



May 31, 2023

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

**Re: California Independent System Operator Corporation
Docket No. ER23-____-000**

**Tariff Amendment to Adjust Shift Factor Threshold and
Enhance Market Parameter Change Process**

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) submits this tariff amendment to implement two sets of changes to its market processes.¹ First, the CAISO proposes to adjust the threshold it applies for considering the effectiveness of a resource in managing congestion. The CAISO applies a two percent threshold, whereby the CAISO disregards a resource's impact on relieving congestion on a constraint if the shift factor is below two percent with respect to that constraint. The CAISO proposes to lower that threshold to two-tenths of a percent for Default Load Aggregation Points (Default LAPs), Trading Hubs, and Interties with significant transfer capability. Second, the CAISO proposes a new process to permit temporary changes to parameter values the CAISO market uses to reflect relative scheduling priorities and constraints. The CAISO would invoke this new process only when necessary to ensure market solutions align with intended scheduling priorities or avoid operational or reliability problems. Changes to the parameter values would not affect the relative scheduling priorities in the tariff.

This filing contains three discrete and severable sets of tariff amendments. The two main elements of this filing, described above, are discrete, severable,

¹ The CAISO submits this filing pursuant to section 205 of the Federal Power Act (FPA), 16 U.S.C. § 824d, and Part 35 of the Commission's Regulations, 18 C.F.R. Part 35. Capitalized terms not otherwise defined herein have the meanings set forth in Appendix A to the CAISO tariff, and references herein to specific tariff sections are references to sections of the CAISO tariff unless otherwise specified.

and not interdependent with each other. Further, the proposal to apply a lower threshold to Default LAPs and Trading Hubs is severable from the proposal to apply a lower threshold to certain Interties. The CAISO requests the Commission separately evaluate the justness and reasonableness of the three aspects of this filing. The CAISO respectfully requests the Commission issue an order accepting the proposed tariff revisions by July 31, 2023. The CAISO requests these tariff revisions become effective no later than September 30, 2023, subject to the CAISO filing a notice with the Commission within 5 days of the actual effective date.

I. Shift Factor Threshold

A. CAISO's Existing Two Percent Shift Factor Threshold

1. Explanation of Shift Factors

Through the day-ahead and real-time markets, the CAISO seeks to minimize the cost of dispatching electricity to serve demand while considering physical limitations on the transmission system. Congestion occurs when demand for transmission exceeds the available capacity and causes a congestion cost as part of locational marginal prices on the CAISO system. Shift factors are a key conceptual tool the CAISO uses both to manage congestion and price electricity at different locations on the grid based on congestion.

Shift factors, also known as sensitivity factors, measure the effectiveness of injecting or withdrawing power on the transmission system at a specific location relative to the change of power flow on a specific constraint. The CAISO calculates shift factors for both individual nodes, such as an individual generator location and aggregated pricing nodes. Aggregated pricing nodes are locations such as Default LAPs, which the CAISO uses to model demand bids. Trading Hubs are also aggregated pricing locations for generation connected to network nodes associated with a Trading Hub. They align with CAISO congestion zones, e.g. NP15, SP15, or ZP26.² The CAISO models and prices these locations to support bilateral transactions. Trading Hubs also serve as sources of supply for congestion revenue rights (CRRs).

The CAISO uses shift factors to manage congestion and calculate Locational Marginal Prices (LMPs). In the CAISO's markets, congestion management refers to re-dispatches of market resources to comply with transmission limits. The market considers various factors to comply with those transmission limits, including resources' operational characteristics, market bids, and shift factors. The shift factors determine the magnitude and direction of the re-dispatch because some resources can exacerbate congestion but others can

² CAISO tariff section 27.3.

mitigate it. Resources on one side of the constraint will increase generation, while resources on the other side of the constraint will decrease generation. The shift factor also reflects relative value of an injection of supply at one location as opposed to another and thus factors into calculation of LMPs.

The value of the shift factor at an individual location depends on the transmission topology, the slack node choice³, and the transmission system's specific characteristics. A location will typically be a supply (generation) node or demand (load) node. For instance, a 40 percent shift factor means that 0.4 MW will flow on a constraint if one (1) MW is injected and withdrawn between a node and the slack node. If the shift factor is positive, the flow will increase by 0.4 MW on the constraint. If the shift factor is negative, the flow will reduce by 0.4 MW on the constraint.

2. CAISO's Shift Factor Threshold

The CAISO markets employ a two percent shift factor threshold in price formation and to determine what power injections and withdrawals the CAISO uses to manage congestion on transmission constraints. In the congestion management process, the CAISO market only will consider resources with a shift factor of at least two (2) percent for re-dispatch. In the price formation process, the CAISO does not use shift factors below the threshold for any binding constraint to derive the marginal congestion component of a location marginal price. This approach means the market model disregards the impact of resources (injections/withdrawals) with shift factors below the threshold to set prices.

3. Rationale for Adopting the Threshold

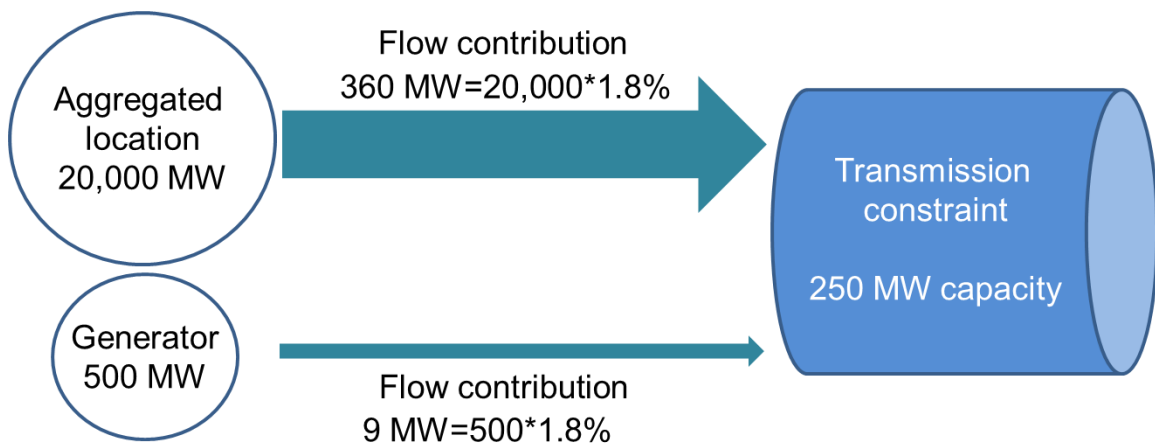
The CAISO adopted the shift factor threshold as part the nodal market it implemented in 2009. Considering every shift factor, regardless of magnitude, would provide the most accurate prices possible. Such accuracy, however, would create a trade-off in the form of less effective congestion management. The CAISO determined that resources with a shift factor less than two percent were electrically too distant to manage constraints effectively. Using resources with a very low shift factor for congestion management could lead to an ineffective re-dispatch of resources far away, electrically speaking, from a constraint. The re-dispatch would produce little congestion relief on these

³ The slack node or reference node is a pricing node used to measure and manage congestion. Since its inception, the CAISO's market has used a distributed slack node. More information about the use of a slack variable is available in the CAISO's Business Practice Manual for Market Operations at pp. 150-151.
https://bpmcm.caiso.com/BPM%20Document%20Library/Market%20Operations/BPM_for_Market%20Operations_V89_Clean.doc.

constraints. The market may have hundreds of transmission constraints with hundreds of locations with associated shift factors. Utilizing a very low shift factor to manage congestion across the entire system could easily create computational problems. The CAISO's use of the threshold thus balances the competing concerns of accurate price formation and effective congestion management.⁴

4. Current Shift Factor Threshold – General Issues

Sometimes, the current shift factor threshold may not strike the right balance between accurate price formation and effective congestion management. Using the current shift factor threshold, the CAISO market model may ignore aggregated locations that could contribute significantly to congestion management and price formation with respect to a given transmission constraint. The figure below illustrates an inherent limitation in the threshold's current formulation.



This example shows two nodes with an identical shift factor of 1.8 percent with respect to a transmission constraint of 250 MW. One node represents an individual generator with 500 MW whereas the second node represents a Default LAP with 20,000 MW. Given their vastly different MWs, modeling an injection at the two nodes will have significantly different flow impacts on the constraint. The individual generator's injection will have a nine (9) MW contribution to flow on the constraint. In contrast, an injection at the Trading Hub will have a 360 MW contribution to flow on the constraint. The existing shift factor threshold, however, treats these two situations as though they were the same, which can affect both price formation and congestion management. For example, the Default LAP could resolve congestion on the constraint, but the market would

⁴ *Calif. Indep. Sys. Operator Corp.*, 126 FERC ¶ 61,147 (2009), PP 57-58; *Calif. Indep. Sys. Operator Corp.*, 127 FERC ¶ 61,233 (2009), PP 13-20.

ignore that location to manage congestion and form prices under the current shift factor threshold.

5. Current Shift Factor Threshold – Congestion Revenue Rights Impacts

The current shift factor threshold has also had specific impacts on the CRR market.

a. Description of Congestion Revenue Rights

CRRs are financial instruments that market participants can acquire through a CAISO-administered allocation and auction process to provide a level of financial protection against the risks associated with unpredictable congestion charges.⁵ The CAISO financially settles CRRs based on the difference in the marginal cost of congestion component of the locational marginal price between two pricing points – called a source and a sink – on the CAISO’s system (as determined day-ahead forward market), multiplied by the MW quantity of the CRRs a market participant holds between the two points. The CAISO maintains a CRR model that reflects the most up-to-date direct current full network model. This model includes constraints and network topology that seeks to reflect, as closely as possible, similar constraints and network topology expected in the day-ahead market. However, the CRR model supports annual and monthly CRR allocations and auctions and runs well before the day-ahead market.⁶

b. Financial Settlement of Congestion Revenue Rights

From the start of the CAISO’s nodal market through 2019, the CAISO guaranteed settlement of CRRs at their full notional value. A holder of a CRR was guaranteed to be paid based on the product of its CRR quantity and the differential in marginal cost of congestion between the source and sink. The CAISO funded CRR payments from CRR auction proceeds and congestion revenue collected in the day-ahead market. The CAISO covered any shortfall, called revenue inadequacy, by an uplift payment assessed to load. To address the equity concerns of such uplift payments, which at times were significant, the CAISO revised its CRR settlement rules in 2019 by ending full funding and instead scaling CRR payments based on the day-ahead market congestion

⁵ See, e.g., *Cal. Indep. Sys. Operator Corp.*, 149 FERC ¶ 61,093, P 2 (2014) (citations omitted) (“CRRs are financial instruments that enable their holders to hedge variability in congestion costs. Entities acquire CRRs primarily to offset integrated forward market congestion costs reflected in the congestion component of locational marginal prices (LMPs).”).

⁶ CAISO Tariff 36.4.1.

revenues the CAISO collects from the constraints over which it modeled the CRRs as flowing.⁷

c. Interrelationship between Shift Factor Threshold and Scaled Settlements for Congestion Revenue Rights

Following implementation of scaled CRR settlement, the CAISO observed an issue in settling CRRs created by application of the shift factor threshold. Applying the threshold to locations with significant injections or withdrawals meant the market was not accounting for significant flow contributions in estimating power flows and financially settling the CRRs.

i. Shift Factor Threshold May Create CRR Overpayments

The CAISO's day-ahead market and the CRR model both perform congestion management as part of the clearing process. Both markets calculate shift factors and produce marginal congestion components that inform prices. The shift factors from the CRR processes can differ from those used by the day-ahead market for several reasons, including transmission configuration differences. For instance, an outage modelled in the day-ahead market but not modelled in the CRR auction may yield different shift factors. Furthermore, using the shift factor threshold in the day-ahead market but not in the CRR market may cause the market to mis-estimate the implied CRR flow on a transmission constraint.

ii. Shift Factor Threshold May Create Under-Collection Of Congestion Rents

Applying a two (2) percent shift factor threshold to locations with significant injections or withdrawals also may result in the market not accounting for significant flow contributions in estimating power flows and settling CRRs. The market does not consider locations below the two (2) percent shift factor threshold for re-dispatch for congestion management. In addition, the market does not reflect the effectiveness of these resources' contributions in LMPs, thereby causing a potential under-collection of congestion rents to fund CRR settlements.

B. Targeted Reductions to the Shift Factor Threshold

1. Description of Proposed Changes to Threshold

⁷ *Cal. Indep. Sys. Operator Corp.*, 165 FERC ¶ 61,085 (2018).

The CAISO proposes to reduce the threshold from two percent to 0.2 percent for large aggregated demand and generation locations - Default LAPs and Trading Hubs to address the above-noted limitations the CAISO has identified with its existing approach. The CAISO also proposes to establish authority for it to apply this lower shift factor threshold to Interties with significant enough transfer capability to create similar inefficiencies to those identified from Default LAPs and Trading Hubs. Through more formal analysis of the historical impact on market results, the CAISO will identify the specific Interties through its Business Practice Manual and may revise the specific Interties over time based on operational experience and changes in market dynamics. The CAISO expects to apply the lower threshold only to Interties that routinely represent volumes significantly in excess of the largest individual resource locations. The existing two percent threshold would continue to apply to all other pricing locations to avoid the potential increase in computational efforts in the market clearing process and inefficient re-dispatch of resources that offer little benefit for congestion management.

2. A Lower Threshold for Default LAPs, Trading Hubs, and Large Interties Strikes a Better Balance

As explained above, the CAISO adopted the shift factor threshold to balance the sometimes competing priorities between effective congestion management and accurate price formation. The CAISO has now recognized the current approach of applying the same threshold to all locations has not struck the appropriate balance. The proposed tariff amendments will better harmonize those factors. A lower shift factor threshold for these nodes with significant MW volumes appropriately recognizes that they merit different treatment from nodes that represent, for example, a single generation resource.

The CAISO initially proposed to lower the threshold only for Default LAPs and Trading Hubs. During the CAISO's stakeholder process, some stakeholders noted that some Interties represent injections/withdrawals of a magnitude comparable to Default LAPs and Trading Hubs. For example, some Intertie locations such as Palo Verde, Malin, and Nevada/Oregon Border (NOB) can represent injections between 1,000 MW and 3,000MW, which are significantly larger than individual resource locations. These stakeholders questioned why the rationale for applying a lower shift factor threshold would not hold equally for these large Interties. The CAISO agreed with this feedback and expanded the scope of its proposal to cover Interties with significant Total Transfer Capability.⁸ The CAISO proposes to identify what set of Interties could be subject to the lower threshold in its applicable business practice manual.⁹ The CAISO has proposed

⁸ Proposed tariff section 27.4.3.5

⁹ *Id.*

this approach because applying the lower threshold to Interties with minimal transfer capability would impose similar computational issues for the CAISO's market clearing process posed by individual resources and would not materially change which resources could effectively manage a transmission constraint. Instead, the CAISO proposes to maintain flexibility to apply the lower shift factor threshold to Interties based on further analysis.

The proposed change will likely materialize in the marginal cost of congestion component of LMPs. The CAISO's analysis performed during the stakeholder initiative shows the difference in marginal congestion component by using the reduced shift factor threshold for Default LAPs and Trading Hubs.¹⁰ The change can be either an increase or reduction in the marginal cost of congestion depending on the relative effectiveness of the Default LAP and Trading Hubs to the congestion management on the transmission constraint. However, this price impact is appropriate given the material impact that Default LAPs and Trading Hubs may have on flows to manage transmission constraints.

Notably, the CAISO does not propose to eliminate the threshold altogether for these locations. The CAISO concluded that a very small threshold is still appropriate at these locations to account for extreme scenarios. For example, the CAISO's initial concerns about employing a threshold still would apply to a Default LAP where it had a shift factor with respect to a constraint not at two (2) percent or even .2 percent but at .000002 percent. In such a case, it would be unreasonable for the CAISO market to manage congestion on a constraint by issuing a schedule for withdrawal or injection at a node with that minuscule an impact on the constraint.

3. Reducing the shift factor threshold for Default LAPs and Trading Hubs from two percent to 0.2 percent will help resolve concerns with CRR performance

Reducing the shift factor threshold will also benefit the CRR process by bringing the CRR model more closely in alignment with the model used in pricing the energy market. Specifically, by reducing the shift factor threshold used in the day-ahead market at aggregated locations with large injections and withdrawals, the CRR and day-ahead market models will more closely converge reducing the risk of CRR overpayments. With the treatment of shift factors more closely aligned, CRRs can be a more effective hedging instrument.

¹⁰ CAISO Revised Final Proposal dated March 14, 2023 at 22-37.

II. Scheduling Parameters in the CAISO's Markets

A. Background

The CAISO's market optimization uses a set of configurable scheduling parameters to enforce scheduling priorities in the market clearing process. These parameters also guide the relaxation of constraints in the market clearing process. Scheduling parameters are relevant when the market software has exhausted economic solutions, and uneconomical adjustments are necessary to clear the market and resolve constraints.

The CAISO defines these values based on studies and analysis to ensure the market maintains expected priority under different scenarios. The CAISO also tests these parameters when it implements new functionality and market features. Ensuring the parameter values are set correctly is important because when they are not coordinated correctly, the resulting market solutions under these extreme conditions may pose market and operational inefficiencies.

Even with the CAISO's diligent efforts to study, analyze, and regression-test the parameter values, given the large number of different scenarios the market can encounter day-to-day, conditions may arise under which the pre-defined parameter values do not preserve relative scheduling priorities or constraints as intended. The parameter values and the scheduling priorities are most likely to fall out of synchronization under extreme and stressed market and system conditions that require the market to enforce uneconomical adjustments in which the parameter prices are important to obtain a market solution.

One possible condition that could occur is the need to calibrate specific parameter prices of certain self-schedules to ensure some outlier pricing conditions do not undermine the relative priorities among schedules. For instance, the parameter prices used for different self-schedules include a buffer between them. This helps ensure that the optimization can clearly differentiate between the relative priorities of each self-schedule. This price separation works well under most market conditions. However, under some conditions, such as the impact of marginal losses leading to large price differentials, the buffer between these parameter values may not be sufficient and, thus, the optimization may no longer follow the expected scheduling priorities between the relative self-schedules.¹¹

¹¹ The CAISO has separately described this process in its initiative regarding adjustments to Intertie constraint penalty prices to mitigate for the unintended overscheduling of Intertie constraints. In the CAISO's draft final proposal, there is a specific illustration of why the CAISO needs enough headroom between parameter values to account for other pricing dynamics such as those arising for marginal losses. Sometimes that headroom may no longer be sufficient, and the CAISO may need to revise parameter values quickly to mitigate market issues. See p. 16 of

Events of July 9, 2021, provide a clear example of this scenario. On that day the CAISO's system faced tight supply conditions due to loss of imports when the Bootleg Fire in southern Oregon caused a derate on the California Oregon Intertie. The parameter values at the time prioritized import schedules during the real-time market in relation to an Intertie transmission constraint, creating an overscheduling issue. The CAISO had to make post-market adjustments to import schedules during conditions of extreme stress on the system.

Under these extreme events, the CAISO could have avoided multiple uneconomical adjustments and relaxation of constraints if it had the authority to adjust the parameter values quickly. However, many of these values are defined in the CAISO tariff and cannot be changed without the CAISO submitting a filing to the Commission under section 205 of the Federal Power Act.

B. Proposed Parameter Change Process

The CAISO proposes to amend its tariff by creating a new tariff section 31.4.1 that will authorize the CAISO to make temporary changes to the scheduling parameter values specified in the CAISO tariff to address the limitations described above.¹² The procedures proposed in this new tariff section would allow the CAISO to modify the scheduling parameter values in the tariff on a temporary basis – for a period of no more than 90 days – to ensure market solutions align with intended priorities or avoid future operational or reliability problems. Making such a change would require the CAISO to file a tariff revision with the Commission within 30 days of any modification to a scheduling parameter in the tariff. The CAISO will notify and consult with its Department to Market Monitoring and the Commission as soon as reasonably possible after implementing a temporary change, if not beforehand. Further, the proposed procedure would require the CAISO to notify market participants of any temporary modification within one business day and explain the reasons for the change.

In designing its temporary modification provision, the CAISO was informed by the Commission-approved tariff provisions of three other independent system

in the CAISO's draft final proposal: <http://www.caiso.com/InitiativeDocuments/DraftFinalProposal-Adjustment-IntertieConstraintPenaltyPrices.pdf>.

¹² The CAISO proposed this temporary authority as part of a compliance filing in Commission docket no. ER21-1790. The Commission rejected the proposal as outside the scope of the CAISO's specific compliance obligation in that proceeding but noted "[i]f CAISO wishes to pursue such a change to its tariff, it can submit a filing under section 205 of the FPA with appropriate support." *Cal. Indep. Sys. Operator Corp.*, 178 FERC ¶ 61,181 (2021), P9 & n.17.

operators (ISOs) and regional transmission organizations (RTOs) that permit them to make temporary changes to the transmission constraint penalty factor values specified in their tariffs.¹³ The proposed parameter change procedure will allow the CAISO to modify the scheduling run parameters when necessary to ensure feasible market solutions or avoid future operational or reliability problems the resolution of which would require recurring operator intervention outside of normal market scheduling procedures. Under the proposed tariff language, the CAISO may temporarily modify the scheduling run parameter for a period up to 90 days, provided the CAISO must file a tariff amendment with the Commission within 30 days of the modification. The NYISO tariff allows such a change to remain in effective for 90 days and requires the NYISO to make a tariff amendment filing within 45 days.¹⁴ The Commission should permit the CAISO to implement tariff provisions as it has done for other ISOs and RTOs.

In Order No. 844, where the Commission required each ISO and RTO to include in its tariff its transmission constraint penalty factor values, the Commission also permitted them to include any procedures for temporarily changing such values with “notice of the change to market participants.”¹⁵ Order No. 844 required that if “any procedures for temporarily changing transmission constraint penalty factor values must provide for notice of the change to market participants as soon as practicable.”¹⁶ The CAISO’s proposed tariff revision meets this directive, and the Commission should accept it as just and reasonable. Again, the CAISO stresses that its proposal does not permit the CAISO to change the relative scheduling priorities specified in tariff sections 34.1 and 34.12; it only permits the CAISO to tweak the specified penalty parameter values within the relative scheduling priority ranges to address potential problematic and inefficient market outcomes.

