California Independent System Operator Corporation

July 28, 2026

The Honorable Debbie-Anne A. Reese
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

**Re: California Independent System Operator Corporation**
**Docket No. ER26-____-000**

**Tariff Amendment to Model Loop Flow in the Annual Congestion Revenue Rights Process**

Dear Secretary Reese:

The California Independent System Operator Corporation (CAISO) submits this tariff amendment to give it authority to model the expected impact of loop flow in the year-ahead congestion revenue rights (CRR) process. The CAISO already holds such authority for the month-ahead CRR processes. This amendment would give the CAISO that same authority in the annual process.[1]

The CAISO respectfully requests the Commission issue an order accepting the proposed tariff revisions by September 28, 2026, with an effective date of July 29, 2026. An immediate effective date would permit the CAISO to begin the annual CRR process on schedule in September with loop flow modeled but without requiring expedited action from the Commission. Delaying the start of the annual CRR process pending a Commission order risks either not finishing the annual process before 2027 or requiring the CAISO and its market participants to expedite the final stages of the annual process through the holiday period in 2026. If the Commission were to reject this filing, the CAISO would rerun the annual processes without modeling expected loop flow. Under this approach, whether the amendment is accepted or rejected, no CRRs ultimately will be settled based on a modeling approach that lacks Commission approval.

[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.

## I. Background

### A. What Are Congestion Revenue Rights

CRRs are financial hedging instruments the CAISO issues to its market participants. A CRR is defined by source, sink, MW quantity, and a time of use. The CRR grants the holder part of the congestion revenue collected in the day-ahead market between the source and sink for the time covered by the CRR multiplied by the MW quantity of the CRR.

CRRs are an outgrowth of firm transmission rights that are available outside of organized markets. Having a congestion hedge in the form of a CRR replicates the firm rights that pre-exist ISOs/RTOs, and still exist under Open Access Transmission Tariff (OATT) regimes. The Commission consistently has emphasized the importance of hedging instruments such as CRRs in providing open access to the transmission grid, managing exposure to congestion costs, and promoting competitive electricity markets.[2] In providing reliable hedges, CRRs facilitate long-term contracting by load-serving entities and suppliers. They also serve to return congestion revenue to load, in return for supporting the embedded costs of the grid.[3]

### B. Financial Settlement of Congestion Revenue Rights

Before 2019, CRR holders were paid at the difference in the marginal cost of congestion between the source and sink of the CRR. These payments were funded by revenue from the CRR auction and congestion from the day-ahead market. If there was insufficient revenue, CAISO charged load to cover the shortfall. This was referred to as a full funding approach for CRRs. This approach ensured each CRR would be paid at its full notional value for all hours it was in effect (*i.e.*, the difference in marginal cost of congestion at the source minus the marginal cost of congestion at the sink times the MW quantity for each hour applicable to the CRR's time of use).

Starting in 2019, the CAISO no longer guarantees full funding at a CRR's notional value. Instead, CRRs are settled based on the revenue collected from auctions and market congestion, subject to a cap at the CRR's overall nominal value. If revenue is insufficient, CRR holders receive proportional cuts based on

[2] *See, e.g.*, *Cal. Indep. Sys. Operator Corp.*, 149 FERC ¶ 61,093 at 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).").

[3] *PJM Interconnection, L.L.C.*, 158 FERC ¶ 61,093, P 27 (2017) ("We reject the arguments that the sole purpose of FTRs is to return congestion revenue to load" and FTRs "play a key role in ensuring open access to firm transmission service by providing a congestion hedging function").

a constraint-by-constraint approach. Under this approach the CAISO breaks down each CRR into how the energy would flow if the CRR represented a physical injection of energy (rather than a financial product). Each modeled path essentially is treated as its own CRR. Those disaggregated CRRs are eligible to receive their proportionate share of the nominal value, assuming the CAISO collected enough revenue for that path. If the CAISO does not collect sufficient congestion revenue in the day-ahead market for a constraint to fund each CRR with modeled flow on that constraint, then the CAISO assigns that shortfall pro rata for all CRRs with flow modeled on that constraint. The total payment a CRR holder receives is the aggregation of the payments for each path on which the CRR has modeled flow, capped at the overall nominal value of the CRR. Any congestion revenue collected for a transmission constraint remaining after each CRR is funded fully as to its modeled flow on that constraint is assigned to load serving entities.

### C. Distributing Congestion Revenue Rights

The CAISO releases CRRs on a year-ahead and month-ahead basis through both allocation and auction processes. The CAISO releases a portion of CRRs at no cost to load-serving entities (LSEs) through an allocation process based on individual entities' load-serving obligations. The CAISO also conducts CRR auctions that allow all market participants to bid to obtain CRRs.

The iterative CRR processes make available an increasing percentage of the total system capacity. For example, the annual process makes 65 percent of total system capacity available, with 35 percent reserved for the monthly processes. The allocation also has several tiers, each of which releases an increasing percentage of the capacity available in that process. Given the percentage of system capacity available, the CAISO uses a simultaneous feasibility test to determine how much of the requested CRR MWs are feasible based on the CRR network model. This network model is based on the most up-to-date direct current full network model. This model includes constraints and network topology and is intended to reflect, as closely as possible, similar constraints and network topology expected in the day-ahead market.

One difference between the allocation and auction is the total volume of CRRs that can be awarded. In the allocation, each LSE can only request CRRs up to their historical load serving obligation, which means the total volume of CRRs awarded cannot exceed all LSEs' load obligations. There is no such limit in the auction. The auction is still limited by the simultaneous feasibility test. However, subject to overall credit limitations on participants, there is no limit to the volume of CRRs that can be released through the auction processes because in the simultaneous feasibility test, flow and counterflow CRRs can wash each other out. For example, a transmission line might only have 5 MW reserved for it in a monthly CRR auction. If one participant bids for 10,005 MW in

the flow direction but another bids for 10,000 MW, then the CAISO could award 20,005 MW of total CRRs on a constraint that only had 5 MW of total capacity available in the auction. In the simultaneous feasibility test used for the allocation, flow and counterflow would still cancel each other out but individual entities could not seek a volume of CRRs beyond their historical load.

### D. Congestion Revenue Rights Efficiency

The CAISO has used two primary metrics to evaluate the efficiency of the CRR processes – (1) revenue inadequacy; (2) auction revenue shortfall. Evaluation of these metrics resulted in several prior tariff filings with the Commission as well as continued analysis leading to the instant filing.

#### *1. Revenue Inadequacy*

Ideally, the congestion revenue the CAISO collects in its day-ahead market would meet or exceed the net notional value of all CRRs. This would give the CAISO sufficient revenue to provide CRR holders a complete congestion hedge as to the MW quantity of their CRR. The day-ahead market, however, often does not collect adequate congestion revenue to cover CRRs fully. This scenario creates the phenomenon of revenue inadequacy in the CRR process. Revenue inadequacy reflects an inefficiency in the CRR process the CRR process is not self-supporting.

The CAISO has been managing the revenue inadequacy issue since the beginning of the CRR process. The CAISO initially assigned the costs of revenue inadequacy to load serving entities. Since 2019 CRR holders have borne the burden of revenue inadequacy. No matter who bears the cost, the existence of a gap between the face value of CRRs and day-ahead market congestion revenue is an ongoing issue for the CRR process.

#### *2. Auction Revenue Shortfall*

Another measure of CRR efficiency is CRR auction revenue shortfall. This is the difference between CRR auction revenues and day-ahead market payouts to holders of auctioned CRRs. As adjusted by hedging value, risk premium, and/or time value of money, an efficient and competitive CRR auction would be expected to clear CRRs roughly at prices that reflect market participants' expectations of congestion price exposure in the day-ahead market. The reason being a market participant should be willing to pay for a CRR up to the amount it expects to receive from the CRR. A CRR that clears for far less than its expected payout represents a profitable opportunity. In a competitive market, the existence of such opportunities would draw in more participants and higher bids. Increased competition would eventually eliminate the systematic profitability. Over time, however, the auction revenues collected from CRR

holders in the CAISO's CRR auctions have been persistently (and sometime significantly) lower than CRR payments. This persistent shortfall reflects an inefficiency in the current CRR auction process.

