as well as the Market Simulation cases that have been run to date, has demonstrated that extremely severe derates of capacity must occur in order to trigger any reduction in existing rights self-schedules. All along the intent of the Uneconomic Adjustment provisions with respect to existing rights has been to honor them in accordance with their contractual rights, and to establish parameter values for Uneconomic Adjustment that will enable the software to identify needed curtailments on an equivalent basis to how grid operators would need to curtail existing rights when grid conditions so require. The CAISO believes based on its testing to date that this can be achieved with appropriate values of the parameters, so that curtailments of such self-schedules will occur only when transmission is so reduced that it cannot support those schedules.

It is also important to emphasize that curtailments to self-schedules in the IFM do not necessarily constrain the ability of the entity to operate in real-time by deviating from its IFM schedule. Indeed the CAISO tariff clearly states that the CAISO cannot direct parties to operate in such a way as to violate California or federal statutory obligations, for example, with respect to water delivery (Section 22.13). Thus CAISO does not believe that Uneconomic Adjustments to existing rights self-schedules impose any adverse operational impacts that need to be addressed. Additional testing results that support these conclusions will be presented at the September 25 public meeting.

With regard to demand-side reductions to ETC self-schedules, CAISO recognizes that the discrepancy in scheduling priority created by the use of the large-area D-LAPs for most of the load is an unintended consequence of the D-LAP design. Although CAISO does not expect these ETC load curtailments to be frequent, it is correct to state that when there is a binding transmission constraint in the area of the ETC load, and there are not other means to relieve the constraint (such as additional generation within the area of the ETC load), then the relative priority of ETC load versus generic self-scheduled D-LAP load will be reduced to provide greater priority for the D-LAP load. A possible way to address this situation is to provide a financial mechanism to offset any congestion exposure for the existing rights holders that may be created by Uneconomic Adjustment.

With regard to the discrepancy identified by SAIC, the CAISO has concluded that this was due to an error in drafting the tariff language. The CAISO proposal that was approved by the Board

in 2004, prior to the FERC filing on ETC and TOR, and more than a year prior to the filing of the MRTU tariff, clearly states that the IFM may unbalance submitted balanced ETC and TOR self-schedules under Uneconomic Adjustment, and that the unbalanced portion would be subject to the normal IFM settlement. Clear statement of this design principle can be found in the CAISO Proposal on MRTU Treatment of ETC and TOR, page 29, published September 21, 2004. This CAISO paper was the final proposal the CAISO issued before taking this topic to the Board and filing it at FERC in December 2004.

The above arguments notwithstanding, CAISO recognizes that it cannot guarantee, based on the test results to date, a specific quantitative upper bound on the frequency or probability of existing rights self-schedules being subject to unbalancing by IFM Uneconomic Adjustments, thereby exposing the rights holder to market congestion charges. Moreover, CAISO recognizes how the use of D-LAP for most of the load and locational pricing for ETC load does compromise the intended scheduling priorities as stated in the tariff. CAISO is currently looking into the possibility of revising the ETC scheduling and settlement provisions to consider using the D-LAP instead of the actual load location for rights that sink at the rights holder's load, but at this time is unable to provide an assessment of either the potential unintended consequences or the feasibility of implementing such a change. CAISO therefore believes it would be appropriate to consider adopting settlement provisions to ensure what may be called the "financial firmness" of the existing rights, by providing financial payments to offset any exposure to congestion charges that may be created by unbalancing adjustments to self-schedules in the IFM.

**Proposal for Mitigating Financial Risks to ETC/TOR Holders Due to Unbalanced IFM Adjustment of Submitted Valid Self Schedules**

The CAISO proposal is best explained through the use of a simple example. Assume for the examples below that all ETC load and generation quantities are within the ETC holder's contractual rights.

**Curtailment of the supply side of the ETC.** The submitted Self-Schedule for the ETC is 150 MW load and 150 MW from supply resource A. Suppose the supply is curtailed in the IFM to 130 MW, and the final metered demand is 155 MWh.

Case (a) Suppose the entity submits additional 25 MW from supply resource B to HASP under its ETC, and it is accepted on an advisory basis and later confirmed by the RTD.

Under today's rules the entity would receive IFM Perfect Hedge (i.e., reversal of the congestion charges) for 130 MWh from resource A to load, and RT Perfect Hedge for 5 MWh from resource B to load. The other 20 MWh load accepted in the IFM would be charged the IFM price, while 20 MWh of resource B scheduled in the HASP would be paid the RTM LMP, with no offset to the congestion cost differential for these 20 MWh.

The CAISO now proposes to pay an additional 20 MWh Perfect Hedge to the entity to compensate for the congestion exposure due to the IFM unbalancing the submitted self-schedule. The additional payment would reflect the congestion cost differential between the RTM price at Resource B and the IFM price at the load location.

In the event that the final metered demand for this ETC turned out to be less than 150 MW – say 145 MW – the additional Perfect Hedge payment would only be fore 15 MW. Thus the entity cannot receive Perfect Hedge settlement treatment in total for a quantity of load that is greater than its final metered demand.

Case (b) Suppose the entity does not submit additional ETC supply to HASP. In this case the entity has decided to serve the additional 25 MWh of its final metered load through the CAISO markets, so it would be charged the IFM price for 20 MWh and the RTM price for 5 MWh.

It is important to note that the proposed additional Perfect Hedge payment described above does require the ETC holder's SC to submit additional supply in the HASP under the ETC.

