



California ISO

Congestion Revenue Rights Enhancements Working Group Discussion Paper

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1 Introduction

This paper is the beginning of the California ISO's ("the ISO") Congestion Revenue Rights (CRR) Enhancements initiative. This initiative continues efforts to enhance the ISO's CRR market using a working group structure to collaboratively identify goals and problem statements that will lead into development of policy solutions.

In 2018's Congestion Revenue Rights Auction Efficiency Track 1B, the ISO committed to: 1) assessing the impacts of both the Track 1A and Track 1B proposals (which were designed to resolve the majority of the observed inefficiencies with the CRR auction); and 2) considering more comprehensive changes to the CRR allocation and auction design as needed. Based on stakeholder prioritization and internal analysis, this initiative will explore a variety of stakeholder concerns identified in the stakeholder catalogue process including issues related to auction efficiency, revenue inadequacy, product definition, and allocation. Given the time since the previous initiative and interest from parties outside of the California ISO BAA, the working group will review the historical goals/purpose of CRRs and the current processes for the allocation and auction of CRRs. The ISO also believes a common understanding of how CRRs fit into the hedging strategies of different entities will be important to developing problem statements and eventual solutions. The ISO requests stakeholder feedback on how to conduct both efforts in a way that will be most helpful to participants, as well as input on recommended steps and topics for the working group.

The ISO anticipates the CRR Working Group can greatly enhance the quality of market policy design by giving stakeholders a more active role in the process. This effort will focus on three key areas: principles, problem statements, and prioritization of issues. The goal is to produce a "CRR Adequacy Action Plan," containing recommendations for the next phase in which stakeholders and the ISO will engage in policy development to address the problem statements.

The initial problem statements focus on:

- Revenue Inadequacy
- Auction efficiency
- CRR product definition

The problem statements included in the paper are a springboard for discussion. Working group members are strongly encouraged to bring and present their own problem statements, principles, goals, and process for the CRR working group for discussion. While the ISO recognizes that there will likely be a range of goals and problem statements proposed by different stakeholders, we are optimistic that at minimum understanding the goals and challenges different participants face will allow for a more effective policy development phase.

2 Conceptual Foundation for CRRs

As the ISO works toward potential reforms to the current CRR processes, we provide a brief review here of the original purposes of financial transmission rights in RTO/ISO markets and the ISO's historical goals around the CRR framework. The ISO believes that establishing a common understanding of the foundational goals of CRRs in RTO/ISOs will be critical as the working group moves towards defining problem statements and then to policy development. Building on this foundational understanding (and factoring in the analysis of the current program), one can consider potential modifications to these objectives and define problem statements to take into policy development.

Precedent at the Federal Energy Regulatory Commission (FERC)

The evolution of financial transmission rights in organized markets has come through a combination of FERC rulemakings and individual RTO/ISO filings. The various financial transmission rights models developed in different RTO/ISOs have a variety of objectives but are primarily designed to:

1. Provide open access transmission,
2. Allocate fairly transmission revenues to customers paying the imbedded costs of the transmission system, and
3. Allow hedging of congestion costs in the context of a Day-Ahead energy market.

The evolution from Open Access Transmission Tariff (OATT)-based transmission to locational marginal price (LMP) markets was paired with the creation of a financial-right equivalent to firm transmission rights. These financial rights were established to allow for the efficient dispatch of resources across the footprint while allowing efficient hedging of congestion cost risks. In building on open access transmission, FERC found that "FTRs were designed to serve as the

financial equivalent of firm transmission service and play a key role in ensuring open access to firm transmission service by providing a congestion hedging function... The purpose of FTRs to serve as a congestion hedge has been well established.”¹ In its Order 681, FERC explained how RTOs and ISOs which operate markets for energy and/or ancillary services with Locational Marginal Prices can have “price differences [that] can be variable and difficult to predict. In order to manage the risk associated with the variability in prices due to transmission congestion, these markets use various forms of financial transmission rights (FTRs) to allow market participants who hold the rights to protect against such price risks.”²

FERC has also helped define the purpose of financial transmission rights in the context of Order 681, which established long-term transmission rights in RTO/ISO markets.³ FERC explained the comparisons to OATT markets in which “a transmission customer that takes network service or firm point-to-point transmission service is not charged directly for the costs of the redispatch that may be required to accommodate its use of the transmission system...[but] must pay a share of any redispatch costs that the transmission provider and other network customers incur.”⁴ Most infeasibilities in both the physical and financial rights models either have their risk shared through an uplift/redispatch costs, or directly assigned through a transmission curtailment (in the OATT context) or a direct reduction to the financial rights.