### *3. Prior Tariff Filings on CRR Efficiency*

In 2017, the CAISO began a stakeholder initiative to consider CRR efficiency and what rule changes could enhance efficiency. The result was three Commission orders[4] approving four major rule changes that went into effect in 2018 and 2019:

1. Allocating revenue adequacy shortfalls to CRR holders instead of load serving entities.[5]

2. Increasing the percentage of system capacity reserved for the monthly CRR process.[6]

3. Creating an earlier deadline for transmission owners to report outages planned for the next year that would impact the CRR model.[7]

4. Limiting the allowable source and sink pairs eligible for nomination in the CRR auction to only pairs associated with supply delivery and to exclude nominations for non-delivery CRR pairs.[8]

### *4. Ongoing Experience with CRR Efficiency*

Since revising elements of the CRR process, the CAISO has observed improvements in CRR efficiency. In the years before the rule changes, congestion and auction revenues were about 75% of CRR payouts. From 2019 to June 2025, CRR payouts have been 79% of total CRR notional value. Similarly, the auction revenue shortfall metric has improved. Before the revisions, the auction on average collected 50% of the funds needed to pay CRRs acquired from the auction. From 2019 through June 2025, that percentage has risen to 68%.

Despite these improvements, three factors have continued to challenge even greater efficiency: (1) model differences between the CRR process and day-ahead market; (2) day-ahead market shift factor threshold; and (3) loop flows from neighboring balancing authority areas.

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4 *Cal. Indep. Sys. Operator Corp.*, 165 FERC ¶ 61,085 (2018) (CRR1b Revenue Scaling Order); *Cal. Indep. Sys. Operator Corp.*, 164 FERC ¶ 61,209 (2018) (CRR1b Monthly Allocation Order); *Cal. Indep. Sys. Operator Corp.*, 163 FERC ¶ 61,237 (2018) (CRR1a Order).

5 CRR1b Revenue Scaling Order.

6 CRR1b Monthly Allocation Order.

7 CRR1a Order.

8 *Id.*

1. *Modeling Differences* – There are inevitably differences between the full network model used for the CRR processes and the network model used in optimizing an interval in the day-ahead market. For example, transmission outages that occur in the day-ahead market after the relevant CRR auction has cleared can reduce available transmission capacity below the level the CRR model assumed. These differences directly affect the revenue adequacy of the allocated and auctioned CRRs. A constraint enforced in the day-ahead market that was not enforced in the auction, or that is tightened in the day-ahead market, also results in higher congestion prices than were priced in the CRR auction.

2. *Shift Factor Threshold* – The day-ahead market generally uses a two percent shift factor threshold, which means injections whose shift factors on a constraint fall below this threshold are not modeled.[9] The CRR model, however, does not use a shift factor cutoff. This asymmetry causes the settlement process to exclude injections that collectively contribute substantial flow to binding constraints, systematically understating congestion contribution when calculating the discount from notional value that a given CRR will receive.

3. *Loop Flows* – Loop flows from neighboring balancing authority areas use CAISO transmission capacity without contributing to day-ahead market congestion rents. If such loop flows are not accounted for adequately in the simultaneous feasibility test for the allocation and auction, then the CAISO may release more CRRs than are actually feasible given loop flows. The CAISO has tools to address this factor but those tools are not fully effective.

## II. Proposed Tariff Revisions

### A. Revising Tariff to Model Loop Flow in the Annual Process

The CAISO proposes to amend its tariff to address more effectively one of the three above-noted drivers of inefficiency in the CRR process – loop flows. Section 36.4.1.2 of the CAISO tariff directs the CAISO to consider a variety of factors in establishing the Monthly Available CRR Capacity, which is the volume of CRRs to release in each monthly CRR process. One factor is an "adjustment[] for possible unscheduled flow at the Interties." This authorizes the CAISO to estimate the impacts of loop flows on CRRs in the monthly process. Section

[9] The exceptions are default Load Aggregation Points and Trading Hubs, which face a threshold of .2 percent. Given the significantly larger MW volume these two class of nodes represent, the CAISO concluded they merit a lower threshold. *See Cal. Indep. Sys. Operator Corp.*, 184 FERC ¶ 61,119 (2023).

36.4.1.1 serves the same function as section 36.4.1.2 for the annual process. It states what factors the CAISO must consider in establishing the Seasonal Available CRR Capacity, which is the volume of CRRs released in each of the four seasons of the annual CRR process. Section 36.4.1.1 does not, however, mention the impact of unscheduled flow at interties as a factor for the CAISO to consider in the annual CRR process.

When the CAISO started developing the CRR process nearly 20 years ago with its stakeholders, the CAISO took a general approach of not adjusting the annual CRR full network model based on predictions.[10] Section 36.4.1.1 includes adjustments for the annual process based on considerations that are reasonably foreseeable like scheduled outages and usage of the grid by holders of Existing Transmission Contracts or Transmission Ownership Rights.[11] Adjustments for items that required forecasting the future, such as adjusting for anticipated loop flow, were reserved for the monthly process. One reason for this approach was that "at the start of the nodal market there simply was not sufficient experience with actual locational marginal prices and revenue adequacy of previously-released CRRs."[12] The logic behind this was that more accurate forecasts are possible closer in time to the period when the CRRs would be active. Further, the additional precision from adding an adjustment for these factors in the annual process would be outweighed by forecast error.

With over 17 years of experience running the CRR processes, the CAISO has now concluded there no longer is a compelling reason to treat anticipated loop flows in the annual CRR process and the monthly CRR process differently. Closer regional integration created from the CAISO's expanded full network model, the Western Energy Imbalance Market, and the Extended Day-Ahead Market has given the CAISO more information about what is happening in neighboring balancing authority areas. With better information, the CAISO is much better positioned than it was in 2009 to forecast loop flows in the year-ahead timeframe. Even holding the quality and quantity of data constant, general improvements in quantitative methods and forecasting approaches have put the CAISO in a better position to make higher-quality loop flow forecasts. Another important development is that the CAISO's ongoing analyses have shown loop

[10] *See Cal. Indep. Sys. Operator Corp.*, Transmittal Letter, FERC Docket No. ER11-3873, at 5 (Jun. 23, 2011) (explaining that a "policy has been in place since the start of the ISO nodal market" not to make adjustments in the annual CRR process to capture unscheduled outages because "rather than speculate on what outages could arise and how the system could be impacted, the ISO assumes all lines are in service in the annual release and does not account for unscheduled outages").

[11] Section 36.4.1.1(iv)(a) includes an adjustment based on analysis of historical outages, which involves a predictive element. Notably, however, this item was added several years into the existence of the CRR processes. *Cal. Indep. Sys. Operator Corp.*, 136 FERC ¶ 61,120 (2011).

[12] *Id.*

flow to be a more significant factor in CRR inefficiencies than anticipated when the CRR processes initially were being developed. Amending the tariff to allow the CAISO to account expected loop flows in the annual CRR process will help the CAISO more closely tailor the CRRs issued from the annual process to match the realities of the day-ahead market. By better matching CRRs to what the day-ahead market likely will do, the CAISO can improve CRR efficiency (particularly revenue adequacy).