¹³ MISO Tariff, Schedule 28A, § 3.3; NYISO Market Administration and Control Area Services Tariff, § 17.1.4; PJM Interconnection LLC Open Access Transmission Tariff, Attachment K –Appendix, § 5.6.3.

¹⁴ NYISO Market Administration and Control Area Services Tariff, § 17.1.4. PJM is authorized to change the Transmission Constraint Penalty Factor before the market runs and is only required to post the change “as soon as practicable.” PJM Interconnection LLC Open Access Transmission Tariff, Attachment K –Appendix, § 5.6.3. MISO can temporarily override a TCDC and must make a posting that describes, among other things, the duration of the override.

¹⁵ *Uplift Cost Allocation and Transparency in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 844, 163 FERC ¶ 61,041, PP 121-22 (2018).

¹⁶ *Id.*

III. Stakeholder Process for this Tariff Amendment

The CAISO's process to develop these proposed tariff changes included iterative proposals and discussions with stakeholders.¹⁷ These discussions yielded changes to the proposal that the CAISO has incorporated. The CAISO Board of Governors and Western Energy Imbalance Market Governing Body approved filing these proposed tariff changes on March 22, 2023. During this process stakeholders generally expressed support for both elements of this filing.

The main areas of outstanding stakeholder concern included whether the CAISO will undertake more stakeholder processes to assess the performance of the CRR rule changes the CAISO implemented in 2019, including the elimination for CRRs for non-delivery paths and rules to require pro-rata funding for CRRs on a constraint-by-constraint basis. The CAISO makes CRR market data available to stakeholders, and it will continue to do so.¹⁸ In addition, the CAISO continuously assesses the need to revise market rules; however, the proposed tariff changes in this filing are not dependent on the CAISO undertaking a future stakeholder process on CRR market rules.

Some stakeholders expressed concern that reducing the shift factor threshold for aggregated locations will increase prices and create a different treatment relative to other pricing locations. This concern ignores the magnitude of injections and withdrawals for aggregated locations relative to individual locations and how that difference leads to materially different power flow contributions to resolve a transmission constraint. Using the lower shift factor threshold at aggregated locations, the CAISO market will treat any market participant bidding at these aggregated locations in a comparable manner. Using the lower shift factor threshold will more accurately reflect the contributions of these aggregated locations to both power flow contributions and price formation, and will both increase and decrease prices at those locations. The CAISO's analysis in the Revised Final Proposal identifies a range of potential pricing impacts.

IV. Effective Date

The CAISO respectfully requests that the Commission issue an order accepting the tariff revisions by July 31, 2023. The CAISO requests these tariff

¹⁷ More information about this stakeholder initiative is available on the CAISO's website: <https://stakeholdercenter.caiso.com/StakeholderInitiatives/Market-parameter-changes-enhancement>.

¹⁸ The most recent reports on CRR market performance are available on the CAISO's website: <http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx>

revisions be effective no later than September 30, 2023, subject to the CAISO filing a notice with the Commission within 5 days of the actual effective date.¹⁹

V. Communications

Under Rule 203(b)(3),²⁰ the CAISO respectfully requests that all correspondence and other communications about this filing be served upon:

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VI. Service

The CAISO has served copies of this filing on the CPUC, the California Energy Commission, and all parties with scheduling coordinator agreements under the CAISO tariff. In addition, the CAISO has posted a copy of the filing on the CAISO website.

VII. Contents of this filing

Besides this transmittal letter, this filing includes these attachments:

| | |
|--------------|---|
| Attachment A | Clean CAISO tariff sheets |
| Attachment B | Redlined CAISO tariff sheets |
| Attachment C | March 14, 2023 Revised Final Proposal |
| Attachment D | Board of Governors Memo. Presentation and Record of Vote. |

¹⁹ The CAISO has included an effective date of 12/31/9998 for the tariff records in this filing. The CAISO will notify the Commission of the actual effective date of these tariff records within five business days after implementation in an eTariff submittal using Type of Filing code 150 –Report.

²⁰ 18 C.F.R. § 385.203(b)(3).

The Honorable Kimberly D. Bose

May 31, 2023

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VIII. Conclusion

For the reasons set forth in this filing, the CAISO respectfully requests that the Commission issue an order accepting the tariff revisions in this filing by July 31, 2023, effective as of the dates specified.

Respectfully submitted,

/s/ David S. Zlotlow

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Attachment A – Clean Tariff
Tariff Amendment – Market Parameter
California Independent System Operator Corporation
May 31, 2023

27.4.3.4 Protection of TOR, ETC and Converted Rights Self-Schedules in the IFM

In accordance with the submitted and accepted TRTC Instructions, valid Day-Ahead TOR Self-Schedules, Day-Ahead ETC Self-Schedules and Day-Ahead Converted Rights Self-Schedules shall not be adjusted in the IFM in response to an insufficiency of Effective Economic Bids. The scheduling parameters associated with the TOR, ETC, or Converted Rights Self-Schedules will be set to values higher than the scheduling parameter associated with relaxation of an enforced internal and Intertie Transmission Constraint as specified in Section 27.4.3.2, so that when there is a congested Transmission Constraint that would otherwise subject a Supply or Demand resource submitted in a valid and balanced ETC, TOR or Converted Rights Self-Schedule to adjustment in the IFM, the IFM software will relax the Transmission Constraint rather than curtail the TOR or ETC Self-Schedule. This priority will be adhered to by the operation of the IFM Market Clearing software, and if necessary, by adjustment of Schedules after the IFM has been executed and the results have been reviewed by the CAISO operators.

27.4.3.5 Effectiveness Threshold

The CAISO Markets software includes a lower effectiveness threshold setting that governs whether the software will consider a bid “effective” for managing congestion on a congested Transmission Constraint, which in the case of Nomograms will be applied to the individual flowgates that make up the Nomogram, rather than to the Nomogram itself. The CAISO sets this threshold at two-tenth of a percent (.2%) for Trading Hubs; Default LAPs; and Interties with significant Total Transfer Capability, as specified in the Business Practice Manual. The CAISO sets the threshold at two percent (2%) for all other Nodes.

* * * * *

31.4.1 Temporary Changes to Scheduling Run Parameter Values

If the CAISO determines it is necessary to modify the scheduling run parameter values in sections 31.4, 34.12.1, or 34.12.2 to address market solutions that do not align with scheduling priorities or avoid operational or reliability problems the resolution of which would otherwise require recurring operator intervention outside normal scheduling and market procedures, it may temporarily modify the value for a period up to ninety days, provided however CAISO will file such change with FERC under Section

205 of the Federal Power Act within thirty days of such modification. If circumstances reasonably allow, CAISO will consult with FERC and the CAISO's Market Monitoring Unit before implementing such modification. In all circumstances, the CAISO will (i) consult with those entities as soon as reasonably possible after implementing a temporary modification, and (ii) notify Market Participants within one business day after the change of any temporary modification and explain the reasons for the change. This section does not authorize the CAISO to change the scheduling run parameter values in a manner that changes the relative scheduling run priorities specified in sections 31.4, 34.12.1, and 34.12.2.

Attachment B – Marked Tariff
Tariff Amendment – Market Parameter
California Independent System Operator Corporation
May 31, 2023

27.4.3.4 Protection of TOR, ETC and Converted Rights Self-Schedules in the IFM

In accordance with the submitted and accepted TRTC Instructions, valid Day-Ahead TOR Self-Schedules, Day-Ahead ETC Self-Schedules and Day-Ahead Converted Rights Self-Schedules shall not be adjusted in the IFM in response to an insufficiency of Effective Economic Bids. The scheduling parameters associated with the TOR, ETC, or Converted Rights Self-Schedules will be set to values higher than the scheduling parameter associated with relaxation of an enforced internal and Intertie Transmission Constraint as specified in Section 27.4.3.2, so that when there is a congested Transmission Constraint that would otherwise subject a Supply or Demand resource submitted in a valid and balanced ETC, TOR or Converted Rights Self-Schedule to adjustment in the IFM, the IFM software will relax the Transmission Constraint rather than curtail the TOR or ETC Self-Schedule. This priority will be adhered to by the operation of the IFM Market Clearing software, and if necessary, by adjustment of Schedules after the IFM has been executed and the results have been reviewed by the CAISO operators.

27.4.3.5 Effectiveness Threshold

The CAISO Markets software includes a lower effectiveness threshold setting that governs whether the software will consider a bid “effective” for managing congestion on a congested Transmission Constraint, which in the case of Nomograms will be applied to the individual flowgates that make up the Nomogram, rather than to the Nomogram itself. The CAISO sets this threshold at two-tenth of a percent (.2%) for Trading Hubs; Default LAPs; and Interties with significant Total Transfer Capability, as specified in the Business Practice Manual. The CAISO sets the threshold at two percent (2%) for all other Nodes.~~The CAISO will set this threshold at two percent (2%).~~

* * * * *

31.4.1 Temporary Changes to Scheduling Run Parameter Values

If the CAISO determines it is necessary to modify the scheduling run parameter values in sections 31.4, 34.12.1, or 34.12.2 to address market solutions that do not align with scheduling priorities or avoid operational or reliability problems the resolution of which would otherwise require recurring operator intervention outside normal scheduling and market procedures, it may temporarily modify the value for a

period up to ninety days, provided however CAISO will file such change with FERC under Section 205 of the Federal Power Act within thirty days of such modification. If circumstances reasonably allow, CAISO will consult with FERC and the CAISO's Market Monitoring Unit before implementing such modification. In all circumstances, the CAISO will (i) consult with those entities as soon as reasonably possible after implementing a temporary modification, and (ii) notify Market Participants within one business day after the change of any temporary modification and explain the reasons for the change. This section does not authorize the CAISO to change the scheduling run parameter values in a manner that changes the relative scheduling run priorities specified in sections 31.4, 34.12.1, and 34.12.2.

Attachment C – Final Proposal
Tariff Amendment – Market Parameter
California Independent System Operator Corporation
May 31, 2023



California ISO

Market Parameter Changes Enhancement

Revised Final Proposal

Revised on March 14, 2023

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The changes shown in the first paragraph on Page 6 of this proposal were made on March 14, 2023, to more accurately summarize the changes in the “WEIM Decisional Classification” section on pages 43-44, and how ISO staff applies the relevant rules. These were the only changes to the paper, which is otherwise unchanged from the version posted February 8, 2023.

INTRODUCTION

As part of its continued assessment of market performance, the CAISO has identified two enhancements to how it manages market parameters. Since implementing either change would require amending the CAISO tariff, the CAISO opened a formal stakeholder process to introduce the issues to be addressed and identify a solution. The scope of this initiative is twofold:

1. Address market issues arising from a shift factor threshold in the CAISO's energy market for aggregated locations, which has implications in the congestion revenue right market, and
2. Develop a mechanism to effectuate expedited changes to the values of the penalty prices utilized in the CAISO's energy market to address production issues that may arise.

These two items fall within the same general subject matter of market parameters but they are not interdependent. The following sections describe each issue and the associated proposal to address them.

CHANGES FROM DRAFT FINAL PROPOSAL AND RESPONSES TO STAKEHOLDER FEEDBACK

The CAISO appreciates the comments received from market participants and stakeholders and has carefully considered all stakeholder input in developing this final proposal and tariff language. This final proposal changes, clarifies, or confirms a few elements of the draft final proposal based on stakeholder feedback. This final proposal:

- **Shortens the notification window for parameter changes from three business days to one (1) business day.** In the draft final proposal, the CAISO proposed to provide notice of market parameter changes within three business days of the change. Middle River Power (MPR) suggested a more expedited notification timeline to inform the market of any parameter changes. The CAISO sees the merits in this suggestion and finds this a reasonable change to accommodate.
- **Reaffirms the decisional classification and its merits for the shift factor threshold item as recommended in the draft final proposal.** Puget Sound Energy (PSE) expressed concern that this initiative could potentially impact EDAM participants and, therefore, suggested to delay this initiative until the EDAM draft tariff language is written. The CAISO understands there is a possibility that this or any initiative “may have market or pricing implications for future

EDAM participants” as PSE states in its comments. Nevertheless, the CAISO ~~will~~¹ ~~plans to~~ apply the rule proposed by the stakeholder representatives on the Governance Review Committee (GRC), as adopted by the Board and the Governing Body in the WEIM BG February session. Specifically, the GRC recognized that, while the tariff amendment process will continue and some of the amendments proposed now might have implications for EDAM, the new expanded scope of joint authority should not go into effect until after FERC has conclusively accepted the EDAM tariff. ~~This rule was a compromise among the GRC members, which is explained on pp. 47-48 (and some of the preceding pages) of the final paper~~². The CAISO is not in a position to put the market development process on hold until the EDAM tariff is drafted and approved, which is what PSE is proposing³. Instead, the CAISO will maintain the decisional classification as advisory while recognizing the timing complications of this item. The CAISO will consider this item, potentially among others, to be brought as an explicit effort for final determination prior to the implementation of the EDAM initiative.

- **Expands tariff language to consider the reduced shift factor threshold to inerties.** The CAISO has added a provision to the proposed tariff language providing flexibility to apply the lower shift factor threshold to intertie locations with significant transfer capability. The draft final proposal discussed the question of applying the lower threshold to intertie locations and concluded that such treatment would be appropriate for larger inerties based on additional study.⁴ The draft final proposal also noted the CAISO’s intent to propose tariff language that would grant the CAISO flexibility to apply this treatment to large inerties.⁵ The draft tariff language proposed in that same document, however, neglected to address the intertie issue.⁶ On the CAISO’s January 26, 2023 stakeholder web conference, the CAISO provided stakeholders with revised draft tariff language addressing the intertie issue and providing minor incremental edits to the previously-proposed draft language. That language is included in this final proposal.

DC Energy and the Western Power Trading Forum (WPTF) suggested that the CAISO define in advance a timeline to assess applying the reduced threshold to intertie locations. Since this assessment is predicated on a software change which needs to be prioritized holistically with

¹ *The changes shown in this paragraph were made March 14, 2023, to more accurately summarize the changes in the “WEIM Decisional Classification” section on pages 43-44, and how ISO staff applies the relevant rules. These were the only changes to the paper, which is otherwise unchanged from the version posted February 8, 2023.*

² The paper is available at <http://www.caiso.com/InitiativeDocuments/EDAM-Governance-Final-Proposal-WEIM-Governance-Review-Committee-Phase-3.pdf>

³ See PSE comments (“the decisional classification for this item should not be determined until CAISO provides, at minimum, draft tariff language for EDAM”) on the Market Parameters Changes Enhancement stakeholder page at <https://stakeholdercenter.caiso.com/StakeholderInitiatives/Market-parameter-changes-enhancement>

⁴ Draft Final Proposal at p. 5

⁵ Draft Final Proposal at p. 5

⁶ Draft Final Proposal at p. 27

other software changes, it is not feasible to provide a definite timeline at this time. As requested by Pacific Gas & Electric, the CAISO will continue to analyze CRR performance and the impact of the proposed change. Once a schedule is identified to assess the impact of applying the reduced threshold to intertie locations, the CAISO will communicate these updates through the Market Performance and Planning Forum.

- **Adjusts proposed Tariff language about the parameter change process.** MRP is concerned with using the term *feasible* when referring to the market solutions as the basis upon which to trigger the process to adjust parameter values. The CAISO appreciates the concern of using the term *feasible*, which does not properly capture the essence of the condition. The CAISO has adjusted the proposed tariff language to read as follows: “*market solutions that do not align with scheduling priorities*”.

Furthermore, CAISO uses this opportunity to address additional comments and suggestions provided by stakeholders.

- **DC Energy and WPTF urge the CAISO to initiate a CRR stakeholder initiative to address concerns about the elements of the pro-rata funding policy.** The CAISO recommends that this request for a potential initiative be added to the Policy Initiatives Catalog and considered for prioritization in the Roadmap. Moving forward, CAISO will perform a targeted analysis on the drivers behind the settlements outcomes observed by market participants. This analysis will serve as a more specific reference to inform areas for further consideration. The drivers identified through this analysis will largely define the next steps for potential changes.
- **WPTF requested additional explanations about the interplay between the proposed change applied to the CAISO’s locations and the WEIM, and potentially to EDAM.** Under both the draft final and final proposal, the shift factor threshold will apply to only CAISO’s DLAPs and trading hubs (THs) because the issue to be addressed is a day-ahead market construct, residing in the interplay between the congestion revenue right market and the day-ahead market. For consistency, the logic extends to the real-time market for CAISO’s area. As explained in response to Puget’s comment, the change to the shift factor threshold would not apply to WEIM or EDAM, but rather would establish a methodology that, absent further stakeholder review, could logically be extended to EDAM. To ensure proper stakeholder review of the policy, as it may affect EDAM, and simultaneously move forward with this change for the CAISO’s balancing authority area, the CAISO commits to holding a catch-up stakeholder review for this policy in connection with drafting tariff language for EDAM. This catch-up review would also include any other new policies that may be adopted before that time for the CAISO’s balancing authority only that may be later applied to EDAM.

- **MRP’s concerns about the potential for undue discrimination by applying the reduced threshold to DLAPS and THs are misplaced.** The application of a reduced threshold is on locations of the transmission system and not based on the type of or who the market participant is. All participants bidding in at DLAP or THs will be subject to the same threshold and will be treated equally. As explained in the proposal, the differentiation of locations is based on the most fundamental aspect of a transmission system, which is the relative effectiveness of locations to a transmission constraint. The selection of the DLAPs and THs for a reduced shift factor threshold is based entirely on the significantly larger size of these aggregated locations (i.e., 20,000 MW for a DLAP versus a typical individual generating resources that could be 200 MW), which translates into significant power flow contributions even with relatively small shift factors. This concern for individual locations with smaller-size resources does not pose the same practical implications. Different resources being dispatched differently to manage congestion on a transmission constraint is not discriminatory but rather is a reflection of optimal dispatches accounting for the inherent locational nature of the transmission system based on physics.
- **MRP misrepresents the scope of the analysis presented by the CAISO in the draft final proposal.** MRP incorrectly asserts that the CAISO has relied on two cases at most to analyze the impact of the proposed change. In the draft proposal, the CAISO presented several different trading dates with each day consisting of 24 hours. This sample covered different trading days at different times of the day and year to capture various system conditions. The sample also included unique constraints from different parts of the system. The analysis presented cases where prices increased or decreased, unlike previous claims that the proposed change would only increase prices. CAISO also presented detailed analysis of the impact of primary issue being addressed with this proposal. CAISO has added additional analysis in this final proposal to have about 10 different days. The CAISO finds no merit in performing additional analysis because the previous analysis already covered a spectrum of conditions to assess the impact of the proposed change. It is not clear how additional analysis will provide any insights beyond what has already been presented, and believes that performing additional analysis will only serve to delay the initiative.

Furthermore, MRP is concerned that potential price changes indicated in the draft final proposal analysis will be significant. This concern is also misplaced because although the proposed change will impact prices, the outcome will be either higher or lower prices in a very narrow range for DLAPs and THs. However, the actual merit of the change should not be assessed on the basis of how much prices move by, but rather that the estimation of power flow contributions from these locations and consequently, the prices for DLAPs and THs, will be more reflective of the congestion impact of these locations.

MRP's concerns about the proposal for parameter changes are misplaced. MRP asserts that the proposal to adjust penalty prices in the scheduling run will unquestionably impact market prices. However, this is not accurate. The penalty prices in this proposal will be used in the scheduling run of the market solution which is primarily used to obtain optimal schedules. After that, the market generates binding prices in the pricing run. Therefore, changes to the penalty prices in the scheduling run will not directly impact prices because binding prices are not generated in the scheduling run.

- **MRP's comments and concern about the shift factor threshold conflates the merits of the two independent components of this proposal.** The argument of the shift factor threshold applied to DLAPs and THs is not within the scope of the proposal for parameter changes. A shift factor threshold is not a penalty price. Thus, the arguments presented by MRP about the merits of the threshold proposal relative to the process change is a moot point.

SHIFT FACTOR THRESHOLD

Background

Since the inception of its nodal market in 2009, CAISO has used a threshold for shift factors in its market optimization. This threshold effectively determines what power injections (from resources) are used in the congestion management process. Based on impact studies and simulations, CAISO arrived at a two percent threshold to determine which resources will be used for congestion management in its markets. CAISO deemed this threshold to achieve a reasonable balance between good utility practice for grid operations and undesirable market outcomes.

Since the initial implementation of the nodal market, CAISO has identified two impacts that the shift factor threshold has on its markets. First, CAISO identified a discrepancy in the price formation for aggregated pricing locations. In 2014, CAISO pursued a market enhancement to change the price formation logic for these aggregated locations. This new logic effectively eliminated the potential for a price discrepancy between default load aggregation points (DLAPs) and trading hubs (THs). Second, as early as 2014, CAISO identified that the shift factor threshold also exacerbated revenue inadequacy for congestion revenue rights (CRRs). Since then, CAISO has continued to monitor its impacts on the market.

On January 1, 2019, CAISO implemented a new policy of pro-rata funding for CRRs. Under this policy, the impacts of a shift factor threshold on the CAISO markets were more visible in market outcomes. Under certain conditions, the shift factor threshold negatively impacted the efficient interaction of the day-ahead market with the CRR market. CAISO provided specific analysis on this interplay in its CRR market performance report published on May 2020. This final proposal addresses the inefficiency introduced by the use of the shift factor threshold for aggregated locations in the CAISO's markets.

Shift factors, also known as sensitivity factors, measure a specific location's effectiveness relative to the change of power flow on a specific constraint. The shift factors depend on the transmission topology, the slack node choice, and the transmission system's specific characteristics like impedances. A location will typically be either a supply (generation) node or demand (load) node. For instance, a 40 percent shift factor means that 0.4 MW will flow on a constraint if 1 MW is injected and withdrawn between a given node and the slack node. If the shift factor is positive, the flow will increase by 0.4 MW on the given constraint. If the shift factor is negative, the flow will reduce by 0.4 MW on the given constraint. CAISO's market uses shift factors in both its congestion management process and its price formation mechanism. Shift factor values are typically in the range of negative 100 percent to positive 100 percent.⁷

CAISO's market produces and uses shift factors for both individual and aggregated nodes, such as generator-specific nodes or DLAPs. These are calculated for both physical and virtual resources, such as inerties, internal generators, convergence bids, and demand resources. The market calculates shift factor values relative to the slack node, which can be either an individual or distributed slack reference. Since its inception, CAISO's market has used a distributed slack node.