California ISO Precedent:

Like other RTO/ISO markets, the ISO operates wholesale markets that include a day-ahead market and a real-time market and settles both load and resources at locational marginal prices. The ISO minimizes the total cost of dispatching electricity to address customer needs while taking into account physical

¹ Federal Energy Regulatory Commission Docket No. EL16-6-002, 2017, p. 11

² [FERC Order 681](#), July 20 2006, pg 5.

³ *Long-Term Firm Transmission Rights in Organized Electricity Markets*, Order No. 681, 71 Fed. Reg. 43,564 (Aug. 1, 2006). Long-term physical or financial transmission rights are required under section 217(b)(4) of the Federal Power Act. 16 USC § 824q(b)(4) (“The Commission shall exercise the authority of the Commission under this chapter in a manner that facilitates the planning and expansion of transmission facilities to meet the reasonable needs of load-serving entities to satisfy the service obligations of the load-serving entities, and enables load-serving entities to secure firm transmission rights (or equivalent tradable or financial rights) on a long-term basis for long-term power supply arrangements made, or planned, to meet such needs.”)

⁴ [FERC Order 681](#), July 20 2006, pg 7.

limitations in the transmission system. The ISO markets' least-cost dispatch and price signals are created by bids in the market that allow different generation and loads to use transmission lines efficiently within the BA without an explicit "use it or lose it" OATT priority on the transmission system. CRRs are the ISO's defined financial instruments that market participants can acquire through an ISO-administered allocation and auction process as described in more detail below.

The ISO's CRR program was adopted in 2006 as part of the Market Redesign and Technology Upgrade (MRTU) project. Among other features, the MRTU created the Day-Ahead Market and moved the ISO's markets to an LMP model. This market redesign required a corresponding update to the way congestion was managed. This in turn called for the ISO to replace its system of firm transmission rights with a system of financial transmission rights (*i.e.*, CRRs). The ISO's MRTU tariff filings with FERC explained CRRs were meant to serve three key functions in the new LMP-based market.⁵

1. *Facilitate long-term contracting by load serving entities (LSEs) and generators* – CRRs provide a hedge for congestion charges in the LMP-based market. Without that hedge, LSEs and generators might not be as willing or able to enter into long-term contracts for energy.
2. *Distribute congestion rents created from congestion pricing in the LMP market* – An LMP market creates congestion rents from the different LMPs between where power is injected into the grid and where it is withdrawn. CRRs are a mechanism for allocating those congestion rents.
3. *Support equitable allocation of costs and benefits of using the transmission system* – Load has paid for the embedded costs of the transmission system and has a continuing obligation to pay those costs. The CRR allocation process provides the majority of CRRs to LSEs who hold CRRs for the benefit of load, which is a way to ensure those who pay for the transmission system benefit from the congestion rents collected on that system.

The ISO's MRTU filing also explained it was important not to limit participation in the CRR process to LSEs; the process would benefit if generators and financial

⁵*Cal. Indep. Sys. Operator Corp.*, Electric Tariff Filing to Reflect Market Redesign and Technology Upgrade, Prepared Direct Testimony of Scott M. Harvey and Susan L. Pope, at 22-23, FERC Docket No. ER06-615-000 (Feb. 9, 2006)

traders also could participate. Among the reasons cited, non-LSE participants would have more incentives to bid counterflow CRRs into the auction. This in turn would increase CRR liquidity and make more CRRs available for LSEs to hedge their anticipated congestion risk.⁶

3 The California ISO CRR Program

The ISO wholesale market structure includes a day-ahead market and a real-time market. The FERC-approved rules for these markets call for the ISO to minimize the cost of dispatching electricity to address customer needs while taking into account physical limitations in the transmission system. Congestion occurs when demand for transmission exceeds the available capacity. The ISO manages transmission congestion through an LMP design. Years of experience by the ISO and other ISOs and RTOs shows that nodal markets employing locational marginal pricing are effective at achieving least-cost dispatch and sending efficient price signals. Because the transmission system operated by the ISO comprises thousands of miles of transmission lines connecting hundreds of resources with the end-use customers consuming electric power, the ISO settles energy prices in its markets at hundreds of pricing locations.