### B. Stakeholder Issues and CAISO Responses

At the conclusion of the prior CRR stakeholder process that began in 2017, the CAISO committed to review the impact of the new rules on the CRR process and consider further enhancements based on that impact. The stakeholder process leading to this filing grew out of that prior commitment. The initiative began in November 2024 with a working group phase. Through seven working group meetings over the next year, the CAISO and stakeholders defined a statement of the problems confronting the CRR process and the goals of comprehensive improvements. The initiative moved into the policy phase in December 2025 with publication of an issue paper on potential revisions to CRR product definition. The CAISO followed this up in January 2026 by publishing an issue paper focused on potential revenue adequacy and auction efficiency policies. In June 2026, the CAISO published a straw proposal in which it proposed to pursue two CRR enhancements on an expedited timeline for implementation in time for the 2027 annual CRR process run in 2026. These two enhancements were a minimum bid and price in the CRR auction and adding loop flow modeling to the annual CRR full network model.

The minimum bid and price aspect of the initiative was the subject of significant stakeholder feedback. Some stakeholders actively opposed the proposed minimum bid/price, and others did not view the CAISO as having established a sufficient foundation for them to form an opinion on the proposal. Only one stakeholder indicated support. The CAISO concluded it was more appropriate to consider the minimum bid/price, along with other potential comprehensive measures to address CRR efficiency, in a new, separate phase of the stakeholder process. That phase is scheduled to begin in the third quarter of this year.

Most stakeholders supported, and none opposed, the proposed loop flow modeling authority. Some stakeholders expressed interest in additional details on the methodology the CAISO will use. The CAISO will provide those details as part of the information the CAISO releases before the annual process. One stakeholder, although not opposing the loop flow proposal, questioned whether this new modeling authority would create significant benefits for the CRR process. The proposed amendment may not materially improve auction revenue shortfall. However, these changes potentially could provide significant benefits

for revenue adequacy by reducing the frequency of the CAISO allocating CRRs on transmission paths that have less than expected congestion collected in the day-ahead market because some of that path's capacity is taken up by loop flows. The CAISO cannot predict with certainty the magnitude of improvement to revenue adequacy from this modeling change. However, the CAISO is reasonably confident this change will create some tangible improvements for CRR efficiency. Given the proposed changes are easily implementable, the CAISO sees no reason not to pursue this authority. Accordingly, the Commission should find the proposed tariff revisions are just and reasonable.

## III. Effective Date(s)

The CAISO respectfully requests the Commission issue an order accepting the proposed tariff revisions by September 28, 2026. The CAISO respectfully requests the Commission grant a waiver of the 60-day prior notice requirement and accept an effective date of July 29, 2026 for the tariff revisions contained in this filing.[13]

The annual CRR process began on July 22 with publication of the initial CRR full network model, and the CAISO will publish the final model on August 26.[14] Tier 1 nominations will be accepted from September 1 through September 3, with Tier 1 results scheduled for posting on September 9. To meet this schedule, the proposed tariff revisions must be implemented no later than the Tier 1 optimization period, which occurs between September 3 and September 9.

Delaying the annual CRR process until the CAISO receives a Commission order on the standard 60-day timeline is not feasible. The annual process is scheduled to conclude on November 9 with publication of annual auction results. A 60-day notice period would shift the calendar by more than one month especially given the Thanksgiving holiday. This creates a substantial risk the annual process could extend into the December holiday period or not be completed before the start of 2027 if unforeseen delays were to occur. Alternatively, maintaining the current annual CRR process completion date would require the CAISO unduly to compress the timeline, imposing additional administrative burdens on the CAISO and market participants.

The CAISO is reluctant to request an expedited order from the Commission, given the burden such a request would impose on the Commission and its staff. Instead, to allow the proposed loop flow modeling authority to be

[13] Specifically, pursuant to Section 35.11 of the Commission's regulations (18 C.F.R. § 35.11), the ISO requests waiver of Section 35.3 of the Commission's regulations (18 C.F.R. § 35.3) in order to permit this effective date.

[14] The calendar for CRR activities in 2026 and 2027 is available at: https://www.caiso.com/documents/2026-monthly-and-2027-annual-allocation-and-auction-calendar-revised.pdf.

implemented in the 2027 annual CRR process, the CAISO requests the Commission issue an order by September 28, allowing the tariff revisions become effective immediately, subject to refund. This approach would permit the annual process to proceed on schedule using a CRR full network model that incorporates loop flow modeling. If the Commission subsequently were to reject the proposal, the CAISO would restart the process beginning with the Tier 1 optimization using already-submitted nominations. Participants would be on notice there is a chance their Tier 1 nominations will be optimized using somewhat higher constraint limits than were included in the model provided on August 26. Because of the iterative nature of the CRR process, the CAISO would have to permit parties to resubmit nominations to the long-term tier, which follows Tier 1; the CRRs open for nomination in the long-term tier are based on the results of Tier 1. Although this contingency would delay completion of the annual process beyond November 9, it would significantly reduce the risk of extending the process into the holiday period or beyond the start of 2027. Under this approach, regardless of the Commission's decision on this proposed tariff amendment, no CRRs ultimately will be settled based on a modeling approach that lacks Commission approval.

The CAISO recognizes implementation of this contingency plan would create inconvenience for both the CAISO and market participants. Nevertheless, given the available procedural alternatives and the CAISO's confidence the proposed revisions are just and reasonable, making the tariff provisions effective July 29, 2026, subject to refund, is the most appropriate course.

## IV. Communications

Under Rule 203(b)(3),[15] the CAISO respectfully requests that all correspondence and other communications about this filing be served upon:

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[15] 18 C.F.R. § 385.203(b)(3).

## V. 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.

## VI. Contents of this filing

Besides this transmittal letter, this filing includes these attachments:

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|---|---|
| Attachment A | Clean CAISO tariff sheets |
| Attachment B | Marked CAISO tariff sheets |
| Attachment C | Final Proposal |
| Attachment D | Board of Governors Memo |

## VII. 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 September 28, 2026, effective July 29, 2026.

Respectfully submitted,

***/s/ David S. Zlotlow***
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**Attachment A – Clean Tariff**

**Tariff Amendment to Model Loop Flow in the Annual CRR Process**

**California Independent System Operator Corporation**

**July 28, 2026**

### 36.4 FNM for CRR Allocation and CRR Auction

The CAISO shall prepare the CRR FNM that it will use in the CRR Allocation and CRR Auction consistent with the following requirements:

#### 36.4.1 Adjustments to the FNM in Preparing the CRR FNM

When the CAISO conducts its CRR Allocation and CRR Auction, the CAISO shall use the most up-to-date DC FNM, which is based on the AC FNM used in the Day-Ahead Market.

##### 36.4.1.1 Seasonal Available CRR Capacity

The CAISO shall base the Seasonal Available CRR Capacity on the DC FNM, taking into consideration the following, all of which are discussed in the applicable Business Practice Manual:

(i) any long-term scheduled transmission Outages, including planned outages submitted pursuant to Section 9.3.6;

(ii) TTC adjusted for any long-term scheduled derates;

(iii) a downward adjustment due to TOR or ETC as determined by the CAISO; and

(iv) the impact on transmission elements used in the annual CRR Allocation and Auction of:

(a) transmission Outages or derates that are not scheduled at the time the CAISO conducts the Seasonal CRR Allocation or Auction determined through a methodology that calculates the breakeven point for revenue adequacy based on historical Outages and derates; and

(b) known system topology changes, both as further defined in the Business Practice Manuals; and

(v) adjustments for possible unscheduled flow at the Interties.

