

California Independent

System Operator Corporation

**CAISO Draft Final Proposal**

**on**

**Uneconomic Adjustments**

**in the MRTU Market Optimizations**

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**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**

# 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.

# 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.

# Discussion of CAISO Proposals

## 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:

1. Energy Bid Cap as pricing parameter on energy balance slack variable;
2. Last accepted economic bid (last economic signal), which is obtained by setting $0 price on the energy balance slack variable;
3. 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.  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.  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. |

## 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.

## 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]](#footnote-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 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:

1. Retain multi-interval optimization for the RTD scheduling run, but use single-interval optimization for the RTC pricing run;
2. Relax ramping constraints in the RTD, either in the pricing run alone, or in both the scheduling run and the pricing run;
3. 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;
4. 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).

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| **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  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.  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  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  Will likely be complicated to define, and require software changes to implement |

## 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.

## 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.

## 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.

### 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.

### 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:

* 1. Schedules from resources that are similarly situated are adjusted inconsistent with priorities established in the tariff.
  2. Constraints are relaxed prior to exhausting available economic resource bids that are within threshold of effectiveness.
  3. Solution infeasibility occurs due to overly constrained conditions for which parameter modification could improve the solution.
  4. 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.

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>

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