CRRs are financial instruments that market participants can acquire through ISO-administered allocation and auction processes. All other ISOs and RTOs offer comparable financial transmission rights. When transmission demand exceeds capacity, LMPs vary depending on congestion levels. On an aggregate level, this typically results in supply locations having lower locational prices than load. Congestion charges can change based on system conditions and patterns of supply and demand. The algebraic sum of all the congestion charges and payments in the market is referred to as the market's congestion revenue. As FERC has recognized, CRRs give market participants a level of financial protection against the risks associated with unpredictable congestion charges.⁷

The ISO financially settles CRRs based on: (1) the differences in marginal cost of congestion in the day-ahead market between the CRR source and sink across all

⁶ *Id.* at 178-179.

⁷ *See, e.g., Cal. Indep. Sys. Operator Corp.*, 149 FERC ¶ 61,093 at P 2 (2014) (“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).”).

of the paths over which the CRR has modeled flow; (2) the actual congestion charges collected in the day-ahead market on each path over which a CRR has modeled flow; and (3) the proportion of MWs of CRRs an entity has with modeled flow over a path compared to all MWs of CRRs with flow over that path.⁸

The differences in LMPs between the source and sink of a CRR are due to congestion over one or more constraints in the market. Although the day-ahead market does not model CRRs, a CRR can be thought of as having an “implied flow” over constraints for which the ISO settles the CRR. The price differences between two points are determined by the power flow distribution factors, or “shift factors,” and the constraint prices in the day-ahead market. These same day-ahead market shift factors can be used to calculate a CRR “implied flow” on a constraint by treating the CRR’s source as a power injection and a CRR’s sink as a withdrawal. The sum of these implied flows priced at each constraint’s shadow price equals the LMP difference for which the CRR receives compensation.⁹

Aside from their source, sink, and MW quantity, CRRs are also defined by a time-of-use period (either on-peak or off-peak). The ISO only settles on-peak and off-peak CRRs based on congestion prices during the on-peak and off-peak hours, respectively. The ISO defines peak CRRs from 7am to 10pm PT and off-peak CRRs as 10pm to 7am PT across all days.¹⁰

The ISO allocates a portion of CRRs at no cost to entities that provide upkeep for the transmission system, including internal and external LSEs and project sponsors of merchant transmission facilities. To qualify for the ISO’s CRR allocation on a specific path, entities must provide supporting documentation that reflects the source and historical load responsibility. The ISO’s CRR allocations can last up to 10 years before needing renewal. Merchant transmission CRRs

⁸ Tariff sections 11.2.4.2 – 11.2.4.2.2. Each pair of source-sink points is sometimes called a bid pair. The ISO’s Track 1A tariff changes proposed to refine the source and sink pairs for CRRs that market participants can purchase in the CRR auctions to eliminate those source and sink pairs that are not associated with supply delivery transactions. The Commission approved this proposal in an order issued June 29, 2018. Cal. Indep. Sys. Operator Corp., 163 FERC ¶ 61,237 (2018).

⁹ The shadow price of congestion on a constraint is the production cost savings if the constraint could be relaxed by 1 MW.

¹⁰ [BPM for Congestion Revenue Rights](#), p. 165

follow a separate allocation process and have a term of the lesser of 30 years or whatever the pre-specified intended life of the facility.

The ISO also conducts CRR auctions that allow all market participants to bid to obtain CRRs. The CRR allocation and auction processes occur annually and monthly. Both the annual and monthly processes proceed iteratively. The annual processes begin with four allocation rounds, and conclude with an auction round.¹¹ The monthly processes begin with two allocation rounds, followed by an auction round.¹¹ The annual auction is split between 4 seasons, rather than purchasing rights for the full year. Once the ISO releases CRRs, market participants can also trade those CRRs through secondary market transactions.¹²

For the annual and monthly CRR allocations and auctions, the ISO maintains a CRR model that 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. As discussed further in Chapter 5 below, effective July 1, 2018, only those pairs associated with supply delivery can be used in CRR auctions.¹³¹⁴

4 2019 ISO CRR Policy Changes

The ISO's most recent previous review of CRR policy resulted in a set of changes to address revenue adequacy and auction efficiency. This effort, conducted through the Congestion Revenue Rights Auction Efficiency initiative,¹⁵ resulted in four major changes to the ISO's CRR program, which were first implemented for the 2019 allocation and auction processes:

Transmission Outage Reporting

Transmission owners must now report annually by July 1 known transmission outages they plan to take in the upcoming year that affect power flows in the day-

¹¹ Tariff sections 36.8-36.11 and 36.13.