##### 36.4.1.2 Monthly Available CRR Capacity

The CAISO shall base the Monthly Available CRR Capacity on the DC FNM, taking into consideration:

(i) any scheduled transmission Outages known at least thirty (30) days in advance of the start of that month as submitted for approval consistent with the criteria specified in Section 36.4.3;

(ii) adjustments to compensate for the expected impact of Outages that are not required to be scheduled thirty (30) days in advance, including unplanned transmission Outages;

(iii) adjustments to restore Outages or derates that were applied for use in calculating Seasonal Available CRR Capacity but are not applicable for the current month;

(iv) any new transmission facilities added to the CAISO Controlled Grid that were not part of the DC FNM used to determine the prior Seasonal Available CRR Capacity and that have already been placed in-service and energized at the time the CAISO starts the applicable monthly process;

(v) TTC adjusted for any scheduled derates or Outages for that month;

(vi) a downward adjustment due to TOR or ETC as determined by the CAISO; and

(vii) adjustments for possible unscheduled flow at the Interties.

**Attachment B – Marked Tariff**

**Tariff Amendment to Model Loop Flow in the Annual CRR Process**

**California Independent System Operator Corporation**

**July 28, 2026**

### 36.4 FNM for CRR Allocation and CRR Auction

The CAISO shall prepare the CRR FNM that it will use in the CRR Allocation and CRR Auction consistent with the following requirements:

#### 36.4.1 Adjustments to the FNM in Preparing the CRR FNM

When the CAISO conducts its CRR Allocation and CRR Auction, the CAISO shall use the most up-to-date DC FNM, which is based on the AC FNM used in the Day-Ahead Market.

##### 36.4.1.1 Seasonal Available CRR Capacity

The CAISO shall base the Seasonal Available CRR Capacity on the DC FNM, taking into consideration the following, all of which are discussed in the applicable Business Practice Manual:

(i) any long-term scheduled transmission Outages, including planned outages submitted pursuant to Section 9.3.6;

(ii) TTC adjusted for any long-term scheduled derates;

(iii) a downward adjustment due to TOR or ETC as determined by the CAISO; and

(iv) the impact on transmission elements used in the annual CRR Allocation and Auction of:

(a) transmission Outages or derates that are not scheduled at the time the CAISO conducts the Seasonal CRR Allocation or Auction determined through a methodology that calculates the breakeven point for revenue adequacy based on historical Outages and derates; and

(b) known system topology changes, both as further defined in the Business Practice Manuals; and.

(v) adjustments for possible unscheduled flow at the Interties.

##### 36.4.1.2 Monthly Available CRR Capacity

The CAISO shall base the Monthly Available CRR Capacity on the DC FNM, taking into consideration:

(i) any scheduled transmission Outages known at least thirty (30) days in advance of the start of that month as submitted for approval consistent with the criteria specified in Section 36.4.3;

(ii) adjustments to compensate for the expected impact of Outages that are not required to be scheduled thirty (30) days in advance, including unplanned transmission Outages;

(iii) adjustments to restore Outages or derates that were applied for use in calculating Seasonal Available CRR Capacity but are not applicable for the current month;

(iv) any new transmission facilities added to the CAISO Controlled Grid that were not part of the DC FNM used to determine the prior Seasonal Available CRR Capacity and that have already been placed in-service and energized at the time the CAISO starts the applicable monthly process;

(v) TTC adjusted for any scheduled derates or Outages for that month;

(vi) a downward adjustment due to TOR or ETC as determined by the CAISO; and

(vii) adjustments for possible unscheduled flow at the Interties.

**Attachment C – Final Proposal**

**Tariff Amendment to Model Loop Flow in the Annual CRR Process**

**California Independent System Operator Corporation**

**July 28, 2026**


# Congestion Revenue Rights Enhancements

# Phase 1 Final Proposal

**July 6, 2026**

# Table of Contents

# 1. Executive Summary

This final proposal retains the modified version of the phased approach to the Congestion Revenue Rights Enhancements initiative outlined in the draft final proposal published June 23, 2026. Phase 1 consists of expedited changes designed to be in place for the 2027 annual Congestion Revenue Rights (CRR) process. The Phase 1 scope consists of modeling improvements under the existing tariff and expanded ISO authority to model loop flow in the annual CRR process. In response to stakeholder feedback, the concept of a minimum bid and price in the CRR auction will be explored in Phase 2 and will not be pursued further in Phase 1. This change is not a rejection of the auction floor in concept, but the ISO recognizes most stakeholders' position that this idea would benefit from more consideration and discussion than is possible in Phase 1. The auction price floor proposal will be considered in Phase 2 alongside other proposals for improving auction efficiency that stakeholders have suggested. Phase 2 will consider measures that require more time to fully develop and will include the product definition topics. This phased approach is designed to achieve improvements in revenue adequacy for the 2027 annual process while being responsive to stakeholder feedback and allowing time to fully consider more complex enhancements.

# 2. Introduction

The ISO's Congestion Revenue Rights Enhancements initiative has identified revenue adequacy, auction efficiency, and product definition as the three priority areas for CRR market reform.[1] In support of these priorities, this final proposal retains the modified version of the phased approach to policy development described in the draft final proposal.[2] This final proposal keeps the phased structure, which is designed to balance incremental improvements that can be implemented sooner with thorough consideration of more complex structural reforms. However, in response to stakeholder feedback this final proposal retains the modifications to the Phase 1 scope proposed in the draft final proposal. Phase 1, designed to be implementable for the 2027 CRR annual process, will include only the revenue adequacy measures from the straw proposal and draft final proposal. These measures consist of new ISO authority to model loop flow in the annual CRR process paired with ongoing model improvements within the ISO's existing tariff authority. The proposal for a bid and price floor in the CRR auction, designed to help improve auction efficiency, is moved to Phase 2 for consideration alongside other proposed enhancements aimed at auction efficiency.

This initiative is building on previous market improvements over the past seven years. Revenue adequacy and auction efficiency have improved since the ISO implemented the previous round of policy changes in 2019. Revenue adequacy improved from an average of 75% in the five years preceding the changes to 79% from 2019 through June 2025.[3] Auction efficiency improved from 50% in the two years

[1] The full record for this initiative, including all papers, presentations, stakeholder comments, and recordings of working group meetings, can be found on the initiative's webpage: California ISO - Congestion revenue rights enhancements.
[2] Straw Proposal on Revenue Adequacy and Auction Efficiency, June 1, 2026.
[3] Issue Paper on Revenue Adequacy and Auction Efficiency Enhancements, page 10, January 14, 2026.

preceding the changes to 67% from January 2019 through June 2025.[4] Nonetheless, the CAISO CRR market still faces persistent revenue adequacy and auction efficiency challenges. The improved 79% average system-level revenue adequacy from 2019 through June 2025 reflects a total shortfall of approximately $856 million, or about $114 million per year.

The CAISO's February 2025 root cause analysis identified three structural drivers of revenue inadequacy: missing power flow contributions from injections below the 2% shift factor threshold, loop flows consuming transmission capacity without contributing to congestion rent collection, and divergence between the CRR network model and the day-ahead market, particularly from outage timing misalignment.

The CRR working group also identified auction efficiency as a priority area with significant variation in stakeholder perspectives. Some load-serving entities, the ISO Department of Market Monitoring (DMM), and the California Public Utilities Commission (CPUC) Energy Division conjectured that the low auction efficiency stemmed from an auction design that allows participants with limited congestion risk exposure to acquire CRRs at prices consistently below their realized day-ahead value. Financial market participants and marketers contended that auction efficiency metrics fail to capture significant value streams and that improving revenue adequacy by reducing uncertainty would organically improve auction prices and efficiency.

To drive further improvement in all three key areas, this final proposal retains the modified version of the two-phase structure proposed in the draft final proposal. The purpose of the two phases remains the same. Phase 1 is focused on achieving incremental improvements as quickly as possible, while Phase 2 is designed for comprehensive consideration of more complex potential reforms.

Phase 1 retains the revenue adequacy-focused scope from the draft final proposal, which was not opposed by any stakeholders commenting on the draft final proposal. This consists of new ISO authority to model loop flows in the annual CRR process. This will be accompanied by modeling enhancements within the ISO's existing tariff authority to improve alignment between the CRR model and the day-ahead market. The auction bid and price floor from the straw proposal, aimed at improving auction efficiency, is moved to Phase 2 in response to stakeholder requests for further consideration.