Congestion Management in CAISO Market

CAISO's market uses locational marginal pricing in its clearing process. This accounts for the locational nature of congestion and losses by producing Locational Marginal Prices (LMPs) that include energy, congestion, and loss pricing components. CAISO's market bases the LMP's decomposition on the slack reference choice. However, that choice does not affect the overall LMP value.

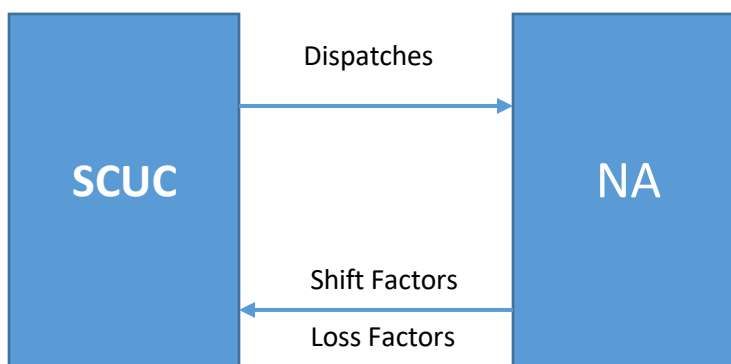
Congestion management refers to re-dispatches of market resources to comply with transmission limits. In order to comply with a transmission limit, the market relies on resources' operational characteristics, shift factors, and market bids. The shift factors determine the direction of the re-dispatch since some resources can exacerbate congestion while others can mitigate congestion. Resources located on one side of the constraint will increase generation, while resources located on the other side of the constraint will decrease generation.

Re-dispatching resources for congestion management is an integral part of the market clearing process. Transmission constraints are one type of constraint the market optimization considers to achieve a least-cost solution.

The CAISO's market clearing process uses a Security Constraint Unit Commitment (SCUC). This type of technology has become ubiquitous in electricity markets. As shown in Figure 1, the CAISO's SCUC design relies on two modules: one that solves for the SCUC problem and another that handles the network application (NA).

⁷ There have been some infrequent instances in which CAISO has posted shift factors outside the 100% range; this applies for nomograms which typically have not been normalized.

Figure 1. Iterative calculation in the CAISO's market clearing process



The SCUC module solves for unit commitments and dispatches. Then, the NA module uses these resource dispatches to run a full alternating current (AC) power flow. The AC power flow produces both shift factors and loss penalty factors at a given operating point. The SCUC module then uses these shift factors to form linearized power flow constraints. These constraints also rely on the base operating point to estimate the full power flow contribution. The SCUC module will enforce these constraints and dispatch resources so that transmission limits are respected. This process represents the congestion management performed through the market clearing process.

As part of the solution, the market determines updated resource dispatches, which in turn are sent to the NA module which performs another estimation of AC power flows. Based on this new AC power flow, the NA module calculates a new set of shift factors and loss penalty factors, which in turn are sent back to the SCUC module. This iterative process converges to a solution after a finite number of cycles and within certain timeframe and optimality criteria.

Every SCUC-NA iteration finds what transmission constraints become overloaded in the AC power flow to then enforce them in the SCUC module and apply congestion management. Since a given market may have hundreds of transmission constraints with hundreds of locations with associated shift factors, the number of shift factors and constraints to optimize can grow rapidly and pose a computational burden on the SCUC solution. For this reason, only constraints that have a capacity loading of at least 85 percent are actively considered in the market and subject to congestion management.

When any linearized power flow enforced in the SCUC module binds, or reaches its limit, it will be priced accordingly with a shadow price.⁸ The marginal congestion component of the LMPs at a given node i is formed by using the linear combination of the shadow prices μ_k of all transmission constraints k binding and the shift factor $SF_{k,i}$ of that given node, or

⁸ As part of its transparency effort, CAISO posts all shadow prices for the various types of constraints binding across the CAISO markets.

$$MCC_i = \sum_k SF_{k,i} \mu_k \quad \forall i$$

Shift Factor Threshold

CAISO markets currently apply a 2 percent threshold on shift factors. The impact of this threshold is reflected in both resource re-dispatch and price formation.

In the congestion management process, only resources with a shift factor greater than 2 percent will be effectively considered for re-dispatch. When the nodal market was launched in 2009, it was observed that the market could potentially utilize generators located far away, electrically speaking, from the constraints being managed and be measured by a small shift factor. This could lead to an unreasonable re-dispatch of these generators for very little congestion relief on the constraint in question. This would not be prudent or consistent with good utility practice.

In the price formation process, shift factors below the threshold for any binding constraint are not utilized to derive the marginal congestion component. This consistently disregards the impact of resources (injections/withdrawals) shift factors for both resource dispatches and their prices. This also means that resources will receive dispatches that are consistent with the prices cleared in the market.

The threshold applies to any shift factors derived in the market, with no consideration to whether they are associated with locations that have only certain type of resources. The threshold is applied the same way to individual resources or aggregated resources, and to physical or virtual resources.

Market Issues

The use of a shift factor threshold in the congestion management of day-ahead energy market has manifested in two main issues. First, the use of a shift factor threshold can result in an overpayment of CRR settlements due to overestimating the implied CRR flow on a given transmission constraint. Second, the use of a shift factor threshold may result in flow contributions not accounted for in the day-ahead flow settlements by means of not collecting sufficient congestion rents, and in some extreme cases it can lead to flow reversals in the CRR settlements. These two issues are explained in more detail in subsequent sections below.

Overestimation of CRR Payments

The first issue due to the application of a shift factor threshold also arose in the analysis of the CRR performance. Both the day-ahead energy and the CRR markets perform congestion management as part of the clearing process. Both markets calculate shift factors and produce marginal congestion components as part of the price formation mechanism.

The shift factors from the CRR processes can be different than the day-ahead market shift factors due to a variety of reasons including transmission configuration and model differences. For instance, an outage modelled in the day-ahead market but not modelled in the CRR auction may potentially yield different shift factors. However, the largest contributor to the CRR deficit is the use of the shift factor threshold in the day-ahead market but not in the CRR market. The CRR auctions use direct current-(DC) based shift factors with no threshold in place. When the CRR auction clears for CRRs, it takes into account any shift factor contributions even if they are smaller than 2 percent. The flow estimated in the CRR auction will consider the contributions of all CRRs. When these CRR injections are applied to the day-ahead shift factors to calculate CRR payments, only the injections and withdrawals related to shift factors greater than 2 percent will contribute to the CRR estimated flow. These flow contributions on the CRR flows can be in either direction – prevailing or counter-flow – and can result in a higher or lower CRR flow than was released in the CRR processes. The lack of accounting for the contributions for locations with shift factors below the threshold resulted in a settlements CRR flow higher than what the CRR flow was in the CRR process. Once these contributions are actually factored in, the flows between the day-ahead market and the CRRs processes converged closer.

Although this issue can be observed at any pricing location, the most significant impact occurs when the issue involves DLAPs and THs with shift factors below the 2 percent threshold. Since these aggregated locations have large injections up to thousands of megawatts, dropping injections/withdrawals with relatively small shift factor even under 2 percent will still not account for a large flow contribution.

This issue was systemic and resulted in CRR deficits for the Devers-Valley constraint, which was binding in last quarter of 2019 and the first two months of 2020. Based on a targeted analysis of this issue, about 40 percent of the CRR deficit on this constraint was caused by using a shift factor threshold in the energy markets but not in the CRR markets.⁹

Under-collection of Congestion Rents

The day-ahead congestion rent measures how much transmission capacity is priced in the day-ahead market. In the congestion management process of the day ahead market, the linearized power flows are estimated at a given based flow from the most recent operating point, and the incremental change around that operating point given the day-ahead shift factors and injections from supply and demand. The base flow is not optimized in the market, only the incremental flow using the shift factors with the supply and demand dispatches being the optimized variables. When estimating the base flow on a constraint in the NA module, the contribution of the aggregate locations will be accounted for but if the DLAPs and THs have shift factors below 2 percent, they will not contribute to the redispatch for congestion management in the SCUC module. The market issue identified in the

⁹ Full analysis results can be found in section 8.3 of the CRR performance report available at <http://www.caiso.com/InitiativeDocuments/CongestionRevenueRightsMarketAnalysisReport-May12-2020.pdf>

CRR performance becomes relevant when dealing with aggregated locations such as default load aggregation points (DLAPs) or Trading Hubs, which are significantly larger than any typical individual resource. For instance, in the summer with loads over 45,000 MW of peak load, the DLAPs can easily be greater than 10,000 MW. When the shift factor of 2 percent is applied, it means that an injection of 10,000 MW with an effectiveness of, say, 1.5 percent will not contribute to congestion rents, even though this means a flow contribution of 150 MW (10,000 MW * 1.5%) on a given constraint. This market issue of under collecting congestion rents can be observed only for constraints in which DLAPs and THs have shift factors that may fall below the 2 percent threshold. In the analysis of the CRR performance, CAISO observed multiple instances of this interplay being more likely to occur when constraints are of small capacity relative to the DLAPs and THs flow contributions. This condition can easily lead the constraint to reverse direction in the CRR settlements. In relative terms to the overall CRR settlements, this issue is small, but it alone does represented an impact of \$3 million of settlements reversal in the first 15 months of the implementation of the new policy¹⁰.

Impact Analysis

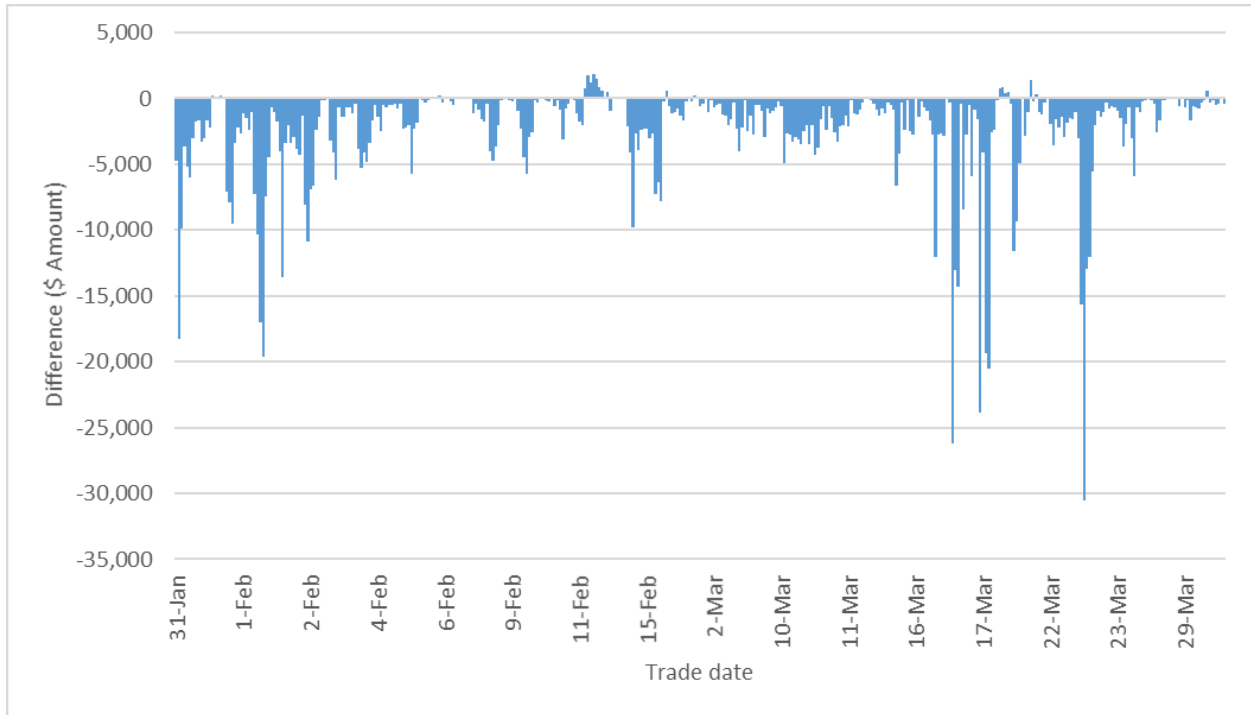
This market issue was observed in the first months of 2022 on the constraint 33020_MORAGA_115_32780_CLARMNT_115_BR_1_1. This constraint started binding frequently in the day-ahead market between January 31, 2022 to March 31, 2022. Since it was binding in the day-ahead market, the congestion rents collected from the day-ahead market should ideally be sufficient to fund the CRR payments for this constraint.

Since the implementation of the CRR auction efficiency initiative in January 2019, the CRR payments are adjusted based on the entities' CRRs contributions on deficits on a constraint-by-constraint basis. The initiative introduced the terms notional amount and offset amount. The notional amount is the face-value numerical amount based on the CRR awarded amounts, while the offset amount represents the revenues that would be reduced due to the mechanism of partial funding. When the difference between the notional amount of the constraint and offset amount on the same constraint for the trade date is positive, the scheduling coordinator will be paid the reduced amount through the CRR settlement. If the difference is negative, the scheduling coordinator will be charged the CRR settlement (negative amount).

Figure 2 shows the difference between the notional amount and offset amount (deficit) for the 33020_MORAGA_115_32780_CLARMNT_115_BR_1_1 constraint between January 31, 2022 and March 31, 2022. For approximately 89 percent of the hours when the constraint was binding, the difference was negative, which indicates that the offset amount was greater than the notional amount. Consequently, scheduling coordinators holding CRRs on this constraint needed to pay for holding CRRs settled on that constraint.

¹⁰ Full analysis results can be found in section 8.2 of the CRR performance report available at <http://www.caiso.com/InitiativeDocuments/CongestionRevenueRightsMarketAnalysisReport-May12-2020.pdf>

Figure 2: Difference between Notional and Offset amount for 33020_MORAGA_115_32780_CLARMNT_115_BR_1_1 constraint



More granular analysis of February 1, 2022 helps illustrate these issues in more detail. Figure 3: shows the comparison of notional amount and offset amount (deficit) and shows that the offset amount was significantly higher than notional amount that is the face value of CRR-awarded payments.

Figure 3: Comparison of Notional Revenue and Offset Revenue for one sample trade (February 1, 2022)

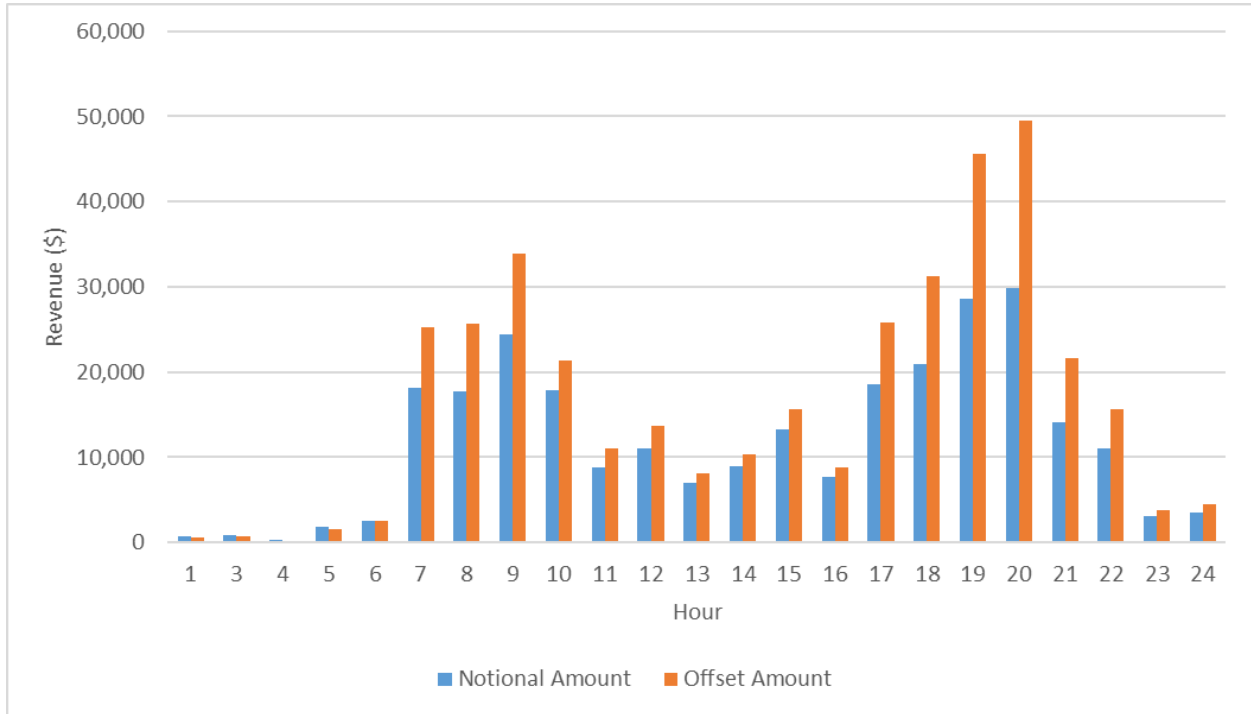
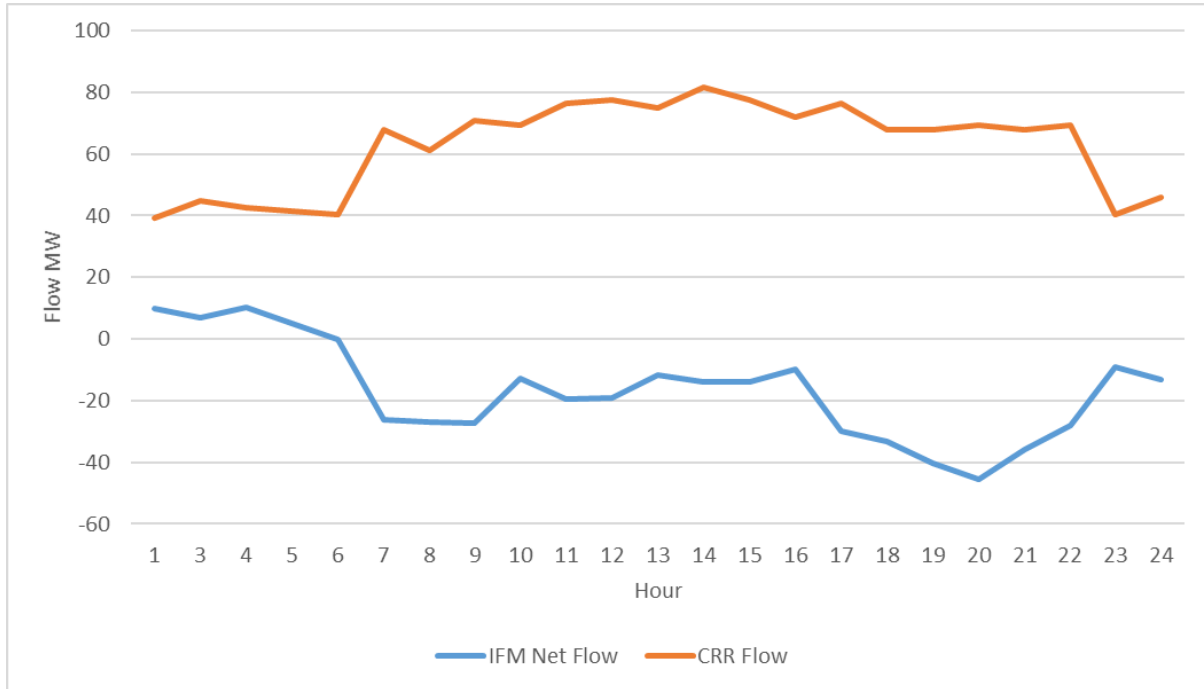


Figure 4 below shows the comparison of IFM flows and CRR flows on this constraint for the same trade. It shows that the IFM flows and the CRR flows are significantly different. The IFM net flow is the amount of flow that collected congestion rents on this constraint from the day-ahead market. The limit of this constraint is about 120 MW for this trade date and the equivalent CRR flow on this constraint (based on the awarded CRRs) is between 60 and 80 MW, while the settled IFM flows are between -5 and -45 MW.

Figure 4 Comparison of IFM net flows with the CRR flows for one sample trade date (February 1, 2022)



For instance, the CRR flows for hour-ending 20 is about 69 MW; however, the corresponding IFM net flow was around -45 MW. For this scenario, the flow contribution of the DLAP injections was not being accounted for in the calculation of IFM net flow because the DLAP shift factor was below the threshold of 2 percent. By missing that contribution, the resulting IFM flow is much lower with less congestion rents being collected.

Additional analysis was performed for the months of January 2022 – October 2022, and it shows the impact amount for the constraints when the offset amount is greater than notional amount. Although the proposal in this initiative is more targeted to the issue driven by the shift factor threshold, there may be other drivers for this type of outcome. Another reason identified in previous analysis efforts is the impact of loop flows considered in the day-ahead market solution.

However, the offset revenue impact is the amount of offset revenues that exceeded the notional revenues based on the historical percentages of offsets for those same constraints. The assumption was based on the average percentages of offset revenues for the constraint and applied that percentage to the intervals when offset revenues was greater than notional revenues.

For example, consider constraint A to be binding and having notional revenues of \$1,000 for one hour. The issue of the lack of shift factors for the DLAPs and THs (less than 2 percent) will have an impact on the offset revenues on constraint A. The offset revenues would be greater than notional revenues; in this case, assume offset revenues to be -\$1,600. The negative quantity indicates a deficit that would need to be offset from the notional revenues. However, based on the historical offset

percentage over notional revenues for the same constraint, let's assume the offset revenue is estimated at -\$400. So the offset revenue impact for this example would be -\$1,200, which is the offset being applied in excess.

Figure 5 shows the offset revenue impact classified by transmission lines with their voltage level, nodal group constraints, nomogram and inerties. The more significant impact is on lower-voltage transmission constraints such as those 115 kV and 230 kV. It does not impact the higher 500 kV lines or other interfaces such as nomograms or inerties or nodal group constraints.