**Curtailment of the demand side of the ETC.** The submitted Self-Schedule for the ETC is 150 MW load and 150 MW from supply resource A, as in the previous example. Suppose this time that the demand is curtailed in the IFM to 130 MW while the full 150 MW of supply from resource A is accepted. Suppose again the final metered demand is 155 MWh.

In this case the 25 MW of load above the IFM load schedule (including the 20 MW that was reduced in the IFM) would be settled at the RTM price for the load location. Also, the 20 MW of supply resource A that was accepted in the IFM but was not balanced against ETC load would be paid the IFM price at the resource location. There would be no compensation for the congestion cost differentials inherent in these settlement items.

The CAISO now proposes that the party be given the Perfect Hedge settlement for the full 150 MW of resource A balanced against 150 MW of the metered load, provided it re-submits the resource A self-schedule to HASP. This settlement would be at IFM prices for 130 MW and at RTM prices for 20 MW. The last 5 MW of metered load would be charged the RTM price, unless the entity self-schedules additional supply in the HASP to balance it. As in the case of the supply-side curtailment discussed first, the ETC holder would not be able to get Perfect Hedge settlement for a total quantity of load in excess of its actual metered demand.

In summary, this proposal enables existing rights holders whose submitted IFM self-schedules have been unbalanced by the IFM to receive Perfect Hedge settlement treatment for up to the full amount of their valid ETC or TOR metered demand, provided they utilize the HASP to submit new or re-submit previously accepted valid supply self-schedules.

## 3.6. Maintaining the Uneconomic Adjustment parameter values in the BPMs, and the process whereby the parameter values may be revised

Since the start of the stakeholder process on Uneconomic Adjustment and Parameter Tuning, important topics of discussion have been the location where the parameters will eventually reside on a permanent basis, and the process for changing those values. This section offers the CAISO proposals on these topics.

### 3.6.1. Where will the parameter values reside?

The CAISO recognizes that for reasons of market transparency the Uneconomic Adjustment parameters need to be well-documented, available to market participants, and subject to a clear, pre-specified change process. The main options that have been discussed for where the parameters will reside are the Tariff, the BPM, Operating Procedures, or some combination of these. CAISO proposes that the BPMs be the primary vehicle for maintaining the Uneconomic Adjustment parameter values. This approach provides a workable level of flexibility to make changes relatively quickly if market performance warrants it, and features a FERC-approved change management process that includes stakeholder review of proposed changes before they are implemented in production.

In addition, CAISO proposes to specify in the Tariff certain pricing parameters that are based on the existing bid caps. For example, Tariff Section 31.3.1.3, which deals with the "LAP Demand Clearing" problem in the IFM, specifies that when a transmission constraint is relaxed to mitigate a potentially severe curtailment of Default LAP demand, a penalty price of three times the

Energy Bid Cap will be applied. As parties are well aware, the CAISO has an outstanding FERC compliance requirement to revise this tariff section and to provide supplementary explanation regarding how the penalty prices work and their impacts on the markets (which has been the central focus of this ongoing effort on Uneconomic Adjustments and Parameter Tuning). Irrespective of whether CAISO decides to use "the Energy Bid Cap" or "three times the Energy Bid Cap" for the pricing parameter on relaxed internal transmission constraints, as discussed in Section 3.2 of this paper, this pricing parameter will be included in the Tariff in Section 31.3.1.3 as a result of fulfilling the compliance requirement. Similarly, CAISO intends to include in the Tariff the use of the Energy Bid Cap as the pricing parameter on the relaxation of the energy balance constraint in the RTM, as discussed in Section 3.1 of this paper.

### 3.6.2. On what basis and through what process will parameter values be revised?

The high-level answer regarding the process for revising Uneconomic Adjustment parameter values is simply to refer to the BPM Change Management process. The CAISO notes that it may be necessary, at least during the first year of the new LMP markets, to utilize the "fast track" version of BPM Change Management if we discover in production that a given parameter setting is not giving the expected results and is causing a problem. That process will involve assessment by CAISO staff and management of the nature and severity of the problem, consideration of alternative parameter values or other options for addressing it, and discussion of these matters with participants as specified in the BPM change management process.

Triggering events that may lead to re-evaluation and possible modification of parameter values would reflect some aspect of inconsistency between the market solutions and the provisions of the tariff. For example:

(a) Schedules from resources that are similarly situated are adjusted inconsistent with priorities established in the tariff.

(b) Constraints are relaxed prior to exhausting available economic resource bids that are within threshold of effectiveness.

(c) Solution infeasibility occurs due to overly constrained conditions for which parameter modification could improve the solution.

(d) Prices are significantly and chronically above (maybe some multiple of) the bid cap or below the bid floor.

Likewise, the criteria used for modifying parameters will be aimed at ensuring consistency with tariff, aligning with economic effectiveness dispatch criteria, improving solution conditions and avoiding or preventing unreasonably high prices that are influenced by the parameter settings.

Depending on the extent of analysis necessary to propose a modified parameter value, the CAISO will likely require at least a few days of review and analysis. In such cases the CAISO would provide notice to market regarding the upcoming parameter change in advance of implementing the change in the software. At this time the CAISO does not intend to make changes to Uneconomic Adjustment parameters within the market production time frame, although we would not want to absolutely preclude such a change if extraordinary conditions arise that prevent the market from solving or lead to repeatedly extreme unreasonable results.