Future phases will pursue larger structural redesign continuing in 2026 and likely into 2027. The ISO will continue considering options already discussed with stakeholders and reflected in stakeholder comments. This may include combining a minimum price floor with other changes, taking into account considerations such as ensuring access to the transmission system via CRRs at a reasonable rate, providing participants with access to hedging instruments, and providing participants a venue to resell allocated rights that do not best fit their hedging needs. Phase 2 will also expand on the Product Definition Straw Proposal with updated time-of-use periods and storage sink flexibility.[5]

[4] Id. at 18.
[5] Issue Paper and Straw Proposal on Product Definition, December 12, 2025.

Modeling improvements will continue in Phase 2, including potentially incorporating Extended Day-Ahead Market (EDAM) Congestion Revenue Allocation (CRA) information to inform modeling and outage timing reforms. Phase 2 could also include discussion on whether outage information received after the start of the allocation process should be included in auction runs.

Several factors will need to be accounted for going forward. The ongoing evolution of the EDAM CRA framework could affect the congestion revenue the ISO has available to fund CRR obligations, and any changes developed in this initiative must be compatible with the EDAM framework. Also, the ISO upgraded the CRR software platform in July 2025, and additional modeling improvements may be achievable under existing tariff authority using this new platform.

The ISO is committed to working with stakeholders to develop policy changes that advance the goals and address the problem statements that the CRR working group identified. We appreciate stakeholders' rigorous engagement with the straw proposal and draft final proposal. This final proposal does not seek to resolve all of the questions the working group identified, but seeks to establish a specific two-phase direction and bring the Phase 1 policy process to a conclusion.

# 3. Stakeholder Process

In the scoping phase of this initiative, the working group identified five goals for the initiative across two key CRR market functions. These goals represent the outcomes that changes to the CRR market design should achieve and that will guide policy development throughout this initiative.

**CRR Market Function**: Fair allocation of transmission revenues to customers paying the embedded costs of the transmission system:

- **Goal 1**: CRRs in the auction should be priced at a reasonable approximation of their costs and the expected payout of congestion rent in the day-ahead market.
- **Goal 2**: Customers paying the costs for the CAISO transmission grid should receive approximately commensurate value for payouts made to CRR rights purchased in the auction when considering all demonstrated value provided by entities purchasing CRRs in the auction.

**CRR Market Function**: Allow hedging costs of congestion in the context of a day-ahead energy market:

- **Goal 3**: The CRR market's products and processes should facilitate the ability for participants to obtain effective hedging tools and maintain the hedging value of CRRs to the extent possible, including by minimizing divergence between the CRR model and the day-ahead market model.
- **Goal 4**: Day-ahead energy market participants exposed to congestion risk should be able to hedge that risk efficiently.
- **Goal 5**: The CRR market structure should support open access to the CAISO transmission system, in keeping with FERC Order 888.

The working group also identified five problem statements to guide the policy development phase. The straw proposal in the chapters that follow is structured to address each of these problem statements, particularly numbers 1 through 4.

1. **Auction revenue adequacy**: Since adoption of the 2019 policy changes, the ratio of auction revenue per dollar of CRR payout has improved from 50 cents to 68 cents. However, many load-serving entities have expressed that the benefits from the auction mechanism still do not fully justify the cost to them in foregone congestion rent allocation. Questions remain whether the auction mechanism justifies the cost to customers that pay the costs for the CAISO transmission grid in foregone congestion revenue.
2. **Participant contribution to fair allocation**: Based on market results, it is unclear to what extent all CRR auction participants contribute to the fair allocation of transmission revenues. Particular focus of reforms should consider whether the congestion revenues received from different types of auction participants are commensurate with (A) their funding of the transmission system, (B) their payments for auction CRRs, and (C) other hedging value received by physical market participants.
3. **Model divergence and revenue inadequacy**: Divergence between monthly CRR modeling outcomes and day-ahead market outcomes contributes to revenue inadequacy that reduces the value of CRRs as a hedging tool. CAISO should evaluate and where feasible adopt measures for reducing this divergence, including those related to loop flows, shift factors, and transmission outages. Reform measures should align with Congestion Revenue Allocation methodologies and consider the most accurate information of transmission use from neighboring balancing authorities.
4. **Shortfall allocation methodology**: The method for allocating revenue shortfalls should strike the best balance practicable between allocating congestion revenue back to transmission customers and maintaining the hedging value of CRRs, while recognizing the evolving congestion revenue allocation on external constraints. Allocation of revenue shortfalls should be guided by cost causation principles.
5. **Evolving hedging needs**: Hedging needs are evolving alongside the composition of the ISO BAA's generation fleet. The products available in the CRR market and the processes by which they are distributed should be updated to match evolving hedging needs. This could include revisiting time-of-use periods, developing measures to facilitate hedging of congestion risk associated with storage charging load, and revisiting the auction schedule.

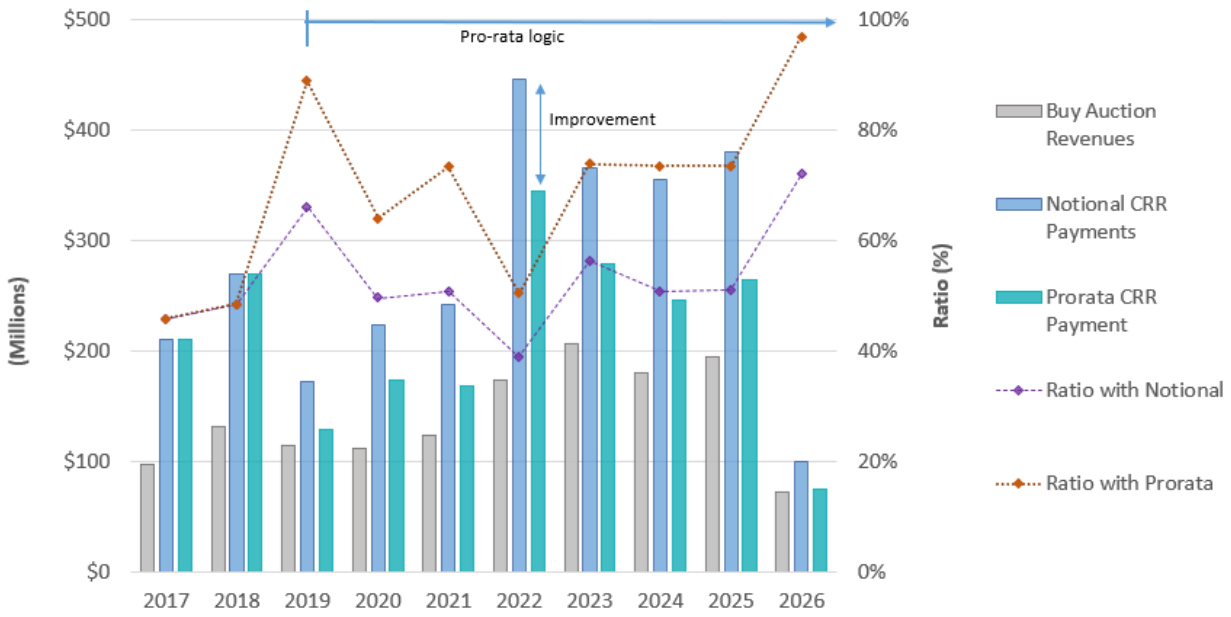
# 4. Final Proposal: Phase 1 CRR Enhancements

## 4.1. Background

### Historical Auction Efficiency Outcomes

CRR auction efficiency averaged about 67% from 2019 through June 2025, an improvement from pre-2019 auction efficiency of 50%.[6] The pro-rata revenue shortfall allocation methodology implemented in 2019 reduced payouts by over $530 million, improving auction efficiency by driving down the difference between revenues and payments. Excluding the shortfall allocation, auction efficiency averaged 50% over the same time period, similar to the pre-2019 results.