Figure 5: Offset revenue impact for all the constraints from January – October 2022

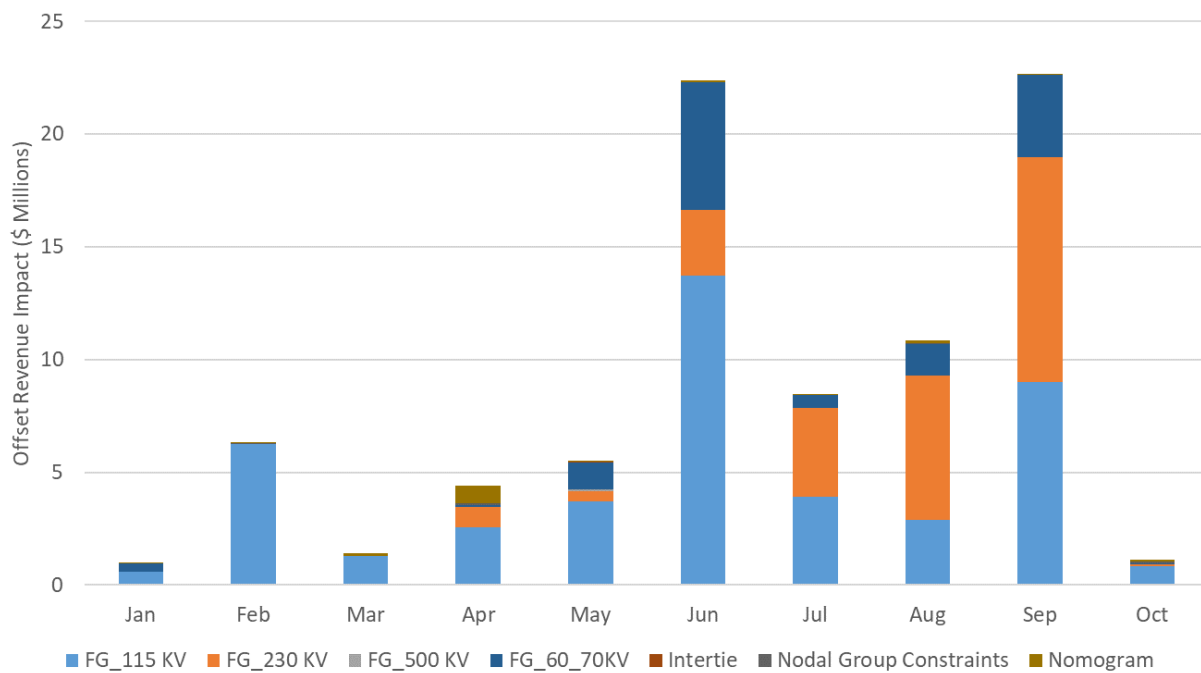


Figure 6 shows the offset revenue impact on an hourly pattern showing that the majority of the impact is on the 115 kV lines and 230 kV lines impacting during the peak hours. It shows that the majority of the impact is seen in the peak hours (HE 15 – 21) and mostly on the 115kV and 230 kV lines.

Figure 6 Offset revenue impact for all the constraints from January – October 2022 on hourly basis

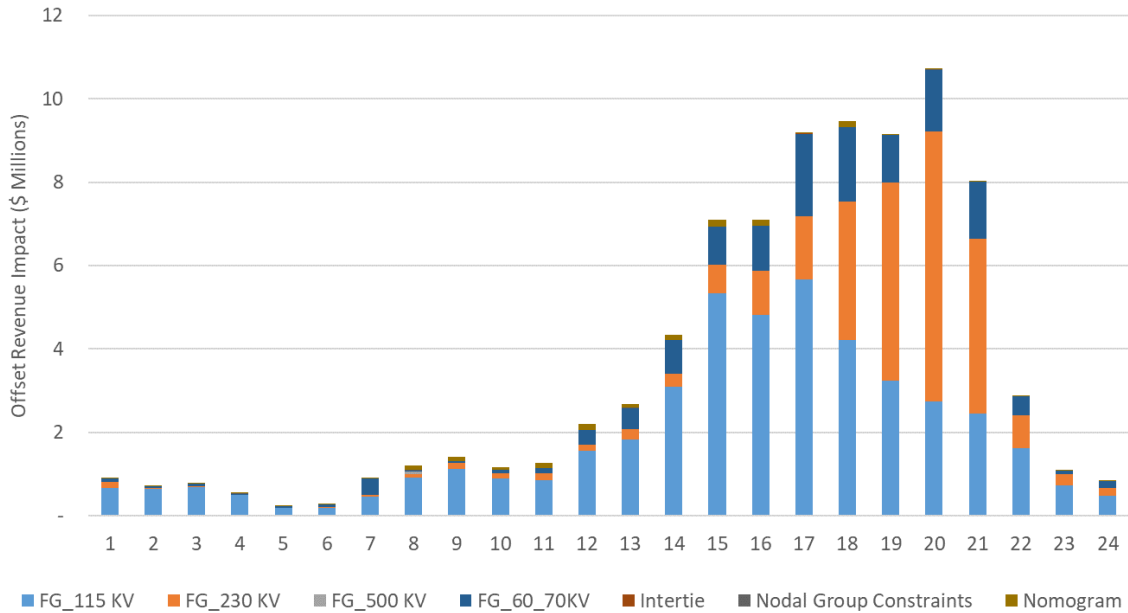
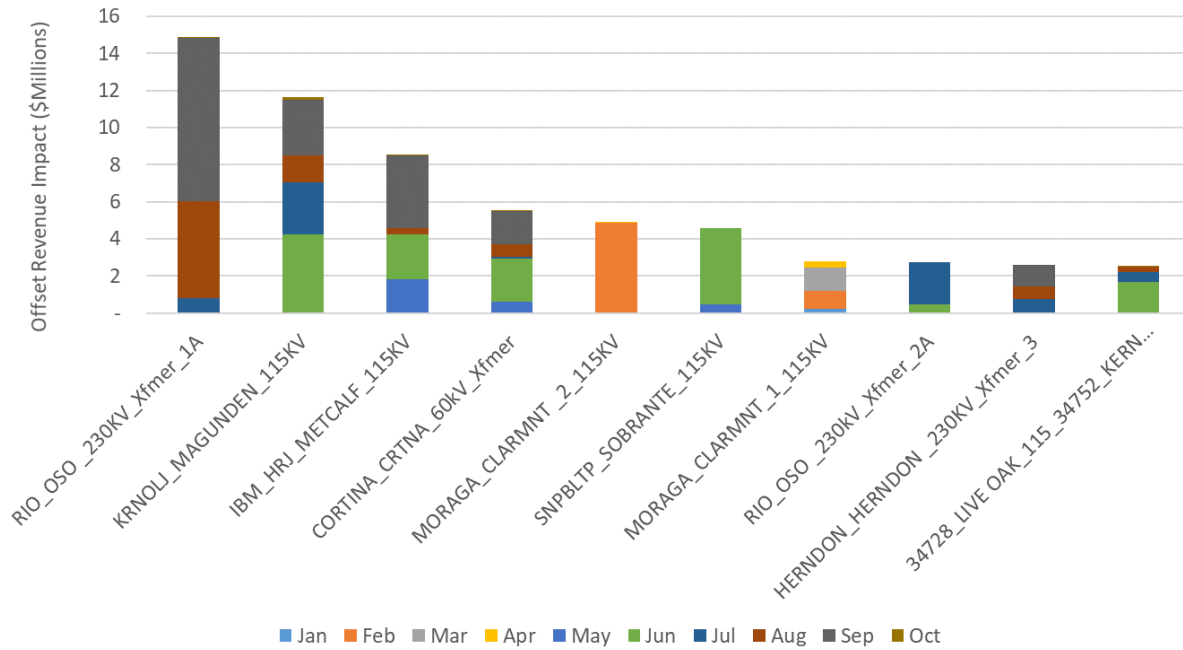


Figure 7 shows the top ten constraints that were most impacted due to the shift factor thresholds. The 32214_RIO OSO _115_30330_RIO OSO _230_XF_1A had the most offset revenue impact from all the months analyzed, followed by 34724_KRN OLJ_115_34736_MAGUNDEN_115_BR_1_1. It shows that there are mostly 115 kV line that are impacted from the list of top 10 constraints.

Figure 7 Offset revenue impact for the top ten constraints from January – October 2022



Pricing Analysis

Some participants requested pricing analysis of this proposed change. This section has been added to the draft to illustrate the impact of the proposed change on prices.

By considering flow contributions of DLAPs and THs below 2 percent, they will not be considered in the congestion management for re-dispatch and consequently will also be part of the price formation. Therefore, it is expected that this change will have an impact on congestion management and congestion prices for the CAISO area. On one hand, the price impacts are expected to be relatively minor because the contributions that will be included are based on fairly small shift factors. When the shadow prices of the constraints is multiplied by the small shift factor, the price contribution will be in proportion of the shift factor value. For example, if a shadow price of \$100 is now accounted for the DLAP injection with a shift factor of 0.8 percent, the price change of the marginal congestion component will be $\$0.8 = \$100 * 0.008$.

Since congestion management is part of the market clearing process, the price impact cannot be determined accurately based on an original market solution. Therefore, to perform the price impact analysis, the day-ahead market was re-run with the shift factor for DLAPs and THs lowered to 0.00001.

Since the congestion management will not consider additional flow contributions, in general it will impact the overall clearing process. Thus, in addition to impacting the formation of the MCCs, it may also lead to small changes in the system energy marginal prices. There were eight trade dates chosen for analysis which were identified from the offset revenues analysis presented in the section above.

There are two aspects of price impact analysis: 1) impact on the system marginal energy component, or energy prices, and 2) impact on the marginal congestion component. One trade date analyzed was during the summer heat wave on September 7th, 2022 when one of the constraints in the PG&E area was impacted significantly due to the lack of DLAPs flow contributions with using the shift factor threshold of 2 percent.

System Marginal Energy Component Impact

With the inclusion of the reduced shift factors for DLAPs and THs, the impact on energy component was negligible when examined in the counterfactual analysis. Figure 8 shows that energy component increased in some peak hours and decreased in some off-peak hours. However, there was an increase of about \$8/MWh in some peak hours, indicating there was not a significant impact on the energy prices as seen by the difference in energy prices with and without the shift factor threshold reruns.

Figure 8 Average difference in SMEC for the 11 trade dates analyzed

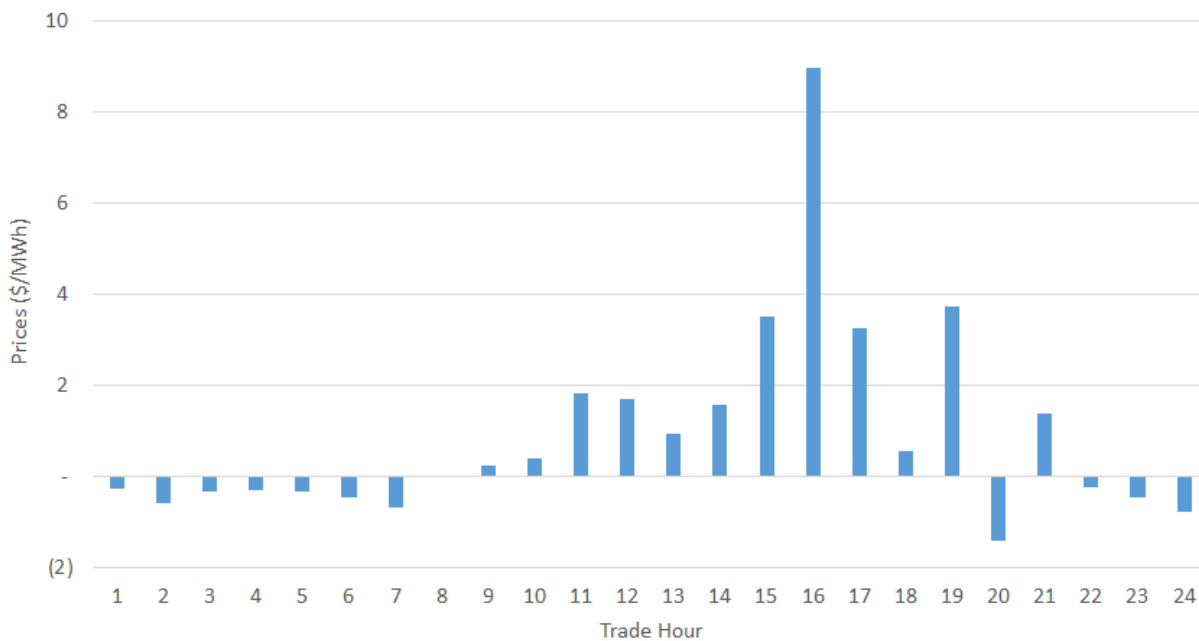
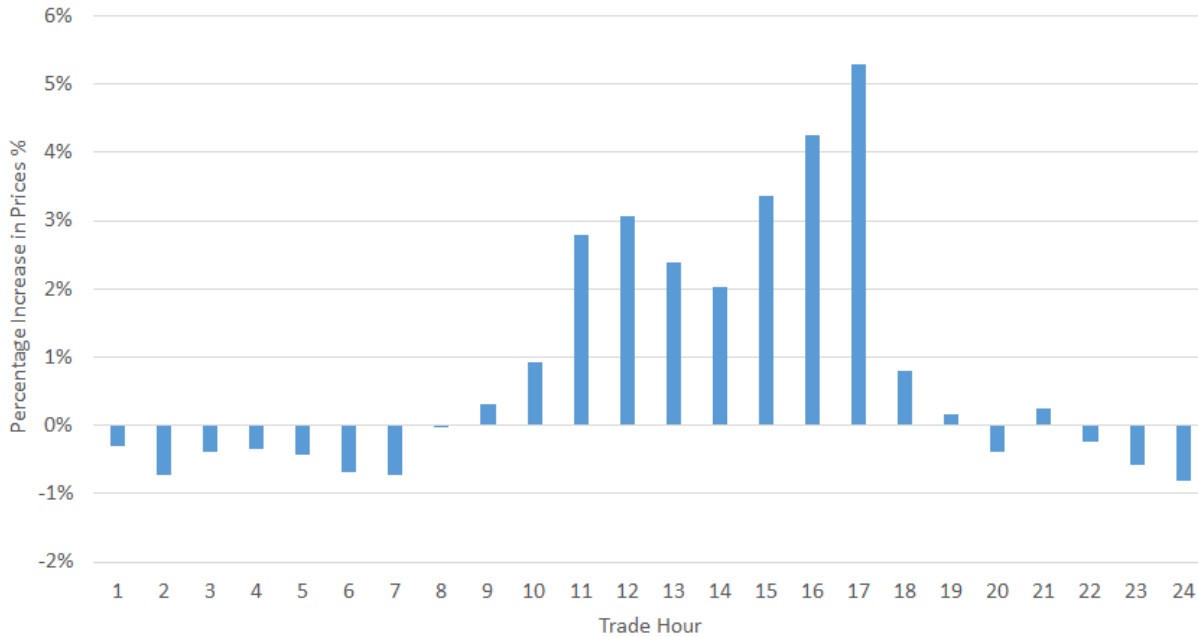


Figure 9 shows the percentage change in energy prices across the 11 trade dates analyzed. Both metrics show there is not any significant impact on the energy prices if the shift factor threshold of 2 percent is removed from DLAPs and THs.

Figure 9 Average percentage change in energy prices



Marginal Congestion Component Impact

The more direct impact of this proposed change will materialize in the marginal congestion component. Figure 10 shows the difference in marginal congestion component by using reduced shift factor threshold for DLAPs and THs. A positive difference in the chart indicates that the marginal congestion component increased when reducing the shift factor threshold for DLAPs and THs.

With the introduction of shift factor for DLAPs and THs, the flow contribution will be impacted and there is an expected slight change in congestion component (positive or negative) because the flow contribution has changed. A positive shift factor indicates an active power injection at the node increases the power flow on the transmission line whereas a negative shift factor indicates an active power injection at the node decreases the power flow on the transmission line and direction.

September 7, 2022

For the trade date September 7, 2022, hour-ending 19, the marginal congestion component saw an increase as the shift factor for the DLAP PG&E was negative; however, the shift factor for SDGE and SCE were positive, resulting in a reduction of the marginal congestion component. There are other constraints that are binding and that contribute to the MCC.

Figure 11 shows the comparison of marginal congestion component for all four DLAPs between the original and the rerun. It shows the magnitude of the increase in MCC with respect to the original price.

Figure 10 Difference in marginal congestion component for September 7, 2022

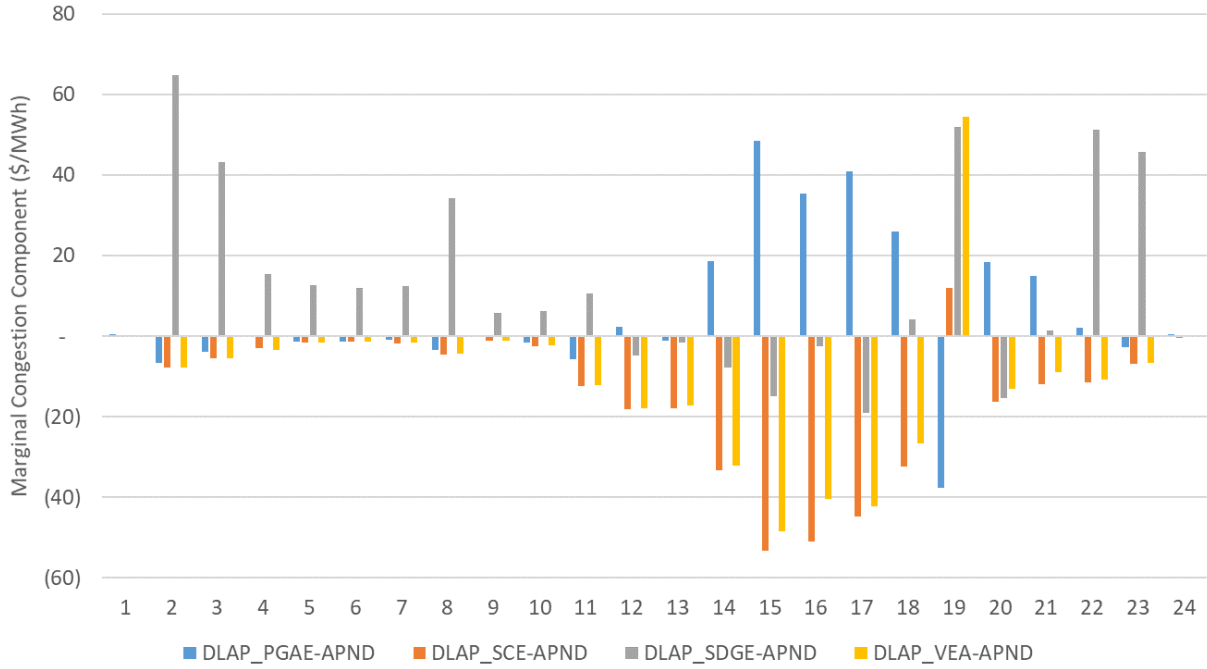
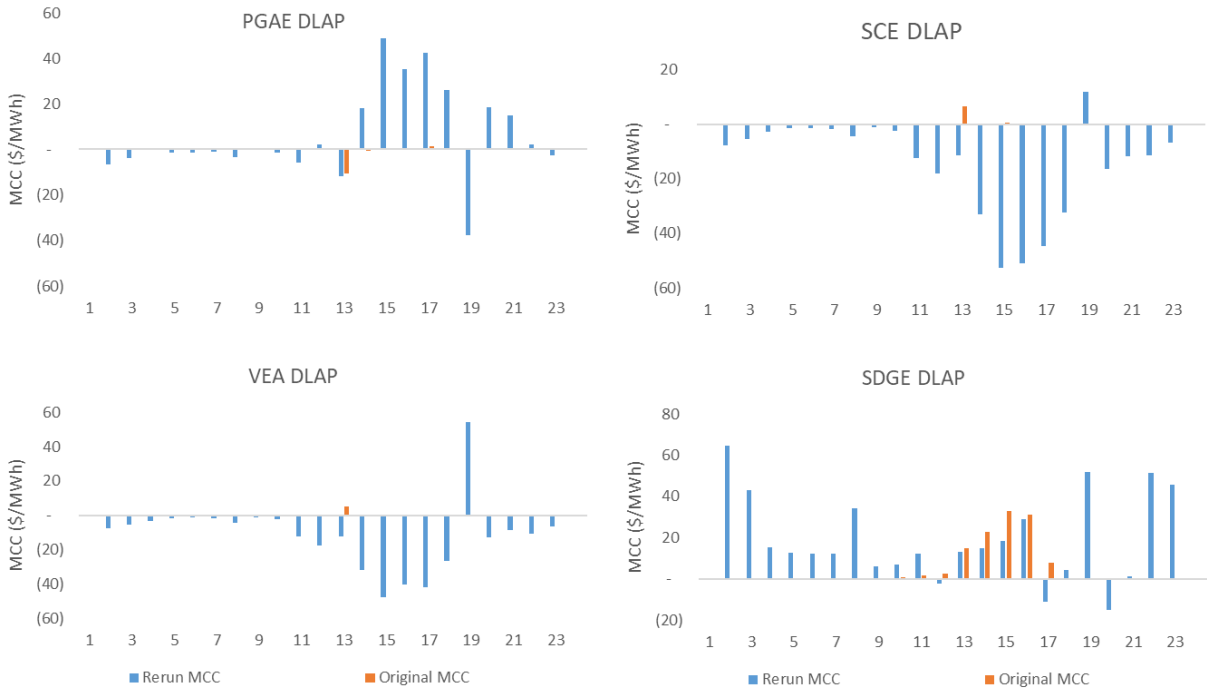


Figure 11 Comparison of marginal congestion component for September 7, 2022



January 31, 2022

January 31, 2022 which saw an increase in the marginal congestion component for the PGAE DLAP due to a negative shift factor for this constraint. Due to the positive shift factor for SCE and SDGE DLAPs, the MCC of those DLAPs decreased.

Figure 13 shows the comparison of MCCs for both the original results and the counterfactual. It does indicate that there was an increase in PGAE DLAP MCC for this trade date as compared to the original solution. However, other DLAPs saw either a decrease in MCCs or more hours with negative MCCs as compared to the original runs. There was an increase in the hours when there was non-zero MCC for the reruns.

Figure 12 Difference in marginal congestion component for January 31, 2022

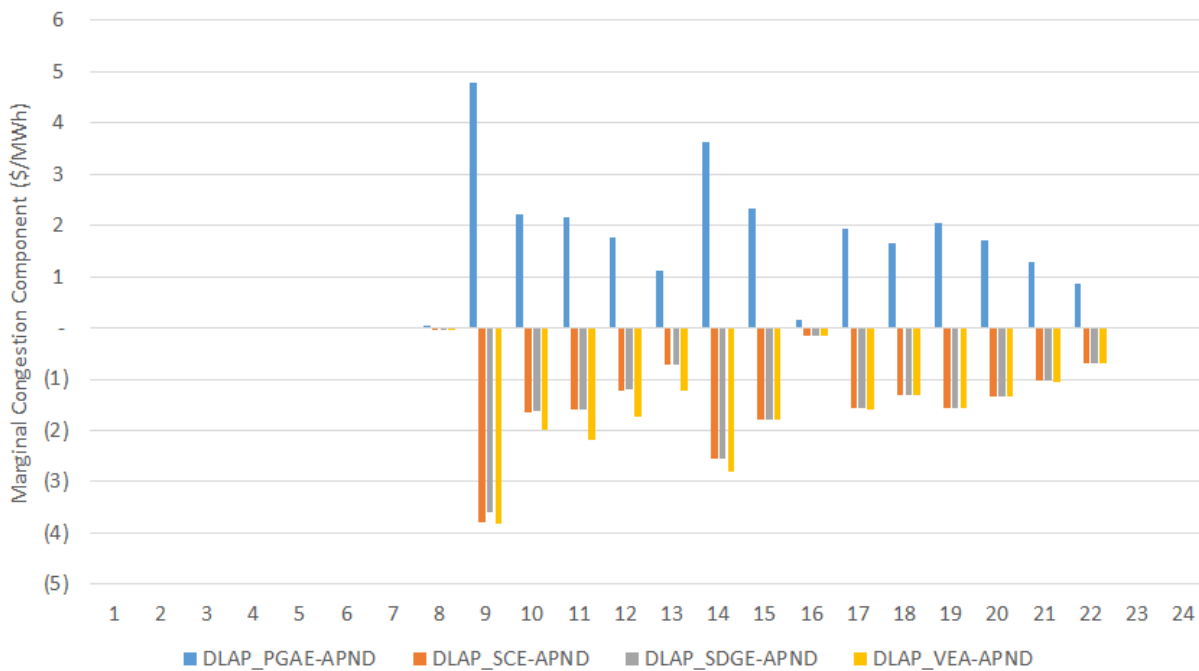
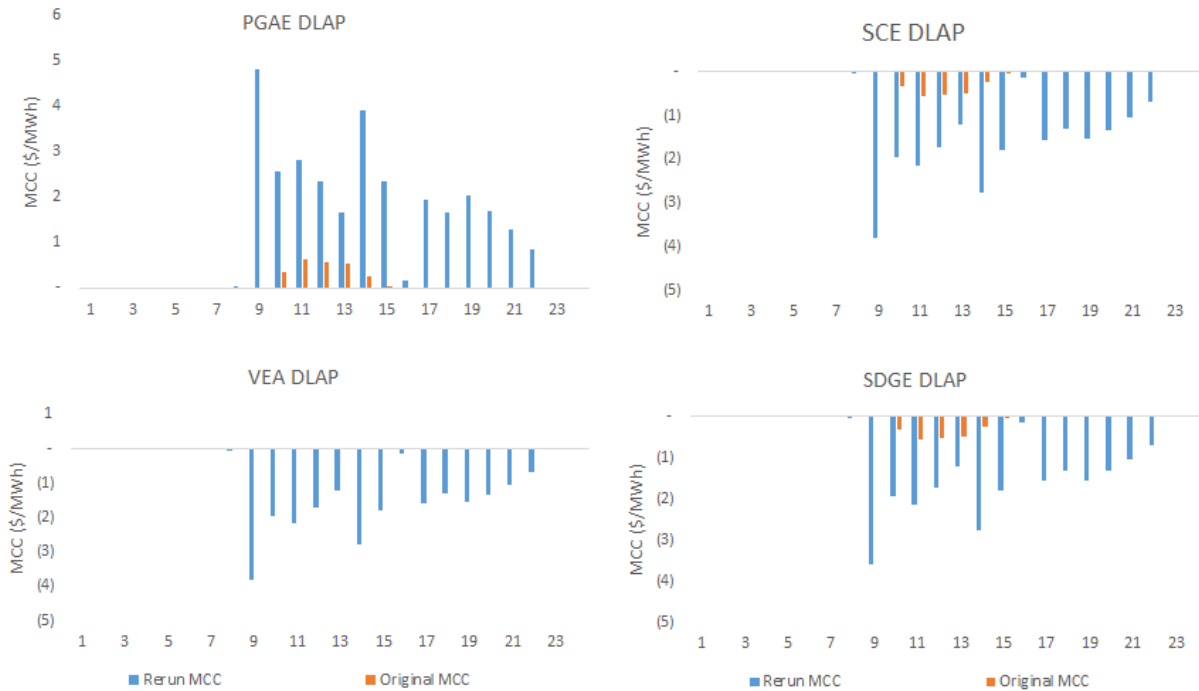


Figure 13 Comparison of marginal congestion component for January 31, 2022



August 1, 2022

Another trade date that was analyzed was August 1, 2022 as shown in Figure 14. This trade date had several constraints binding especially in HE 13 where the interplay between shift factors for different constraints and direction causing the marginal congestion component for SCE, SDGE and VEA DLAP to increase and PGAE DLAP to decrease.

Figure 15 shows the comparison of MCCs between the original results and reruns for August 1, 2022. It shows the MCC does not change significantly for the first 12 hours of the trade date. However for HE 13, the MCC in the original run was almost zero for all the DLAPs however with the introduction of shift factor threshold, all the DLAPs saw a non-zero MCC showing the impact of this proposal.

Figure 14 Difference in marginal congestion component for August 1, 2022

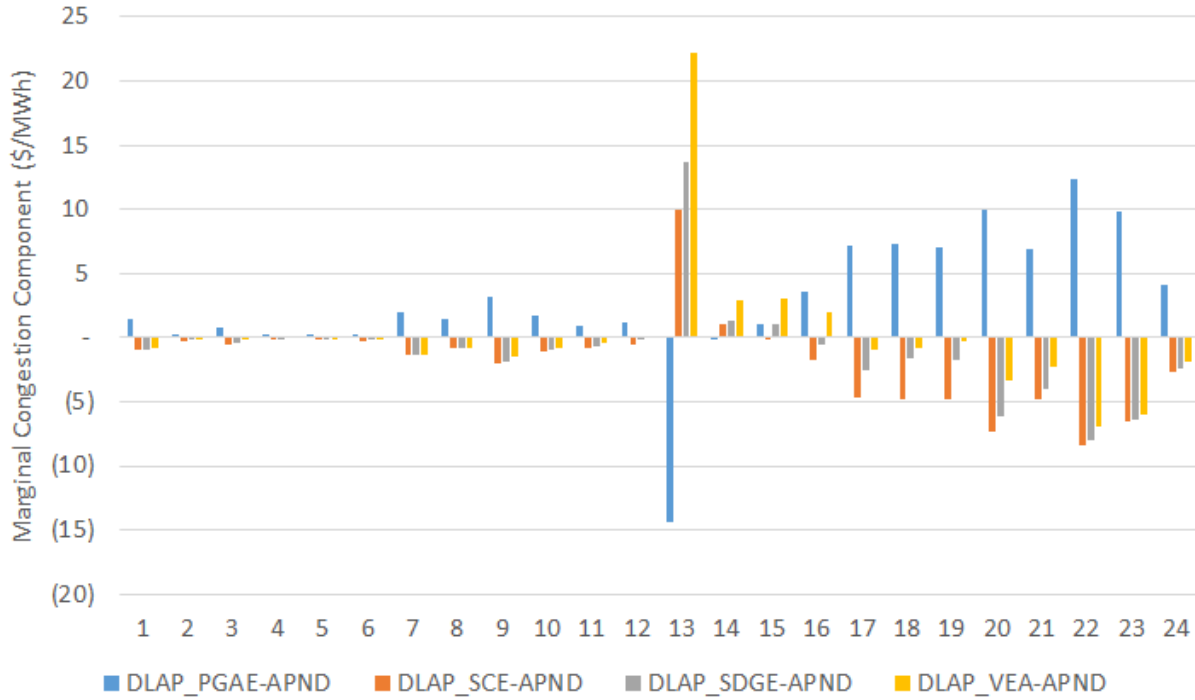
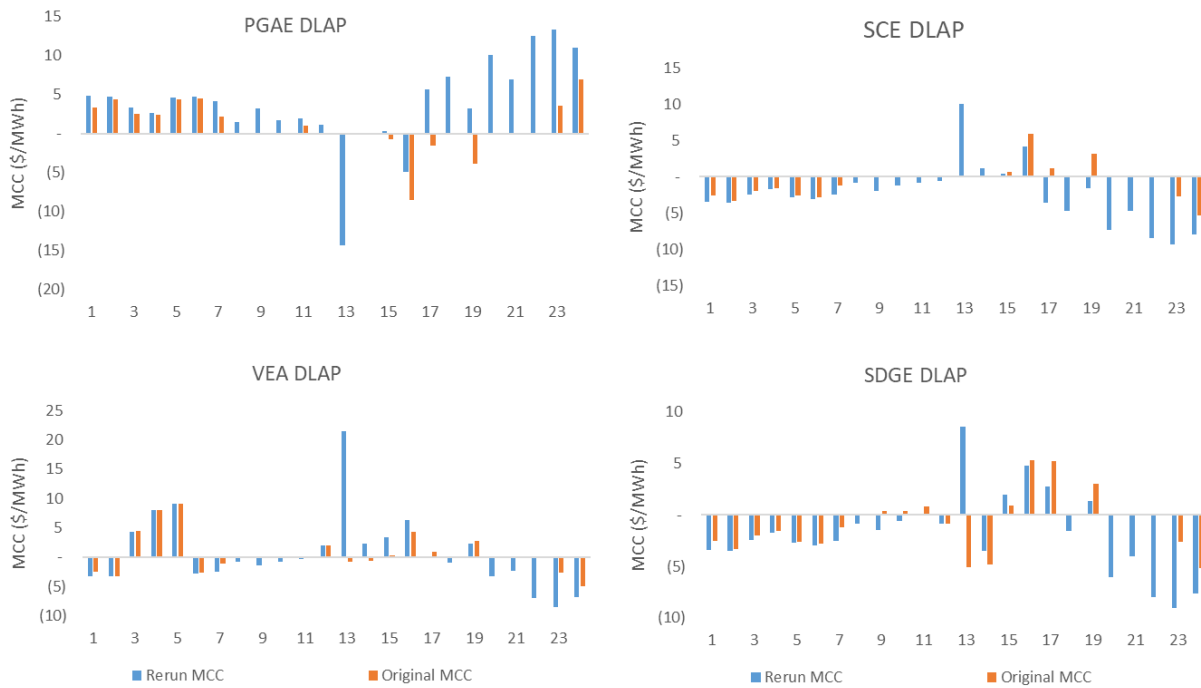


Figure 15 Comparison of marginal congestion component for August 1, 2022



April 19, 2022

One additional trade date analyzed was April 19, 2022 as shown in Figure 16, when there were several constraints binding for all hours. The change in the marginal congestion component depends on the shift factors for that constraint and the direction. Figure 17 shows the comparison of MCCs for different DLAPs for April 19, 2022 between the original solution and the counterfactual. It shows that there was non-zero MCC for several hours in the original case. There was a change in the congestion pattern for the DLAPs depending on the impact of shift factor from different constraints.

Figure 16 Difference in marginal congestion component for April 19, 2022

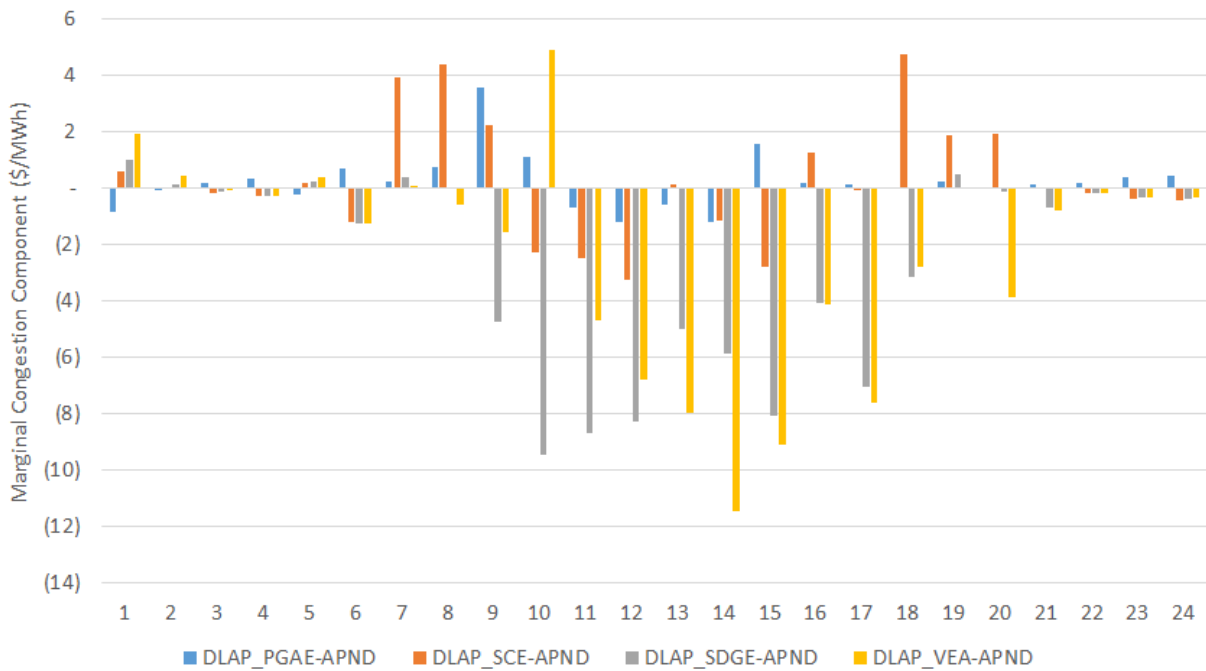
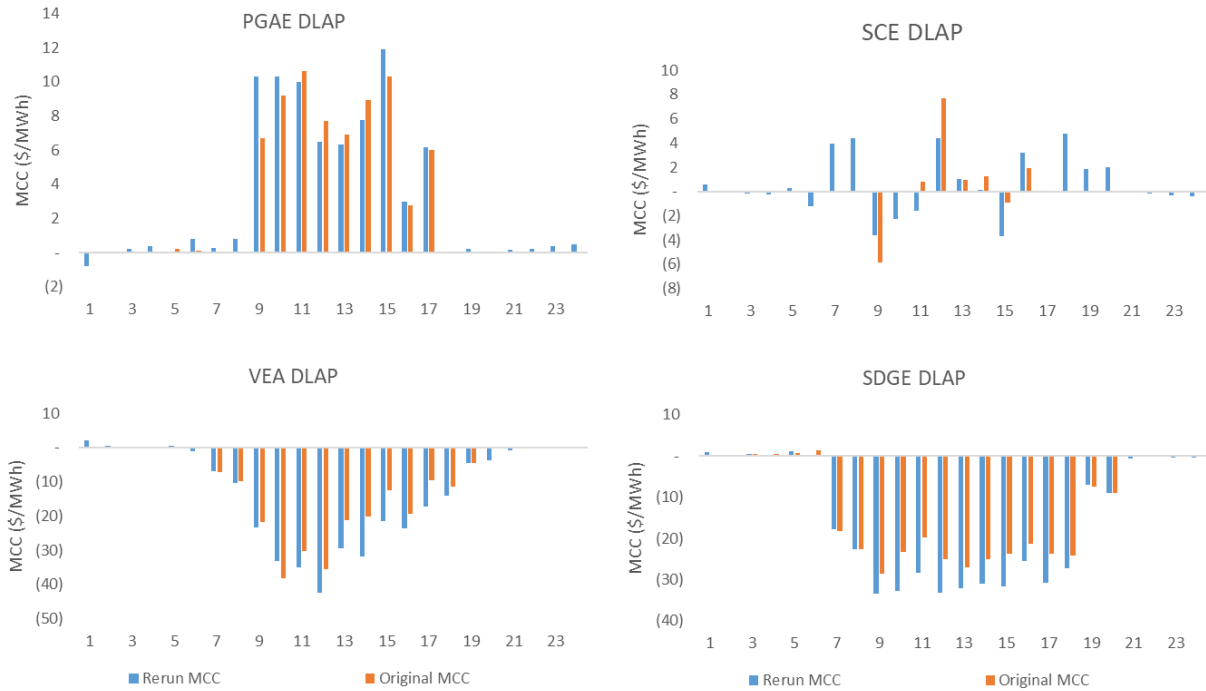


Figure 17 Comparison of marginal congestion component for April 19, 2022



May 23, 2022

One additional trade date analyzed was May 23, 2022 as shown in Figure 18. There were several constraints binding for all hours. The change in the marginal congestion component depends on the shift factors for that constraint and the direction. Figure 19 shows the comparison of MCCs for different DLAPs for May 23, 2022 between the original solution and the counterfactual. It shows that there was non-zero MCC for several hours in the original case. There was a change in the congestion pattern for the DLAPs depending on the impact of shift factor from different constraints.

Figure 18 Difference in marginal congestion component for May 23, 2022

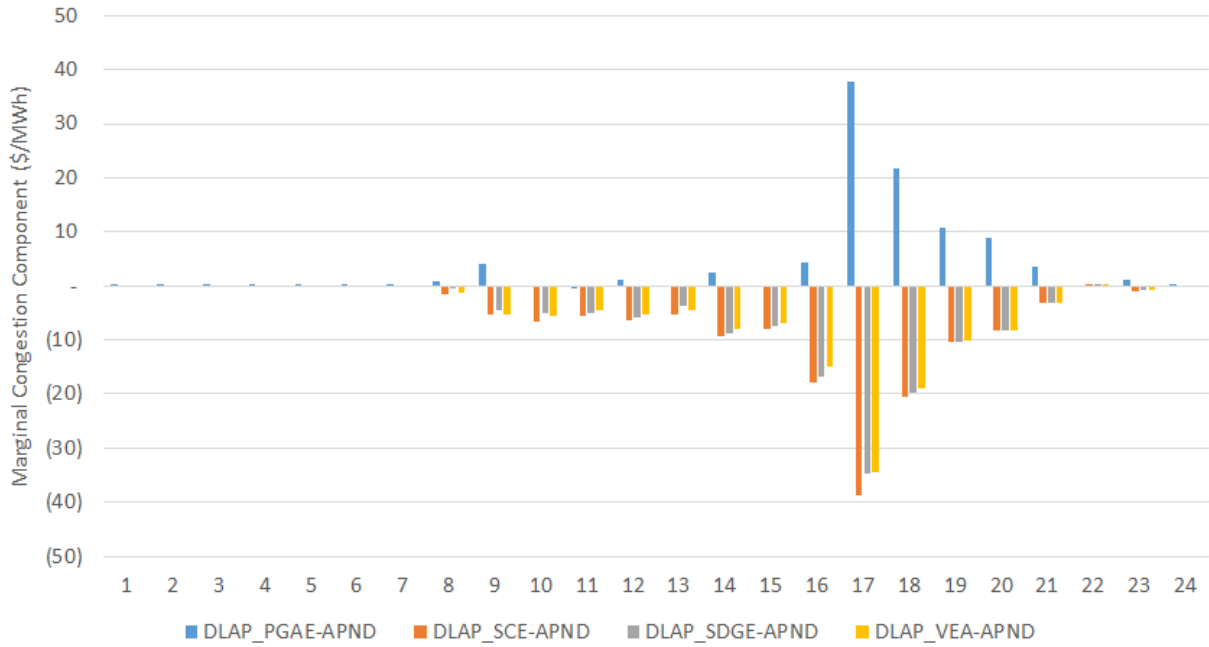
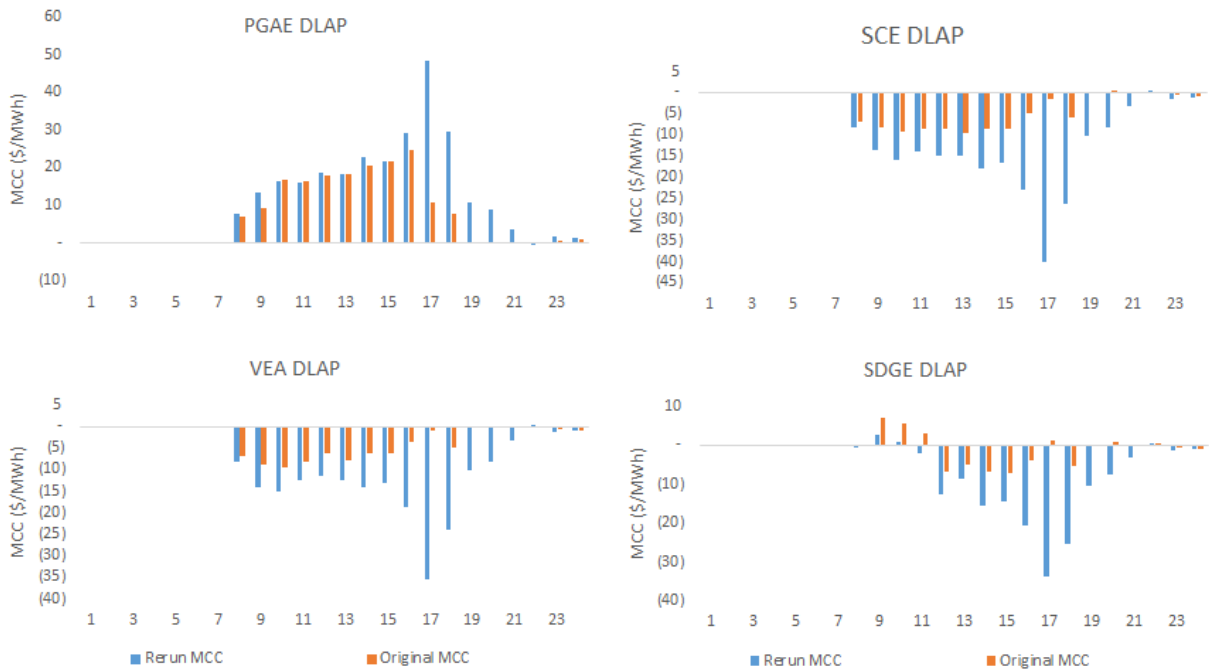


Figure 19 Comparison of marginal congestion component for May 23, 2022



June 23, 2022

One additional trade date analyzed was June 23, 2022 as shown in Figure 20Figure 18. There were several constraints binding for all hours. The change in the marginal congestion component depends on the shift factors for that constraint and the direction. Figure 21 shows the comparison of MCCs for different DLAPs for June 23, 2022 between the original solution and the counterfactual. It shows that there was non-zero MCC for several hours in the original case. There was a change in the congestion pattern for the DLAPs depending on the impact of shift factor from different constraints.