***Figure 1: Auction Efficiency from 2019-2026***




### Historical Revenue Adequacy Outcomes

Congestion rents collected in the day-ahead market have been consistently below the notional value of the CRRs allocated and auctioned by the ISO. From 2019 through June 2025, system-level revenue adequacy averaged 79%, with a total shortfall of $856 million, or approximately $114 million per year. Prior to 2019, revenue inadequacy was allocated to measured demand (load-serving entities and exports). Since the 2019 policy changes, revenue inadequacy has been allocated to CRR rights holders via the CRR1b methodology on a pro-rata, constraint-by-constraint basis.

[6] Issue Paper on Revenue Adequacy and Auction Efficiency Enhancements, page 18, January 14, 2026

Revenue adequacy has varied significantly across different constraints. In the ISO's previously shared analysis, three constraints with the largest documented shortfalls are the Moss Landing–Las Aguilas 230 kV constraint, the San Bernardino–Devers 230 kV constraint, and the Palo Verde intertie constraint.[7] Together they account for more than $174 million in shortfall as documented in the root cause analysis for the 2019–2024 period.

The Moss Landing–Las Aguilas 230 kV constraint recorded a $70.3 million deficit on $302.9 million in notional CRR value from 2019–2024, reflecting only 76.8% revenue adequacy despite being among the most consistently congested paths in the system. The San Bernardino–Devers 230 kV constraint achieved only 44.5% adequacy over a concentrated four-month outage episode that drove a $53.0 million deficit. The Palo Verde intertie constraint had a $50.9 million deficit attributable primarily to outages submitted after the applicable CRR auction deadline.

These outcomes translate directly into pro-rata haircuts on CRR positions ranging from 14% to 72% — and in tail cases exceeding 100%, resulting in settlement reversals that transform CRR revenue streams into payment obligations. Approximately 4% of all CRR payments system-wide result in reversals, with the distribution highly concentrated on specific chronically inadequate constraints.

## Root Cause Analysis Findings on Revenue Inadequacy

In February and March 2025, the ISO shared with the working group a root cause analysis of the contributors to revenue inadequacy in the CRR market since the 2019 policy changes. The analysis identified three leading structural causes.

### *Shift Factor Threshold*

The ISO's day-ahead market uses a 2% shift factor threshold: injections whose shift factors on a given constraint fall below this threshold are not modeled. The CRR model does not use a shift factor cutoff. This asymmetry causes the settlement process to exclude injections that collectively contribute substantial flow to binding constraints, systematically understating congestion contribution in the settlement calculation.

Stakeholders broadly agreed that the shift factor threshold is a high-priority area for reform. However, the ISO's market AC powerflow optimization and timing limitations limit the ability of the ISO to adopt near term solutions in these areas.

### *Loop Flows (or parallel flow)*

Loop flows use transmission capacity without contributing to congestion rent collection. If not adequately accounted for in the simultaneous feasibility test, loop flows can cause the ISO to release more CRRs than can be funded by congestion revenue. The ISO currently indirectly accounts for loop flows through the global derate factor applied in CRR processes. The global derate factor is fixed while loop flow patterns have significantly different impacts on specific CRR paths. Stakeholder comments in the working group broadly supported enhanced loop flow modeling with more granular assessment in the monthly and annual processes of expected loop flow impacts. The ISO notes as well that the

[7] CAISO Root Cause Analysis presentation, slide 88, February 27, 2025.

amount, impact, and patterns of loop flow could change either as the EDAM footprint expands or as CRA enhancements are finalized. The Phase 1 enhancements described below include increased authority for the ISO to consider loop flow in the annual CRR process.

### *Model Differences Between the CRR and Day Ahead Markets*

Any differences between the CRR and day-ahead markets can also contribute to revenue adequacy. For example, transmission outages that occur in the day-ahead market after the relevant CRR auction has already cleared can reduce available transmission capacity below the level the CRR model assumed. These differences directly affect the revenue adequacy of the allocated and auctioned CRRs. Reducing divergence between the CRR model and the day ahead market outcomes is a focus of both proposed phases of the proposed initiative structure.

## 4.2. Stakeholder Feedback on the June 23rd Draft Final Proposal

On July 2, 2026, 13 stakeholders submitted comments on the draft final proposal and June 25th stakeholder meeting. The major themes expressed in the comments were:

1) **Most stakeholders supported removing the auction bid and price floor concept from the Phase 1 scope.** Several elaborated that they did not think a single floor value applied to all paths in the auction should be the starting point for the Phase 2 auction efficiency discussion.
2) **All stakeholders supported or did not oppose the proposed Phase 1 revenue adequacy measures**. These measures include expanding the ISO's authority to conduct loop flow modeling into the annual CRR process and continuing to explore modeling improvements that fall within the existing tariff.
3) **Several stakeholders expressed support for moving directly into Phase 2 without a pause**. These comments also requested more concrete timelines or requested certain issues be prioritized.

The decision to remove the auction floor concept from Phase 1 was supported by all commenters except for the California Public Utilities Commission (CPUC) Energy Division. The Energy Division saw the lack of auction-focused measures in the revised Phase 1 scope as a missed opportunity to address the core issues facing the CRR market. The Energy Division's comments continued previous support for the bid and price floor as an incremental improvement that could be refined and built on in Phase 2.

Most stakeholders supported and none opposed the new loop flow modeling authority in the annual CRR process. The most frequent caveat to supporting the measure was a request for more details on the exact methodology the ISO would use to implement this loop flow modeling. In particular, the Department of Marking Monitoring (DMM) requested clarification on whether the derates associated with the loop flow modeling would be applied instead of or in addition to the Global Derate Factor. The CPUC Energy Division, while not opposing the loop flow modeling authority, emphasized that it does not see this as the most pressing issue facing the CRR market and expects it to have limited effect on revenue adequacy.

## 4.3. Final Proposal: Phase 1 Enhancements

Phase 1 is targeted for CRR year 2027 implementation and is designed to take meaningful and quick action to address priority areas. The ISO makes this final proposal in response to stakeholder feedback on the draft final proposal.

### Minimum Bid and Price Floor

In response to stakeholder feedback, the ISO stands by the removal of the minimum bid and price floor from the Phase 1 proposal. Measures such as a minimum price will be considered in Phase 2 alongside other reform options. . The ISO recognizes that some stakeholders do not see the auction price floor as discussed in Phase 1 as the preferable starting point for the Phase 2 discussion. The ISO also recognizes that some stakeholders had different models and packages for implementing a potential price floor including applying such a floor on a constraint basis. The ISO is committed to exploring a variety of options in phase 2, but the lessons and alternatives gained from the Phase 1 minimum bid discussion serve as a valuable starting point for the next phase.

### Modeling Enhancements for Improved Revenue Adequacy

In light of stakeholder support, the ISO will continue forward with the Phase 1 revenue adequacy measures in the draft final proposal. These are to continue improving the ISO's modeling to the extent the current tariff allows, while making a targeted improvement to loop flow modeling capabilities.

The ISO has already begun modeling improvements that are supported by the existing tariff and facilitated by the ISO's move to an updated software platform in 2025. The April 22nd stakeholder meeting in this initiative and the April 27th Market Performance and Planning Forum both discussed how the ISO began applying the Global Derate Factor to contingency constraints in the CRR model in March 2026. While a single month is too small a sample to draw definitive conclusions, March saw a revenue adequacy surplus of $1.6 million, the first monthly surplus in the last three years.[8] The ISO will look for additional ways to improve its modeling accuracy within existing tariff authority and, as with this measure, to keep stakeholders apprised.