Figure 20 Difference in marginal congestion component for June 23, 2022

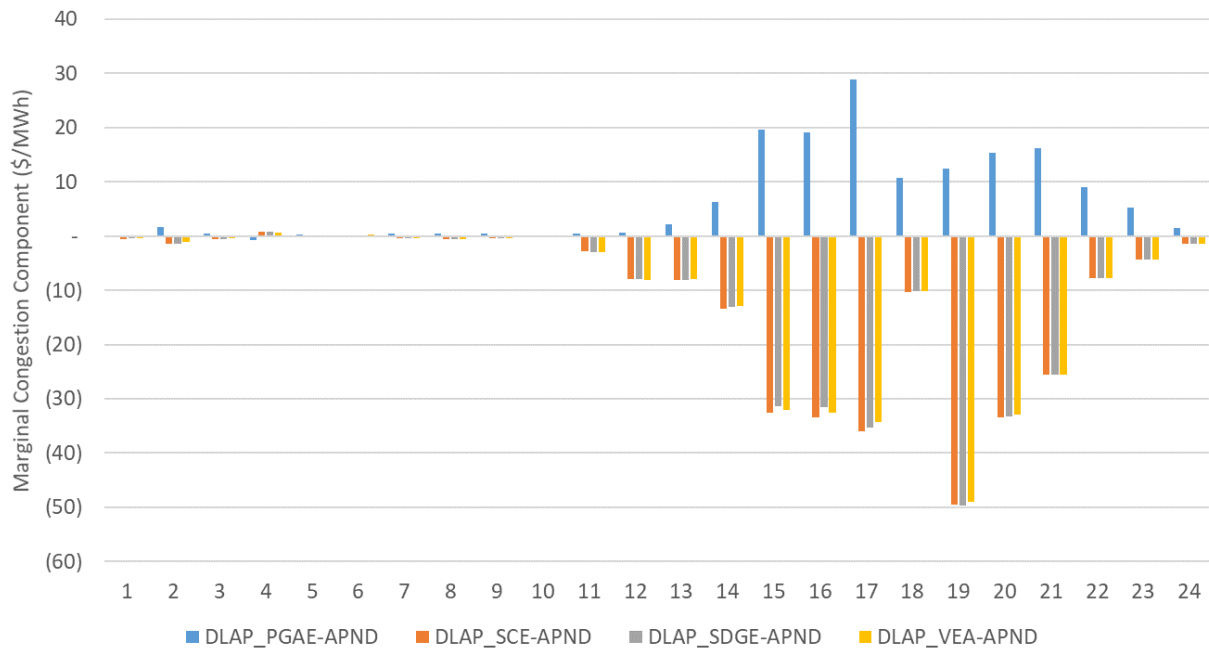
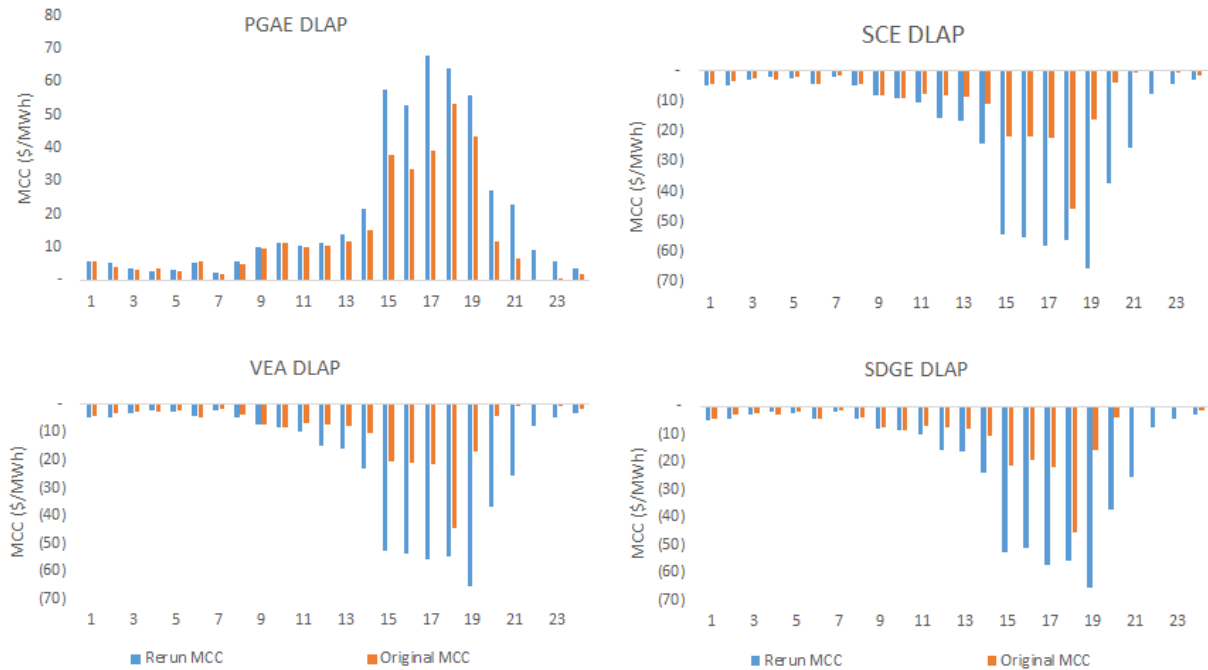


Figure 21 Comparison of marginal congestion component for June 23, 2022



May 20, 2022

One additional trade date analyzed was May 20, 2022 as shown in Figure 22. There were several constraints binding for all hours. The change in the marginal congestion component depends on the shift factors for that constraint and the direction. Figure 23 shows the comparison of MCCs for different DLAPs for May 20, 2022 between the original solution and the counterfactual. It shows that there was non-zero MCC for several hours in the original case. There was a change in the congestion pattern for the DLAPs depending on the impact of shift factor from different constraints.

Figure 22 Difference in marginal congestion component for May 20, 2022

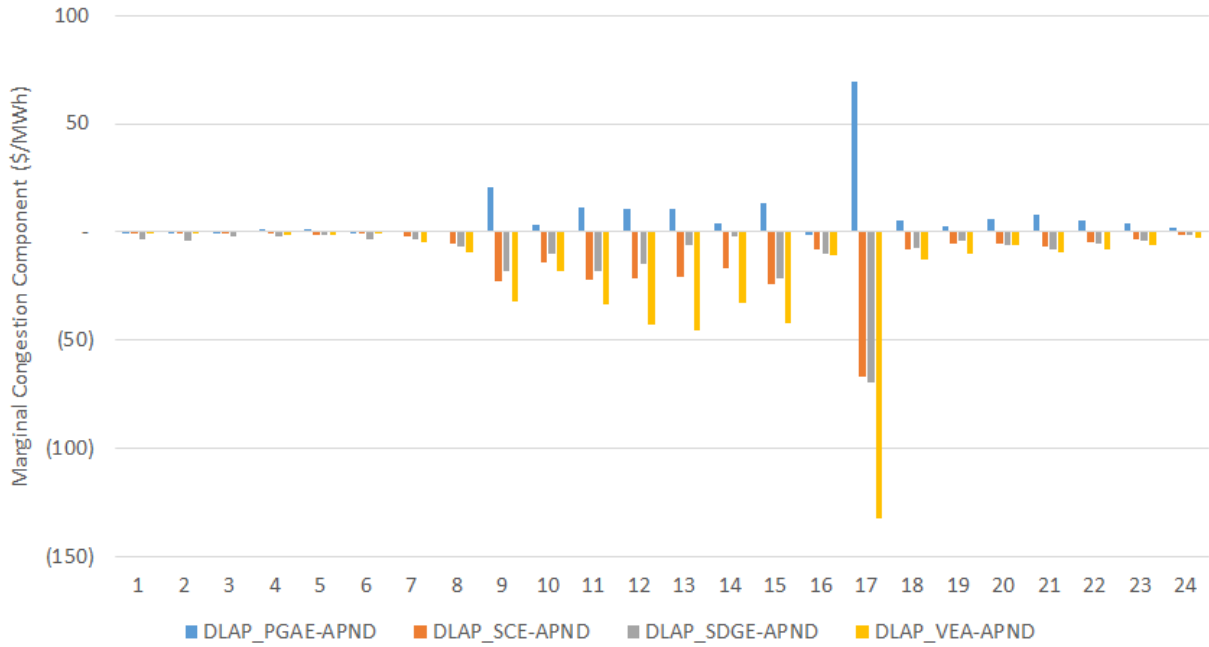
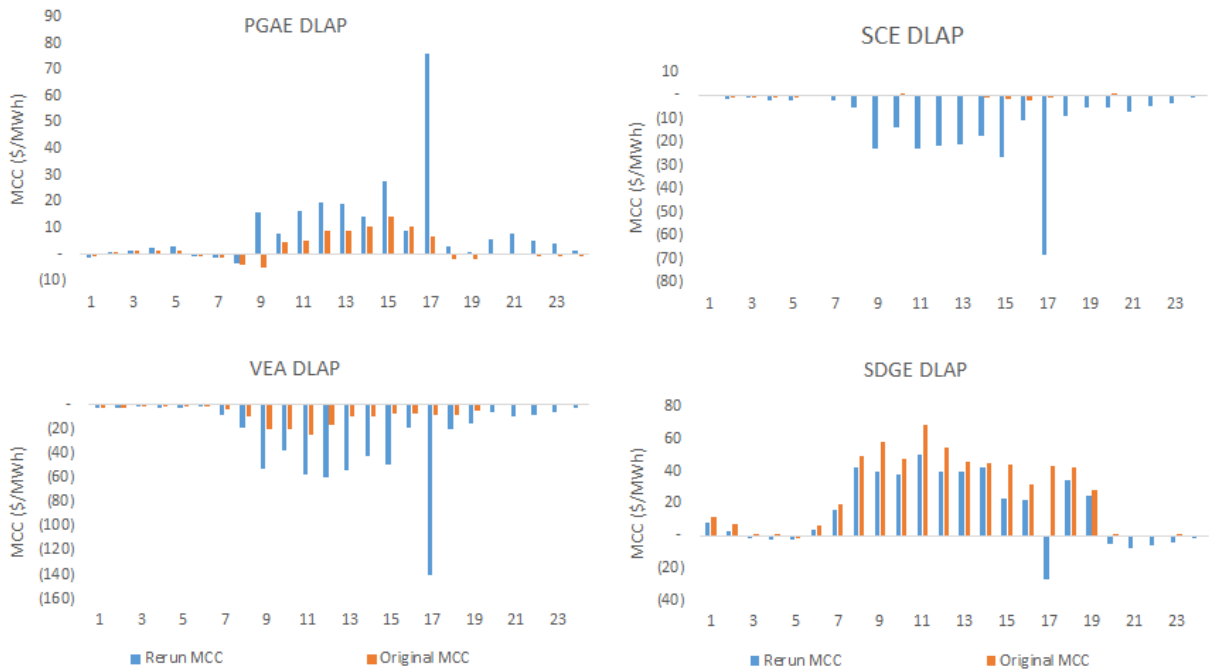


Figure 23 Comparison of marginal congestion component for May 20, 2022



August 31, 2022

One additional trade date analyzed was August 31, 2022 as shown in Figure 24. There were several constraints binding for all hours. The change in the marginal congestion component depends on the shift factors for that constraint and the direction. Figure 25 shows the comparison of MCCs for different DLAPs for August 31, 2022 between the original solution and the counterfactual. It shows that there was non-zero MCC for several hours in the original case. There was a change in the congestion pattern for the DLAPs depending on the impact of shift factor from different constraints.

Figure 24 Difference in marginal congestion component for August 31, 2022

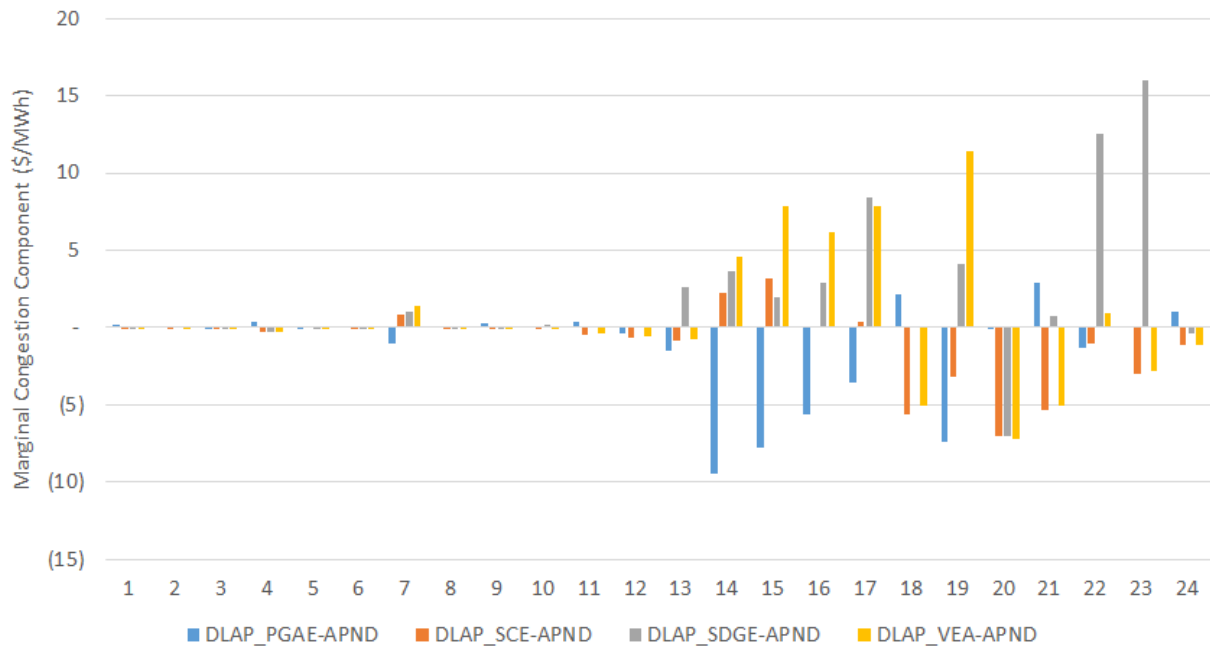
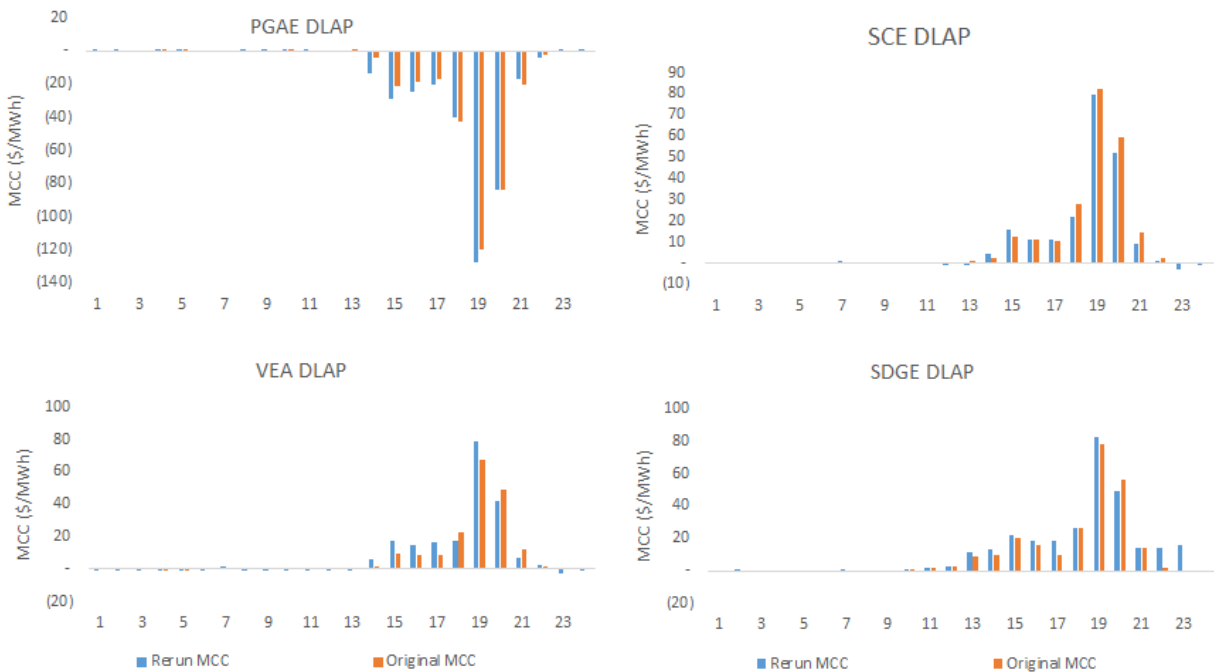


Figure 25 Comparison of marginal congestion component for August 31, 2022



June 10, 2022

Another additional trade date analyzed was June 10, 2022 as shown in Figure 26. There were several constraints binding for all hours. The change in the marginal congestion component depends on the shift factors for that constraint and the direction. Figure 27 shows the comparison of MCCs for different DLAPs for June 10, 2022 between the original solution and the counterfactual. It shows that there was non-zero MCC for several hours in the original case. There was a change in the congestion pattern for the DLAPs depending on the impact of shift factor from different constraints.

Figure 26 Difference in marginal congestion component for June 10, 2022

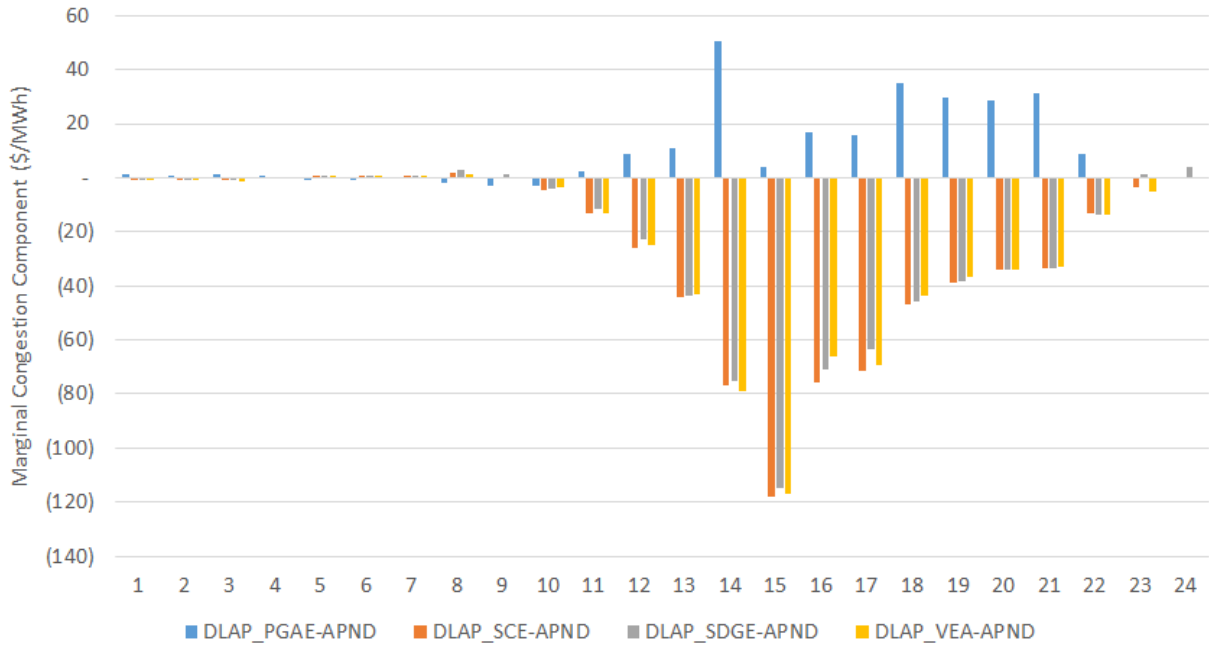
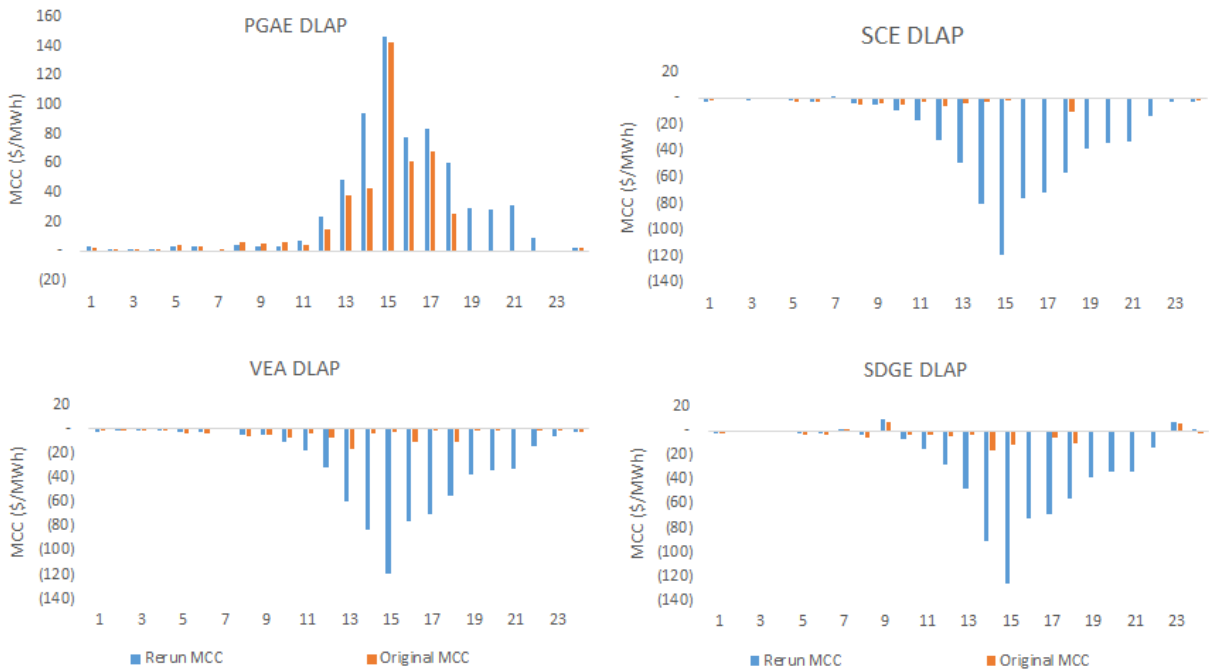


Figure 27 Comparison of marginal congestion component for June 10, 2022



September 5, 2022

Another additional trade date analyzed was September 05, 2022 as shown in Figure 28. There were several constraints binding for all hours. The change in the marginal congestion component depends on the shift factors for that constraint and the direction. Figure 29 shows the comparison of MCCs for different DLAPs for September 05, 2022 between the original solution and the counterfactual. It shows that there was non-zero MCC for several hours in the original case. There was a change in the congestion pattern for the DLAPs depending on the impact of shift factor from different constraints.