The expanded loop flow modeling authority will take the form of a tariff change to enhance the ISO's loop flow modeling capabilities. Section 36.4.1.2(vii) currently directs the ISO to consider "adjustments for possible unscheduled flow at the Interties" among other factors when determining the quantity of CRRs to release each month, known as the Monthly Available CRR Capacity.[9] The ISO proposes to add this same language to the previous tariff section, which details the factors to consider when determining the Seasonal Available CRR Quantity in the annual CRR process.[10]

With this expanded loop flow modeling authority in place, the ISO will be able to introduce loop flow modeling for the 2027 annual CRR process. This will consist of targeted, manual adjustments to some high-market-impact constraints based on historical loop flow information. In the longer term, the ISO

[8] See slide 47 of the MPPF presentation: MarketPerformance-PlanningForum-Apr-27-2026
[9] Tariff Section 36.4.1.2(vii): section-36-congestion-revenue-rights-as-of-aug-3-2024.pdf
[10] Tariff Section 36.4.1.1: section-36-congestion-revenue-rights-as-of-aug-3-2024.pdf

will explore other loop flow modeling approaches, such as modeling loop flows as injections and withdrawals as opposed to constraint derates. The ISO recognizes continued stakeholder interest in the details of loop flow modeling and will provide more information in the future.

# 5. Governance Classification

CAISO staff believe that this initiative should be presented only to the CAISO Board of Governors (the Board) for decision, because any proposed tariff amendments will be limited to CAISO's balancing authority area's Congestion Revenue Rights rules.

The Western Energy Markets Governing Body has primary authority over any proposal to change or establish any CAISO tariff rule(s) applicable to the Extended Day Ahead Market (EDAM) or Western Energy Imbalance Market (WEIM) Entity balancing authority areas, EDAM or WEIM entities, or other market participants within the EDAM or WEIM Entity balancing authority areas. This scope excludes from primary authority, without limitation, any proposals to change or establish tariff rule(s) applicable only to the CAISO balancing authority area or to the ISO-controlled grid per charter for WEIM and EDAM Governance § 2.2.1. None of the tariff rule changes contemplated in this initiative would be "applicable to WEIM/EDAM Entity balancing authority areas, WEIM/EDAM Entities, or other market participants within WEIM/EDAM Entity balancing authority areas, in their capacity as participants in the WEIM/EDAM." Rather, the proposed tariff rules would be applicable "only to the ISO balancing authority area or to the ISO-controlled grid." Accordingly, the matters scheduled for decision fall outside the scope of primary authority.

While the WEM 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 primary authority," no aspects of this initiative would establish or modify rules of the day-ahead or real time market. Accordingly, this initiative falls outside of the WEM Governing Body's advisory role as well.

This proposed classification reflects the current state of this initiative and could change as the stakeholder process moves ahead.

# 6. Next Steps

The ISO anticipates Phase 2 discussions to be ongoing in Q3 2026 to develop broader solutions addressing the goals developed by the working group.

**Attachment D – Board of Governors Memo**

**Tariff Amendment to Model Loop Flow in the Annual CRR Process**

**California Independent System Operator Corporation**

**July 28, 2026**

# Memorandum

**To:** ISO Board of Governors

**From:** Anna McKenna, Vice President Market Design and Analysis

**Date:** July 8, 2026

**Re:** **Decision on congestion revenue rights enhancements: phase 1**

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***This memorandum requires ISO Board of Governors action.***

## EXECUTIVE SUMMARY

Management proposes enhancements to the ISO's modeling capabilities and revenue adequacy in the congestion revenue rights (CRR) market to allow the ISO to model loop flow, also referred to as unscheduled flow, in the annual CRR process. This targeted enhancement will improve alignment between the CRR model and the day-ahead market, reduce a known source of CRR revenue inadequacy, and strengthen the effectiveness of CRRs as a hedging tool.

With the authority to model and account for loop flow in the annual CRR process, the ISO will be better positioned to account for the effects of loop flow when determining the quantity of CRRs to release. Releasing a quantity of CRRs that is more accurately aligned with the energy flows in the day-ahead market, from which congestion revenue is collected, will reduce the frequency and magnitude of revenue inadequacy. Improved revenue adequacy will, in turn, improve the effectiveness of CRRs as a hedging tool.

Analysis shows that lack of loop-flow modeling in the annual CRR release processes is a significant driver of CRR revenue inadequacy. This proposed change comes from the first phase of the CRR Enhancements initiative, which the ISO undertook as part of its commitment to evaluate CRR market performance and identify improvements that strengthen CRRs as hedging instruments while supporting the ISO's open-access transmission framework. This proposal addresses a specific CRR modeling issue and improves alignment between the day-ahead market and CRR models.

Stakeholders supported or did not oppose the proposed change and agreed that it is consistent with the ISO's analysis of the causes of CRR revenue inadequacy.

***Moved, that the ISO Board of Governors approves the congestion revenue rights enhancements phase 1 final proposal as described in the memorandum dated July 8, 2026; and***

***Moved, that the ISO Board of Governors authorizes Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the changes 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.***

## BACKGROUND

The ISO's congestion revenue rights enhancements (CRRE) initiative focuses on identifying and developing enhancements to the ISO's CRR market. When the ISO adopted changes to the CRR framework in 2018, it committed to reviewing CRR market performance and evaluating whether further changes were warranted. The CRRE initiative fulfills this commitment, and Management's proposal in this memorandum is the first result of that effort. The CRRE initiative continues and will likely yield further enhancements.

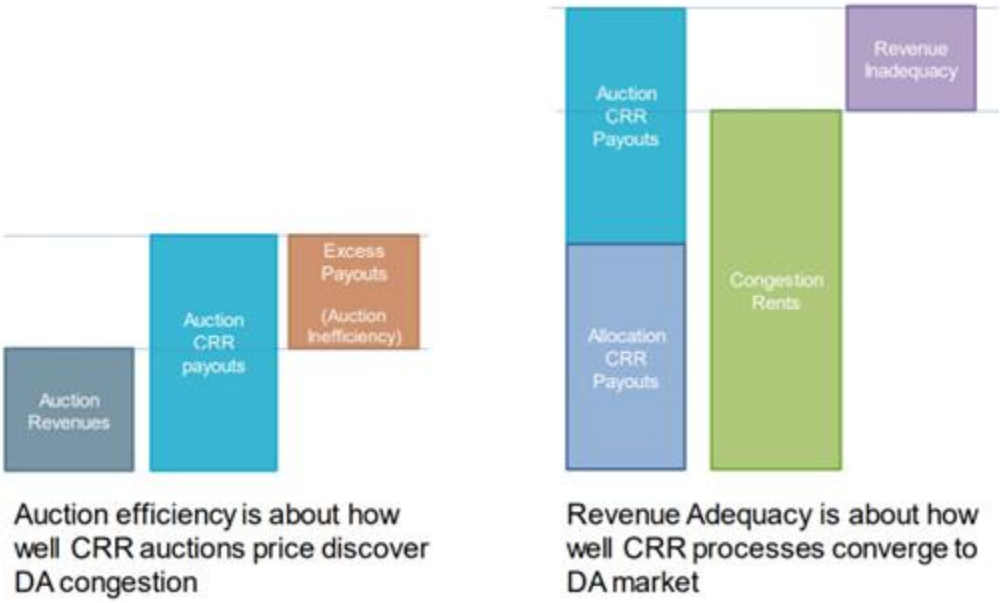
The CRRE initiative began with a scoping phase from November 2024 through December 2025. During this phase, the CRRE working group established objectives and problem statements to guide subsequent policy development. The working group identified three priority areas: revenue adequacy, auction efficiency, and product definition.

Revenue adequacy is a measure of the extent to which the congestion revenue the ISO collects in the day-ahead market meets the notional value of CRRs allocated and auctioned by the ISO. If the ISO collects less congestion revenue than the notional value of the CRRs it has issued, there is revenue inadequacy. In other words, revenue inadequacy occurs when congestion revenues collected by the ISO are insufficient to fund the notional value of issued CRRs.

Auction efficiency is the ratio of the total amount paid by participants in the CRR auction to the total amount of congestion revenue paid out to holders of auctioned CRRs. It measures how effectively auction prices reflect the congestion revenues ultimately paid to CRR holders. Figure 1 compares the information used to calculate revenue adequacy and auction efficiency.

Product definition refers to how CRRs are defined, particularly whether CRR products align with market participants' hedging needs and exposure to congestion risk in the ISO energy market. Product definition includes characteristics such as the hours of the day covered by a CRR, the duration of the CRR (e.g. monthly versus seasonal), and the transmission paths CRR market participants may nominate in the allocation or purchase through the auction.

***Figure 1. Definition of auction efficiency (left) and revenue adequacy (right)***




Revenue adequacy and auction efficiency have improved since the ISO implemented the previous round of CRR design enhancements in 2019. Revenue adequacy, which would equal 100% if the congestion revenues collected in the day-ahead market fully funded the notional value of issued CRRs, increased from an average of 75% in the five years preceding the changes to 79% from 2019 through June 2025. Auction efficiency improved from about 50% preceding the changes to 67% from January 2019 through June 2025. Despite these gains, the ISO's CRR market still faces persistent revenue adequacy and auction efficiency challenges. While revenue adequacy improved from 75% to 79% following the 2019 reforms, approximately 21% of the notional value of issued CRRs remains unfunded on average, indicating that further improvements are warranted.

The ISO's February 2025 root cause analysis identified three structural drivers of revenue inadequacy. The first is the exclusion of power-flow contributions from injections that fall below the shift-factor threshold used in the day-ahead and real-time markets. The shift-factor threshold is necessary in the day-ahead and real-time markets to ensure timely market optimization. Although these flows are small individually, excluding them in the markets but not in the CRR model collectively creates a difference between the CRR and market models.

The second driver is loop flows consuming transmission capacity without contributing to congestion revenue collections. Loop flows occupy transmission capacity, and the market dispatches based on the amount of available transmission less estimated loop flows. Accordingly, market dispatch accounts for the impact of loop flows by reducing the transmission capability available to the market. Congestion revenue results from market dispatches paying for congestion, but loop flows do not pay. Because loop flows are not associated with market transactions, they do not contribute to congestion revenues.

The third driver is divergence between the CRR network model and the day-ahead market, which creates revenue inadequacy.

To drive further improvement in all three priority areas, the ISO has taken a sequenced, two-phase approach to the policy development portion of the CRRE initiative. Phase 1 focuses on targeted enhancements designed to address discrete challenges and deliver incremental improvements. Management's proposal presented in this memorandum is the final product of Phase 1. Phase 2 will evaluate more complex reforms related to auction efficiency and product definition, as well as additional measures to improve revenue adequacy.

## PROPOSAL

Management proposes expanding the ISO's authority to model loop flow in the annual CRR process. This change will improve the accuracy of CRR modeling and reduce the likelihood and magnitude of revenue inadequacy.

Management proposes to implement this change by adding loop flow to the list of factors the ISO may consider when calculating the Seasonal Available CRR Capacity — the amount of CRR capacity the ISO can release in each annual CRR process. The ISO already includes in the tariff "adjustments for possible unscheduled flow at the Interties" in the factors it considers when calculating the Monthly Available CRR Capacity, which plays a corresponding role in the monthly CRR process. Management proposes adding comparable language to the tariff section governing calculation of Seasonal Available CRR Capacity.

Although the ISO currently incorporates adjustments for possible unscheduled flow in the monthly CRR process, the tariff does not provide comparable authority in the annual CRR process. The proposed amendment closes this gap and ensures consistent treatment of loop flow impacts across CRR timeframes.

Of the three structural drivers identified in the ISO's root-cause analysis, the phase 1 proposal directly addresses loop flow impacts and partially reduces model divergence by allowing the annual CRR process to better reflect conditions represented in the day-ahead market.

This proposal presents limited implementation risk because it expands the ISO's modeling authority without requiring changes to market systems, CRR products, participant processes, or settlement calculations. Initial implementation will utilize existing CRR modeling capabilities and configurable transmission constraint parameters.

With this expanded loop flow modeling authority in place, the ISO will be able to introduce loop flow modeling for the 2027 annual CRR process. For the 2027 CRR releases, this will consist of targeted, manual adjustments to transmission constraints with significant market impacts based on historical loop flow data. Over time, the ISO will explore other loop flow modeling approaches under this same authority, such as modeling loop flows as injections and withdrawals rather than constraint derates.

Having the flexibility to change the exact method of loop flow modeling will allow the ISO to use the best available information and coordinate with the evolving congestion management framework in the Extended Day-Ahead Market (EDAM).

## STAKEHOLDER FEEDBACK

Management appreciates the robust stakeholder engagement and thoughtful feedback received throughout phase 1 of the initiative. Over the course of phase 1, the ISO published four papers: an Issue Paper, Straw Proposal, Draft Final Proposal, and Final Proposal. Between January and June 2026, the ISO hosted four stakeholder meetings and received a total of 74 sets of written comments. These contributions were instrumental in refining the final proposal.

Stakeholders supported or did not oppose expanding the ISO's loop flow modeling authority in the annual CRR process. Many stakeholders expressed support for this measure due to its alignment with the findings of the ISO's root cause analysis of the drivers of revenue inadequacy in the CRR market. Some stakeholders requested more details on how loop flow modeling would be conducted. Others noted that, while valuable, this measure was not sufficient and should be built on in Phase 2.

The ISO will provide additional details on its loop flow modeling as the 2027 annual CRR process begins in July. For the 2027 annual process, the methodology the ISO plans to use for initial loop flow modeling will not require any changes by CRR market participants. The manual adjustments to constraint limits described above are implementable within the ISO's existing CRR model, where constraint limits are already configurable. The final constraint limits resulting from the loop flow work will be published as part of the ISO's existing practice of publishing all constraint limits used in the CRR model. These constraints will continue to be published in the same manner and format, so CRR market participants who use ISO CRR materials as inputs for their own internal processes will not experience any disruption. To the extent that the ISO evolves its loop flow methodology in the future, the ISO will keep market participants informed.

Some stakeholders stated that, while the loop flow modeling is an improvement they support, it is insufficient on its own and will need to be augmented in phase 2. This position is consistent with the ISO's planned approach for phase 2. Continued work in the third quarter of 2026 will include consideration of additional revenue adequacy measures alongside proposals focused on auction efficiency and product definition.

As part of the stakeholder process for phase 1, the ISO considered and included in the straw proposal an additional measure to improve auction efficiency. The ISO proposed a bid and price floor in the CRR auction as an incremental enhancement until more complex auction restructuring proposals could be fully considered in phase 2. However, stakeholders generally opposed moving forward with the proposal in phase 1. While some stakeholders opposed the floor concept on principle, even those who supported

the concept argued that the idea was complex enough to merit more discussion than was possible for implementation in the 2027 annual process. Therefore, this possible change will be considered in phase 2, where it will be considered alongside other proposals for improving auction efficiency.

## CONCLUSION

Management recommends that the ISO Board of Governors approve the proposed expansion of the ISO's authority to model loop flow in the annual CRR process. This proposal directly addresses a documented contributor to CRR revenue inadequacy, improves consistency between the CRR and day-ahead market models, presents minimal implementation risk, and has broad stakeholder support. Approval will provide the ISO with an additional tool to improve CRR market performance while maintaining flexibility to pursue further enhancements in phase 2.