Figure 28 Difference in marginal congestion component for September 05, 2022

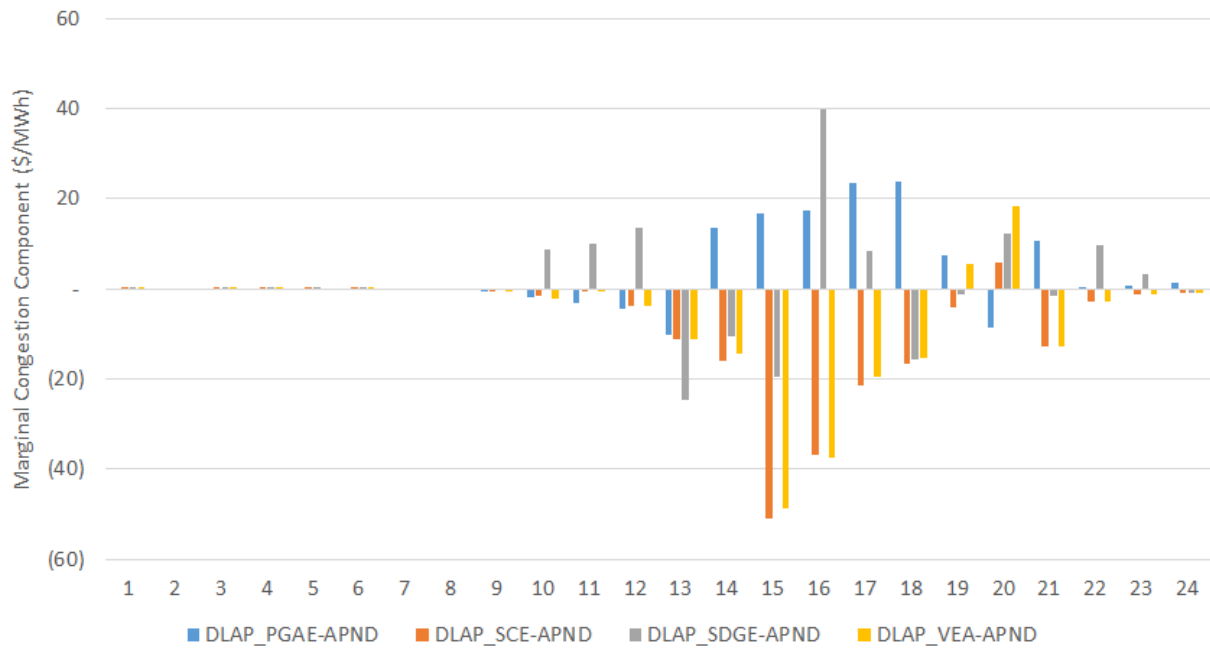
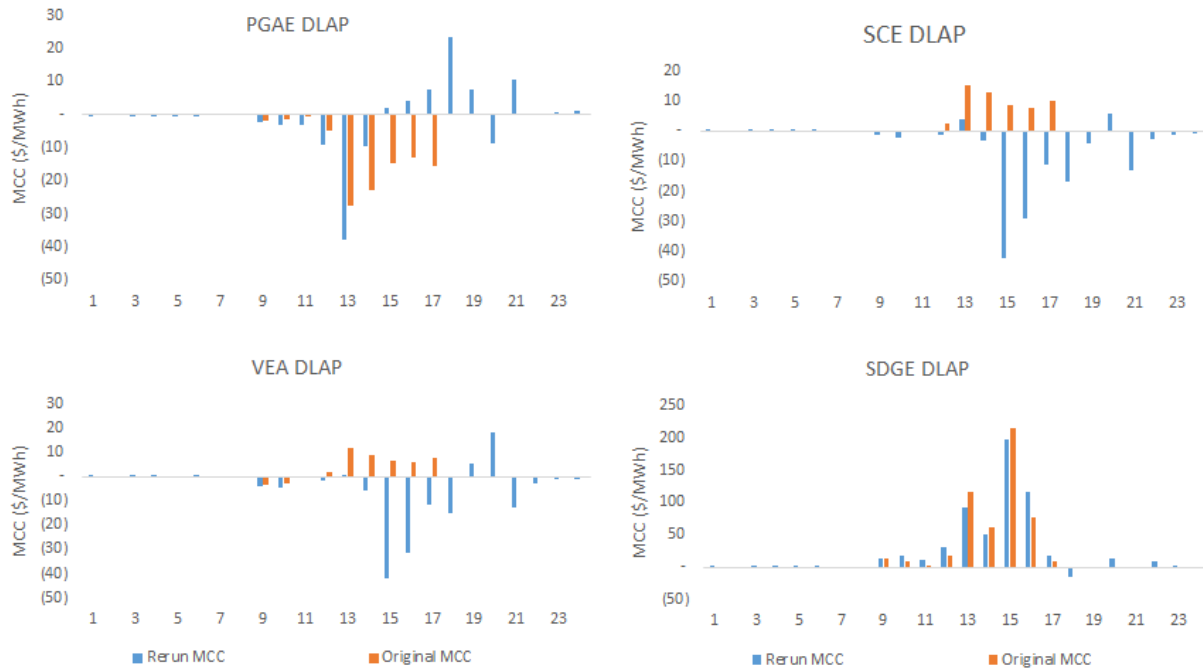


Figure 29 Comparison of marginal congestion component for September 05, 2022



The marginal congestion component impact due to reducing the shift factor threshold for the DLAPs and THs is not significant. The increase or decrease of the MCCs is a factor of the sign convention of the shift factors indicating the direction of the power flow and congestion pattern.

In summary, the proposed change will impact the price formation of the MCCs for DLAPs and THs; the price change can be either an increase or reduction on the price depending on the relative effectiveness of the DLAP and THs to the congestion management on the given transmission constraint.

Proposed Solution

To address the issues identified with the use of a shift factor threshold in the CAISO’s energy market, CAISO proposes to adjust the use of the shift factor. The two percent threshold will continue to apply largely to all locations with the exception of the large aggregated demand and generation locations, namely DLAPs and THs. For these two sets of specific aggregated locations, the two percent threshold will be reduced to 0.2 percent. This proposed value strikes a balance between not considering extremely low values that can result in an impactful increase of computational efforts in the market clearing process while still trying to capture the flow contributions of these large aggregated locations. This logic will apply in both the congestion management process and in the price formation of marginal congestion components (MCCs) in the same way it is currently done for locations with shift factors above 2 percent. This will ensure that dispatches and prices remain consistent.

This modification will apply to both physical and virtual resources in both the day-ahead and real-time markets. In the day-ahead market, DLAP resources are active variables used for congestion management and thus the application of the threshold has implications on these resources' dispatches and their price formation. In the real-time market, such DLAPs and ELAPs are not variables in the congestion management because the real-time market uses demand forecasts instead of bid-in demand. Thus, this has no implications in the real-time re-dispatch of DLAPs, but is still used in the real-time price formation to derive MCCs. Thus, this will also apply in the price formation process in the real-time market.

Since the underlying driver is the CRR implications with the day-ahead settlements, this change will apply only to CAISO's DLAPs and THs; this will not apply to ELAPs and DGAPs of the Western Energy Imbalance Market. This item will need further consideration for large aggregated locations in areas participating in the Extended Day-Ahead Market.

CAISO is proposing to move forward with a resolution to the issue driven by the shift factor threshold and will continue to assess and identify any other drivers for the CRR outcome where the pro-rata allocation of deficiencies result in reversal of CRR settlements.

Based on stakeholder comments, the CAISO also considered how the lowered threshold should apply to intertie locations. The CAISO concluded that it would not be appropriate to apply the lowered threshold to all interties. Applying the lower threshold to significant interties would provide similar benefits to applying the lower threshold for DLAPs and trading hubs. The CAISO, however, has to balance those benefits against the drawbacks of reducing the threshold for smaller interties. Applying the lowered threshold to an intertie with minimal transfer capability functionally could be the same as applying the lowered threshold to a regular pricing node. To maintain the flexibility to strike this trade-off based on operational experience and additional study, the CAISO proposes to define in the business practice manual its methodology for establishing which interties have sufficient transfer capability to justify applying the lowered shift factor threshold.

Proposed Tariff Language

Since the proposed solution is very narrow to the application of a reduced threshold to specifically DLAPs and THs location in the CAISO balancing area, CAISO proposes the following Tariff language within the scope of this final proposal in lieu of a dedicated stakeholder iteration for Tariff Language changes. Participants are encouraged to provide feedback on the proposed Tariff Language, which will be considered prior to filing this proposal with FERC.

27.4.3.5 Effectiveness Threshold

The CAISO Markets software includes a lower effectiveness threshold setting that governs whether the software will consider a bid “effective” for managing congestion on a congested Transmission Constraint, which in the case of Nomograms will be applied to the individual flowgates that make up the Nomogram, rather than to the Nomogram itself. The CAISO sets this threshold at two-tenth of a percent (.2%) for Trading Hubs; Default LAPs; and Interties with significant Total Transfer Capability, as specified in the Business Practice Manual. The CAISO sets the threshold at two percent (2%) for all other Nodes.~~The CAISO will set this threshold at two percent (2%).~~

MARKET PARAMETER CHANGE PROCESS

Background

The optimization process of the CAISO’s energy market uses a set of parameters known as penalty prices to enforce the relative scheduling and relaxation priorities in the market clearing process. The values of these parameters are defined based on studies and analysis to ensure the expected priority under different scenarios is maintained. When new functionality and market features are introduced, all the values of these parameters are assessed for any needed updates. However, given the large number of different scenarios and conditions that the market can encounter on a day-to-day basis, there may be some conditions under which the pre-defined values of the penalty prices may not work as intended. This may typically arise under extreme and stressed market and system conditions that require the market to clear in the range of uneconomical adjustments in which the penalty prices play a role to attain a solution. The resulting market solutions under this type of condition may pose market and operational inefficiencies. To mitigate for this type of risk, CAISO would assess required changes to some of these penalty prices. Since some of these penalty prices may be defined in the CAISO’s tariff provisions, CAISO may not have the ability to effectuate these changes expeditiously.

These events are not frequent but have occurred in the past. The inherent nature of the complexity of the outcomes that can be due to unintended interplay of penalty prices precludes the ISO to specifically characterize specific illustrations of what foreseeable scenarios may require the use of this procedure. Instead, CAISO can refer to a general dynamic of penalty prices that may show in different permutation of outcomes.

One general condition that ISO may foresee is the need for calibration of specific penalty prices of certain self-schedules to ensure some outlier pricing conditions would not result in losing the relative priorities among schedules. For instance, in practical terms the penalty prices used for different self-

schedules maintain certain distance among them, while one penalty price may be set at, say, \$1,250, another self-schedule with lower priority may be set at a lower price of, say, \$1,150. This will ensure that the optimization can clearly differentiate between the relative priorities. This price separation may work very well under most market conditions. However, under some other interplay of conditions, such as the impact of marginal losses leading to large price differentials, the distance between these two penalty prices may not be sufficiently large to keep them apart and thus the optimization may no longer follow the expected and relative scheduling priorities. This precise type of analysis is performed when CAISO assesses the penalty price to be used to achieve certain priority. An example of how this works was elaborated in detail in the expedited policy initiative implemented on May 2022 to mitigate for the unintended overscheduling of intertie constraints¹¹. In the proposal, there is a specific illustration of how CAISO planned to have enough room to account for other corner pricing dynamics. Sometimes that headroom may prove to no longer be sufficient and, thus, CAISO may need to revise those quickly to mitigate for the identified market issues.

Another case of this condition is the overscheduling of imports observed on July 9, 2021 when CAISO's system faced tight supply conditions due to supply imports lost due to fire impacts. This issue has been addressed through a targeted stakeholder initiative with the expectation to implement it prior to summer 2022. This last issue highlights the concern of the long process period it may take to pursue a parameter value change currently defined in the tariff while the market be still producing unintended outcomes.

On April 28, 2021, the CAISO submitted a tariff amendment to modify load, export, and wheeling through priorities in the day-ahead and real-time market optimization processes and implement other market rules (Tariff Amendment). The Commission accepted the proposed tariff revisions in a June 25 Order. However, the Commission also found that "the penalty pricing parameters that determine the relative scheduling priorities of transactions in the CAISO market optimization software must be in the Tariff." The Commission concluded such penalty prices significantly affect the conditions of transmission service on the CAISO grid. Accordingly, the Commission directed the CAISO to submit a compliance filing within 30 days of the June 25 Order that "incorporates the penalty pricing parameters associated with the revised scheduling priorities into the relevant sections of the CAISO tariff."¹²

To comply with the June 25 Order, on June 26, 2021 the CAISO submitted tariff revisions in a compliance filing (June 26 Compliance Filing) that reflected the penalty pricing parameters associated with the revised scheduling priorities. The proposed tariff revisions included the addition of tables to

¹¹ The material of this policy initiative is available at

<https://stakeholdercenter.caiso.com/StakeholderInitiatives/Adjustment-to-intertie-constraint-penalty-prices>

The description of the assessment to have a headroom between penalty prices to account for other pricing factors such as marginal losses is described in the final proposal page 16.

¹² *California Independent System Operator Corporation*, 175 FERC ¶61, 181 at P 167 (2021).

existing tariff sections 31.4, 34.12.1, and 34.12.2 listing the revised scheduling priorities and their associated penalty pricing parameters.

The tariff revisions in the June 26 Compliance Filing also included a new tariff section 31.4.1 to provide “a process for making temporary changes to the scheduling parameter values specified in sections 31.4, 34.12.1, and 34.12.2 (referred to hereinafter as the ‘Parameter Change Procedure’).”¹³ The CAISO stated that the Parameter Change Provision “will allow the CAISO to modify the scheduling run parameters when necessary to ensure feasible market solutions or avoid future operational or reliability problems the resolution of which would require recurring operator intervention outside of normal market scheduling procedures.”¹⁴ As explained in the Compliance Filing, other independent system operators (ISOs) and regional transmission organizations (RTOs) have tariff provisions permitting them to make temporary changes to the transmission constraint penalty factor values specified in their tariffs.¹⁵ Further, in Order No. 844, where the Commission required each ISO and RTO to include in its tariff its transmission constraint penalty factor values, the Commission also permitted them to include any procedures for temporarily changing such values with “notice of the change to market participants.”¹⁶ The proposed Parameter Change Procedure also tracks the CAISO’s current authority to change the penalty pricing parameter values on an expedited basis in emergency situations without following the usual procedure for revising the business practice manual.

After the CAISO submitted the June Compliance Filing, some stakeholders expressed concern about the potential scope of the Parameter Change Provision. They suggested the Parameter Change Provision might be interpreted as allowing the CAISO to change temporarily not only the scheduling parameter values (*i.e.*, the dollar amounts shown in the second and third columns of the new tables in revised tariff sections 31.4, 34.12.1, and 34.12.2), but also the revised scheduling priorities in the tariff (*i.e.*, the scheduling priorities shown in the first column of the new tables).

Accordingly, on August 4, 2021, the CAISO made a supplemental compliance filing. Because the CAISO did not intend that the Parameter Change Procedure would allow it to change the relative scheduling priorities (as opposed to the penalty price values), the CAISO proposed to add the following sentence to the end of the Parameter Change Procedure in section 31.4.1: “This section does not authorize the CAISO to change the scheduling run parameter values in a manner that changes the relative scheduling run priorities specified in sections 31.4, 34.12.1, and 34.12.2.”

¹³ Transmittal letter for June 26 Compliance Filing at 6; Compliance Filing, attachment B, new tariff section 31.4.1.

¹⁴ Transmittal letter for June 26 Compliance Filing at 6-7.

¹⁵ Midcontinent Independent System Operator Tariff, Schedule 28A, § 3.3; New York Independent System Operator, Inc. Market Administration and Control Area Services Tariff, § 17.1.4; PJM Interconnection, L.L.C. Open Access Transmission Tariff, Attachment K –Appendix, § 5.6.3.

¹⁶ *Uplift Cost Allocation and Transparency in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 844, 163 FERC ¶ 61,041, at PP 121-22 (2018).

On March 15, 2022, FERC issued an order on the CAISO's compliance filing, as supplemented.¹⁷ FERC rejected the Parameter Change Procedure "as outside the scope of the compliance directive."¹⁸ However, FERC ruled that if it wished to pursue the Parameter Change Procedure, the CAISO could submit a tariff amendment filing under Section 205 of the Federal Power Act.¹⁹

Proposed Parameter Change Procedure

The CAISO seeks to pursue the same Parameter Change Procedure it proposed in its July 26 Compliance Filing, as supplemented on August 4, 2021. Specifically, the CAISO proposes to add the following provision to its tariff:

31.4.1 Temporary Changes to Scheduling Run Parameter Values

If the CAISO determines it is necessary to modify the scheduling run parameter values in sections 31.4, 34.12.1, or 34.12.2 to address market solutions that do not align with scheduling priorities or avoid operational or reliability problems the resolution of which would otherwise require recurring operator intervention outside normal scheduling and market procedures, it may temporarily modify the value for a period up to ninety days, provided however CAISO will file such change with FERC under Section 205 of the Federal Power Act within thirty days of such modification. If circumstances reasonably allow, CAISO will consult with FERC and the CAISO's Market Monitoring Unit before implementing such modification. In all circumstances, the CAISO will (i) consult with those entities as soon as reasonably possible after implementing a temporary modification, and (ii) notify Market Participants within one business day after the change of any temporary modification and explain the reasons for the change. This section does not authorize the CAISO to change the scheduling run parameter values in a manner that changes the relative scheduling run priorities specified in sections 31.4, 34.12.1, and 34.12.2."

The parameter change provisions the Commission has approved for other ISOs and RTOs informed the CAISO's development of its Parameter Change Procedure. The Parameter Change Procedure will allow the CAISO to modify the scheduling run parameters only on a temporary basis when necessary to ensure feasible market solutions or avoid future operational or reliability problems the resolution of which would require recurring operator intervention outside of normal market scheduling procedures. The CAISO may temporarily modify the scheduling run parameter for a period up to 90 days, provided the CAISO must file a tariff amendment with the Commission within 30 days of the modification. If circumstances reasonably allow, the CAISO will consult with the Commission and Department of Market Monitoring (DMM) before implementing any such modification. In all circumstances, the CAISO must consult with DMM and the Commission as soon as reasonably

¹⁷ *California Independent System Operator Corporation*, 178 FERC ¶ 61,181 (2022).

¹⁸ *Id.* at P 9.

¹⁹ *Id.* at n 17.

possible after implementing a temporary modification. Further, under the Parameter Change Procedure, the CAISO must notify market participants of any temporary modification and explain the reasons for the change. Importantly, the proposed Parameter Change Procedure only allows the CAISO to change temporarily the scheduling parameter values themselves (i.e., the dollar amounts shown in the second and third columns of the tables in tariff sections 31.4, 34.12.1, and 34.12.2); it does not allow the CAISO to change the scheduling priorities in the tariff (i.e., the scheduling priorities shown in the first column of the tables).

WEIM DECISIONAL CLASSIFICATION

This initiative proposes two sets of tariff amendments:

- (1) Reducing the existing 2 percent shift factor threshold to 0.2 percent for default load aggregation points and trading hubs, which are aggregated locations within the CAISO balancing authority area only.
- (2) Creating a procedure to enable the CAISO to adjust identified penalty price values to address production issues. This procedure may apply equally to the CAISO balancing authority area and WEIM balancing authority areas.

To the extent these proposed tariff changes apply to the real-time market, the ISO believes that the WEIM Governing Body will have joint authority over the second change and an advisory role with respect to the first change, as explained below.

The Board and the EIM Governing Body have joint authority over a

proposal to change or establish any CAISO tariff rule(s) applicable to the EIM Entity balancing authority areas, EIM Entities, or other market participants within the EIM Entity balancing authority areas, in their capacity as participants in EIM. This scope excludes from joint authority, without limitation, any proposals to change or establish tariff rule(s) applicable only to the CAISO balancing authority area or to the CAISO-controlled grid.

Charter for EIM Governance § 2.2.1 The first set of proposed tariff changes fall outside this scope, because the changes to the shift factor threshold at default load aggregation points and trading hubs would not apply “to EIM Entity balancing authority areas, EIM Entities, or other market participants within EIM Entity balancing authority areas, in their capacity as participants in EIM.” Instead, these proposed tariff rules would be applicable “only to the CAISO balancing authority area or to the CAISO-controlled grid.” This is because the default load aggregation points and trading hubs are used only for settling transactions in the CAISO balancing authority area; no WEIM transactions are settled based on a price calculated for either of these load aggregation points or trading hubs. The WEIM Governing Body would have an advisory role on this set of changes to the extent they involve rules

of the real-time market, because the Governing Body “may provide advisory input over proposals to change or establish tariff rules that would apply to the real-time market but are not within the scope of joint authority.” Id.

In contrast, the changes to the procedure to adjust penalty price values, item (2) above, would be “applicable to EIM Entity balancing authority areas, EIM Entities, or other market participants within EIM Entity balancing authority areas, in their capacity as participants in EIM.” The proposed tariff amendments to implement item (2) therefore would fall within the joint authority of the WEIM Governing Body.

Puget Sound Energy addressed the proposed classification of the shift factor threshold (item 1) in its comments on the Draft Final Proposal. Without disputing that the classification of advisory is correct under the currently effective rules, Puget Sound Energy pointed out that the proposed change could have implications for EDAM. The ISO agrees; although the change to the shift factor threshold would not apply to WEIM or EDAM, it would establish a methodology that, absent further stakeholder review, could logically be extended to EDAM. To ensure proper stakeholder review of the policy as it may affect EDAM and also move ahead with this change for the ISO’s balancing authority area, the ISO commits to hold a catch-up stakeholder review for this policy in connection with drafting tariff language for EDAM. This catch-up review would also include any other new policies that may be adopted before that time for the ISO’s balancing authority only that may be later applied to EDAM.

NEXT STEPS

The table below outlines the proposed schedule to complete the policy for this initiative:

| Date | Milestone |
|--|----------------------|
| Publish Draft Final Proposal | 19 Jan 23 |
| Stakeholder Call on Draft Final Proposal | 26 Jan 23 |
| Stakeholder comments due | 31 Jan 23 |
| Publish Final Proposal | 8 Feb 23 |
| Joint ISO Board of Governors and WEIM Governing Body | 22-Mar-23 |
| Expected Implementation | June-23 |

Attachment D – Board Memoranda
Tariff Amendment – Market Parameter
California Independent System Operator Corporation
May 31, 2023



Memorandum

To: ISO Board of Governors and Western Energy Imbalance Market Governing Body
From: Anna McKenna, Vice President of Market Design and Analysis
Date: March 14, 2023
Re: **Decision on market parameter changes enhancement**

This memorandum requires ISO Board of Governors and WEIM Governing Body action.

EXECUTIVE SUMMARY

The ISO market systems include configurable market parameters that govern the importance and scale of certain inputs into the market optimization algorithms. Management recommends two changes to address market performance concerns observed in the ISO's continued assessment of market performance that have been vetted through a stakeholder process.

The first proposed change is to modify a market parameter referred to as the "shift factor threshold." The function of the shift factor threshold is to limit what resources are used in the management of congestion in the ISO markets based on the resource's effectiveness to contribute to flow on a constraint. For example, if a specific resource is ineffective in addressing congestion within the specified threshold, the resource will not be part of the solution chosen to address the congestion. The proposed change to the threshold setting in the energy market addresses unintended consequences in the, separate but related congestion revenue rights market. Specifically, the current shift factor threshold applied to locations that are aggregations of high volume distributed locations can result in the optimization failing to account for substantive congestion effects. This in turn results in failing to account for material congestion in the congestion price. In such cases this can result in substantive inconsistencies in the settlement of congestion revenue rights, which are based on the price of congestion determined in the energy market and the amount of congestion revenue rights that are held at these aggregate locations. Management proposes to reduce the value of the shift factor threshold for aggregated pricing locations to more accurately reflect their contributions to congestion and improve the performance of congestion revenue rights. This element falls under the WEIM Governing Body's advisory authority.

The second proposed change is an enhancement to the process for changing market parameters used to enforce scheduling priorities and constraint relaxations in the market clearing process. The effects of such scheduling parameters are sometimes not observable until after they have actually been employed. There have been times when analysis of market outcomes has shown that the market parameters did not result in the intended scheduling priorities as prescribed in the ISO tariff. Management proposes a process to make expedited changes to those scheduling parameters so that if such outcomes are observed, the ISO can align the market parameters with the intended scheduling priorities until a permanent change can be considered and approved. These elements fall under joint authority for decision by the WEIM Governing Body and the ISO Board of Governors.

These changes were largely supported by stakeholders and are carefully tailored to ensure the markets operate optimally. The shift factor threshold proposal described in this memorandum falls under the ISO Board of Governors' approval authority with an advisory role for the WEIM Governing Body; the proposal with respect to changes in market scheduling parameters falls under the joint decisional authority of the ISO Board of Governors and the WEIM Governing Body.

ISO Board of Governors March 22, 2023 motion

Moved, that the ISO Board of Governors approve the changes to the application of the shift factor threshold as described in the memorandum dated March 14, 2023; and

Moved, that the ISO Board of Governors authorize Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the shift factor threshold change proposed in this memorandum, including any filings that implement the overarching initiative policy but contain discrete revisions to incorporate Commission guidance in any initial ruling on the proposed tariff amendment.

Joint Board of Governors and Governing Body March 22-23, 2023 motion

Moved, that the ISO Board of Governors and WEIM Governing Body approve the process to effectuate changes to market scheduling parameters as described in the memorandum dated March 14, 2023; and

Moved, that the ISO Board of Governors and WEIM Governing Body authorize Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the process to effectuate changes to market scheduling parameters proposed in this memorandum, including any filings that implement the overarching initiative policy but contain discrete revisions to incorporate Commission guidance in any initial ruling on the proposed tariff amendment.

DISCUSSION AND ANALYSIS

Shift Factor Threshold

The shift factor threshold is a market parameter that determines what power injections and withdrawals (from market resources) the market software uses in managing congestion on transmission constraints. The shift factor threshold measures a specific location's effectiveness in managing congestion relative to the change of power flow on a specific constraint. The effectiveness depends on, among other things, the transmission topology and the transmission system's specific characteristics like impedances. When the ISO implemented its nodal market in 2009, it established a two percent effectiveness threshold above which resource injections and withdrawals are used for congestion management in its markets.

At that time this threshold struck a reasonable balance between efficient congestion management and price formation, and good utility practice for reliable grid operations.

In the congestion management process, only resources with a shift factor greater than two percent are considered for re-dispatch in the congestion management process. Resources with a shift factor less than two percent were determine considered to be appropriately excluded because these resources may be electrically too distant from the constraints being managed. Using resources with a very low shift factor for congestion management could lead to an unreasonable re-dispatch of resources with little impact on relieving the congested constraint being managed. This would not be prudent or consistent with good utility practice.

To avoid these potentially harmful operational impacts, the market process disregards shift factors on a binding constraint below the two percent threshold in deriving the optimal resource dispatches and marginal congestion component. This removes the impact of those resources' injections and withdrawals for both resource dispatches and prices. The result is that resources receive dispatches that are consistent with the prices cleared in the market.

Following a 2019 change to the funding for congestion revenue rights (CRRs)¹, the ISO observed an issue in settling CRRs created by the shift factor threshold. Application of the threshold to locations with significant injections or withdrawals meant that the market was not accounting for significant flow contributions in estimating power flows and calculating congestion rents used to financially settle CRRs. This is more impactful for transmission constraints with small capacity for which the flow contributions from aggregated locations can consume the full capacity of the constraint.

Management proposes to adjust the use of the shift factor to mitigate for this issue. For large aggregated demand and generation locations, namely default load aggregation

1

<http://www.caiso.com/Documents/DecisiononCongestionRevenueRightsAuctionEfficiencyTrack1BProposal-Memo-Jun2018.pdf>

points and trading hubs, the ISO proposes to reduce the threshold from two percent to 0.2 percent.

The existing two percent threshold would continue to apply to all other pricing locations. The rationale for not changing the shift factor threshold for all pricing locations is that doing so could result in an increase in computational efforts in the market clearing process and inefficient re-dispatch of resources for little gain of congestion management. The proposed change is narrowly tailored to capture the flow contributions of large aggregated locations. This logic will apply in both the congestion management process and in the price formation of the marginal congestion components of the locational marginal prices in the same way it is currently done for locations with shift factors above two percent. This will ensure that dispatches and prices remain consistent.

Because the driver for this proposed change is the impact on CRR settlements, which is only an issue for the ISO balancing authority area, Management proposes to only apply this change to the ISO's default load aggregation points and trading hubs; this will not apply to Western Energy Imbalance Market (WEIM) load aggregation points and default generation aggregation points of the WEIM. The ISO may consider applying this change more broadly in the WEIM or the proposed Extended Day-Ahead Market (EDAM) in future policy initiatives that would be brought back for a separate approval.

Based on stakeholder comments, Management also considered applying the lowered threshold to intertie locations. Management concluded that while there are compelling reasons for using a lower threshold at large intertie locations, applying such a change to all interties would create the same concerns described above when applying it to all locations. Instead, Management proposes a flexible approach in which it could apply the lowered threshold to interties that have sufficient transfer capability and result in similar inefficiency as that identified from default load aggregation points and trading hubs. Based on a future assessment of the impact of interties on the CRR settlements, the ISO would have authority to use the lowered threshold to specific interties. This information will be maintained in one of the ISO's business practice manual.

Market Scheduling Parameter Change Process

The ISO's market optimization uses a set of configurable scheduling parameters to enforce the relative scheduling and relaxation priorities in the market clearing process. The values of these parameters are defined based on studies and analysis to ensure the expected priorities actually result under different scenarios. When new functionality and market features are introduced, the values of these parameters are assessed for any needed updates.

However, given the large number of different scenarios that the market can encounter on a day-to-day basis, conditions arise under which the pre-defined values of the relative scheduling parameters do not coordinate as intended. The scheduling parameters are relevant only when the economic solutions have been exhausted and in order to clear the market and resolve constraints uneconomical adjustments are

necessary. Under such conditions, multiple uneconomical adjustments and relaxation of constraints can occur simultaneously, making correct specification of the scheduling parameters even more crucial. When the scheduling parameters are not coordinated correctly, the resulting market solutions under these extreme conditions may pose market and operational inefficiencies. To mitigate for this risk, the ISO may need to change the scheduling parameters. Since some of these scheduling parameters may be defined in the ISO's tariff provisions, the ISO would not be able to make the necessary changes quickly.

The inherent complexity of the outcomes that can result from unintended interplay of scheduling parameters precludes the ISO from specifically characterizing what scenarios may require the use of the proposed procedure. Instead, the ISO can refer to a general dynamic of scheduling parameters that may manifest under different scenarios.

The proposed parameter change procedure authority will allow the ISO to modify the scheduling parameters on a temporary basis when necessary to ensure market solutions align with intended priorities or avoid future operational or reliability problems. Management proposes that the ISO have the authority to temporarily change the scheduling run parameters for a period up to 90 days, provided the ISO file a tariff amendment with FERC within 30 days of the modification. If circumstances reasonably allow, the ISO will consult with FERC and the Department of Market Monitoring (DMM) before implementing any such modification. In all circumstances, the ISO will consult with DMM and FERC as soon as reasonably possible after implementing a temporary modification.

Further, under the proposed parameter change procedure, the ISO must notify market participants of any temporary modification within one business day and explain the reasons for the change. Importantly, the proposed procedure only allows the ISO to temporarily change the scheduling parameter values themselves; it does not allow the ISO to change the relative scheduling priorities in the tariff. That is, the ISO would change the value of the scheduling parameters while ensuring that the relative priorities are still honored.

POSITIONS OF THE PARTIES

This initiative had three rounds of stakeholder comments, with five participants submitting comments for the draft final proposal. Overall, stakeholders support pursuing the two enhancements proposed. Management adjusted the final proposal and provided further details to address participants' comments.

- Puget Sound Energy supported the proposal but expressed concerns about the decisional classification for the shift factor threshold. Management understands there is a possibility that this or any initiative “may have market or pricing implications for future EDAM participants” as Puget Sound Energy states in its comments. Nevertheless, Management proposes to apply the rule proposed by the stakeholder representatives on the Governance Review Committee, as

adopted by the Board and the Governing Body in the WEIM Governing Body February session.

- DC Energy and WPTF requested the ISO continue to assess the performance of the CRR policy implemented in 2019, which the ISO has committed to do as part of next steps beyond this limited initiative. Based on that feedback, Management adjusted the final proposal to reduce the notification window of parameter changes from three business days to one business day, which is now reflected in the final proposal.
- One stakeholder expressed concern with both reducing the threshold for aggregated locations since it will increase prices and the differentiated treatment relative to the rest of locations. Management has explained the change of the threshold will more accurately reflect the contributions of these aggregated locations to both power flow contributions and price formation, with prices either increasing or decreasing. Management expanded the analysis in the proposal to provide more insights and assess the price impacts. Regarding the concern about differentiated treatment for aggregated locations, the proposal is based on the fundamental difference in the magnitude of injections and withdrawals for aggregated locations relative to individual locations and how that difference leads to materially different power flow contributions. Any participant bidding at any aggregated location will be considered in the same way in the market clearing process.
- Some stakeholders also suggested the ISO expand this logic to include inertie locations. As discussed above, Management agrees this suggestion has merit and expanded the proposal to include the flexibility to apply the lower shift factor threshold to interties whose volume justifies application of the 0.2 percent threshold.

CONCLUSION

Management recommends two changes to market parameters. The first is to lower the shift factor threshold for the ISO balancing authority area default load aggregation points, trading hubs, and large interties. The second modification is to provide authority to change scheduling parameters on a temporary basis. These changes will improve market efficiency, and enable the ISO to nimbly address market outcomes that do not align with intended scheduling priorities.

Decision on market parameter changes enhancement

Guillermo Bautista Alderete
Director, Market Analysis and Forecasting

ISO Board of Governors and WEIM Governing Body
Joint general session
March 22, 2023

Management proposes changes related to two market parameter requirements

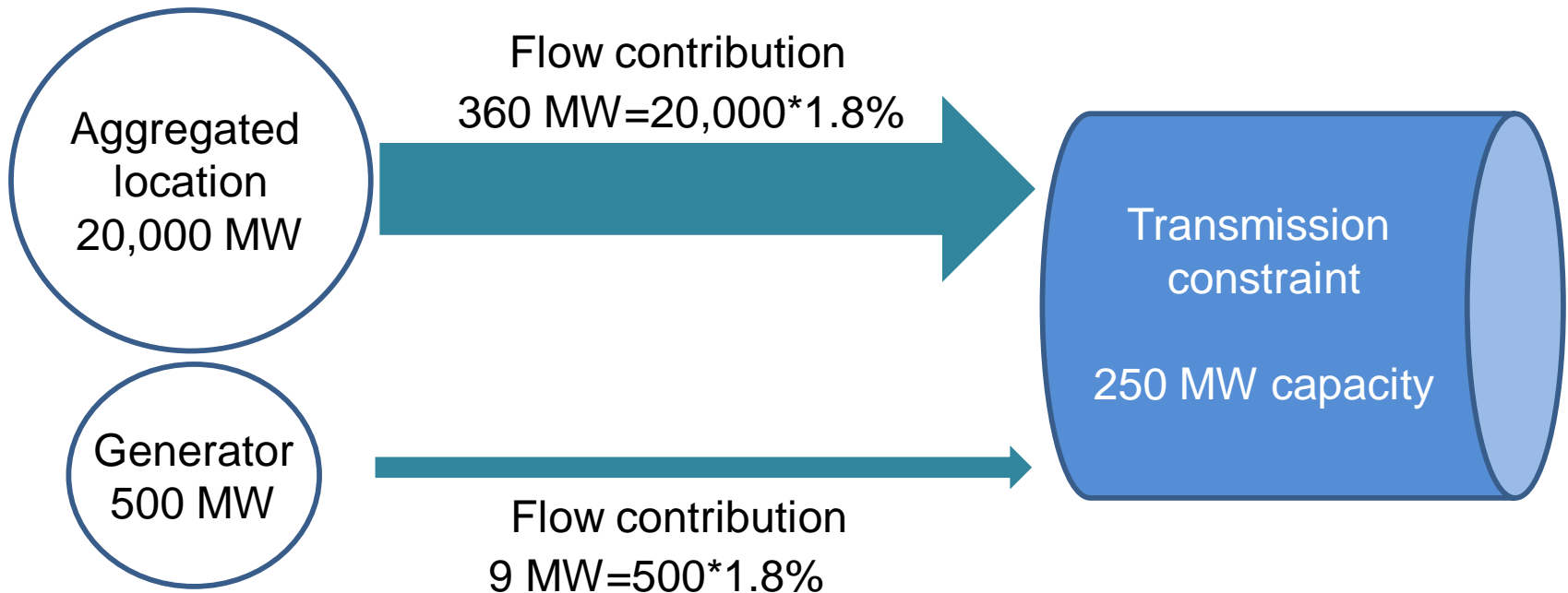
1. Application of a reduced shift factor threshold to aggregated locations
2. Procedure to expedite scheduling parameters changes when production issues arise

These two items are severable and not interdependent

Background -Shift factor threshold

- The market systems estimates parameters known as “shift factors” that measure the contribution of a resource at certain locations to power flows to address a given transmission constraint
- Shift factors threshold values direct the market software on what resources to use manage congestion in the energy markets which forms and determine resource dispatches and the price for congestion in the market
- The current threshold setting is set to 2% to balance ineffective redispatch consistent with good utility practice and handle computational burden

Management identified an inefficiency with using a shift factor threshold for aggregated locations



Although default load aggregation points may have a shift factor below 2%, their MW contributions to flows can still be significant

Current threshold has unintended inefficiencies in congestion used for settlement of congestion revenue rights

- Injections at locations with a shift factor below 2% will not be considered in congestion management (dispatches and prices)
- Relative to small-capacity constraints, the flow contribution from aggregated locations can be too large to disregard, even when their shift factor is below 2%
- Results in under-collection of congestion revenue from the energy market to fund released congestion revenue rights

Management proposes a lower shift factor threshold for certain aggregations in the ISO balancing area

- A 0.2% will apply only to default load aggregations points, trading hubs, and certain interties that share the same aggregation implications in the ISO balancing area only
- Current threshold of 2% will continue to apply to any other location
- Proposed logic will apply to both day-ahead and real-time markets

Background - Procedure to expedite parameter changes

- Energy market systems use a set of scheduling parameters to enforce the relative scheduling and relaxation priorities in the market clearing process
- All parameters work in synchronization and require ongoing monitoring of their performance
- Under certain conditions, specific values can result in unintended or inefficient outcomes that may require expedited adjustments to the value to remain consistent with intended priorities

Management proposes to adopt a procedure that allows the ISO to make expeditious parameter changes

- This procedure will allow a scheduling parameter change for up to 90 days, provided ISO file such change within 30 days of the modification
- If circumstances reasonably allow, the ISO will consult with the FERC and the Department of Market Monitoring about this change
- The ISO will notify the market of the change within one (1) business day
- Process will not allow for changes to relative scheduling priorities
- Similar provisions are in place in other ISOs and RTOs

Stakeholders generally supported the overall proposal, some expressed concerns with specific elements

- Some suggested the lower threshold should apply to intertie locations or to all locations
- A stakeholder expressed concerns with the lower threshold resulting in higher prices
- A stakeholder expressed interest in better understanding the decisional classification if this may impact future Extended Day-Ahead Market (EDAM) participants

Management recommends the WEIM Governing Body advise the ISO Board of Governors of its support for the proposal to apply a 0.2% shift factor threshold to ISO–only aggregated locations

- Proposal improves effectiveness of aggregate locations in congestion management and prices will more accurately reflect the price of congestion
- The settlements of congestion revenue rights will be more sufficiently funded by congestion revenue rights collected in the ISO day-ahead energy market

Management recommends the ISO Board of Governors and WEIM Governing Body approve the proposal to implement a process to expeditiously change scheduling parameters when production issues arise

- Proposal improves the market efficiency by enabling the ISO to nimbly address market outcomes that do not align with intended scheduling priorities



**Board of Governors
General Session**

March 22, 2023

Decision on Market Parameter Changes Enhancement

Motion

Moved, that the ISO Board of Governors approve the changes to the application of the shift factor threshold as described in the memorandum dated March 14, 2023; and

Moved, that the ISO Board of Governors authorize Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the shift factor threshold change proposed in this memorandum, including any filings that implement the overarching initiative policy but contain discrete revisions to incorporate Commission guidance in any initial ruling on the proposed tariff amendment.

Moved: Governor Galiteva

Second: Governor Schori

| | |
|-----------------------------|------------------------|
| Board Action: Passed | Vote Count: 4-0 |
| Borenstein | Y |
| Galiteva | Y |
| Leslie | Y |
| Schori | Y |

**Board of Governors and WEIM Governing Body Joint General Session
Joint decision on Market Parameter Changes Enhancements**

March 22, 2023

Motion

Moved, that the ISO Board of Governors and WEIM Governing Body approve the process to effectuate changes to market scheduling parameters as described in the memorandum dated March 14, 2023; and

Moved, that the ISO Board of Governors and WEIM Governing Body authorize Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the process to effectuate changes to market scheduling parameters proposed in this memorandum, including any filings that implement the overarching initiative policy but contain discrete revisions to incorporate Commission guidance in any initial ruling on the proposed tariff amendment.

| WEIM Governing Body vote: ISO Board of Governors vote: | | | Action: 8-0 | | | | | |
|---|-----------------|-------------|-------------------------|--------------------|-------------------|-------------------|------------------|--------------|
| Name | Position | Body | Move/ Second | Yes BoG | No BoG | Yes GB | No GB | Other |
| Borenstein | Governor | Board | Moved | Y | | | | |
| Campbell | Member | GB | | | | Y | | |
| Decker | Member | GB | | | | | | Not present |
| Galiteva | Governor | Board | | Y | | | | |
| Gardner | Vice Chair | GB | | | | Y | | |
| Kondziolka | Chair | GB | | | | Y | | |
| Leslie | Chair | Board | | Y | | | | |
| Prescott | Member | GB | Seconded | | | Y | | |
| Schori | Vice Chair | Board | | Y | | | | |
| Vote Count | | | | 4 | | 4 | | |