¹² Tariff section 36.7.

¹³ Specifically, the only eligible source and sink pairs are: (1) from a generator bus to either a load aggregation point, a trading hub, or a scheduling point; (2) from a trading hub to either a load aggregation point or a scheduling point; and (3) from a scheduling point to either a load aggregation point or a trading hub. Tariff section 36.13.5.

¹⁴ See Cal. Indep. Sys. Operator Corp., 163 FERC ¶ 61,237 (2018).

¹⁵ [California ISO - Congestion revenue rights auction efficiency \(caiso.com\)](https://www.caiso.com/California-ISO-Congestion-revenue-rights-auction-efficiency)

ahead market and thus CRR revenue adequacy. The ISO tariff previously required participating transmission owners to report annually by October 15 known outages they plan to take in the upcoming year. The additional reporting requirement was narrowly tailored to provide the ISO with outage information on facilities that affect the efficiency of the CRR allocations and auctions. This was designed to enable the ISO to: (1) align the modeling of system capacity in the CRR allocation and auction better with the transmission that actually will be available; and (2) reflect more accurately expected conditions in the day-ahead market during the periods covered by each annual allocation and auction.

The ISO's analysis of CRR auction efficiency at the time found that many constraints contributing to auction revenue shortfalls were not enforced in the annual and monthly CRR auctions but contributed to congestion in the day-ahead market. Better information regarding planned transmission outages now allows the ISO to identify additional constraints that should be enforced in the auction model. This new deadline was appropriate because the ISO releases the CRR model to be used for the annual allocation and auction process in late July.¹⁶

Auction Eligibility for Source-Sink Pairs

The ISO discontinued releasing in the auction CRRs that do not source and sink at points used for delivery of supply. For example, the ISO no longer auctions CRRs that are defined by supply-to-supply points, load-to-supply points, or load-to-load points. This is more consistent with the intended purpose of CRRs as a hedge for supply delivery. The change eliminated CRRs that have a high payout potential relative to the price paid for those CRRs, but are likely unrelated to supply delivery. The previous auction rules allowed bidders to bid for and obtain CRRs with any combination of generator locations, load locations, trading hubs, pricing nodes, and import/export scheduling points. Many of these source-sink pairs, however, have no relationship to the primary purpose of CRRs, *i.e.*, allowing market participants to hedge congestion costs associated with supply delivery.

The ISO's analysis of the CRR auctions at the time showed that these "non-delivery" source and sink CRR pairs were contributing significantly to CRR

¹⁶ For more information on the new transmission outage reporting requirement please see ISO's April 11, 2018 [tariff amendment filing](#) at FERC.

auction revenue shortfalls. Further analysis showed that these non-delivery source and sink CRR pairs were not providing beneficial competitive or counter-flow value in the auctions. Although market participants could have used these CRRs to hedge their portfolio of resources, any incremental benefit those options provided was outweighed by the significant disparity in payouts relative to the CRR auction revenue received for those types of CRRs. This was especially so given that market participants could still obtain CRRs that source and sink from generators to the load aggregation points or trading hubs. These remaining alternatives continue to provide the equivalent hedge at a more competitive price. The delivery pairs that remain eligible for auction bids provide a better hedge because these pairs pay the congestion exposure for supply delivery.¹⁷

Revenue Inadequacy Allocation

The ISO moved from fully funding CRRs to allocating CRR revenue inadequacy to CRR holders, scaling CRR payments so that CRR holders are paid for their CRRs only to the extent that day-ahead market congestion revenue and revenue from counter-flow CRRs is sufficient to fund the payments. The ISO assigns revenue shortfalls to CRR holders on a constraint-by-constraint basis *pro rata* based on the CRRs with implied flow over each constraint in the direction of congestion. However, the ISO first nets the implied flows that all CRRs within a CRR holder's CRR portfolio have on a given constraint. This netting occurs regardless of whether the implied flows from the multiple CRRs are in the same direction or opposite directions.

This change aligned the ISO's methodology for allocation of CRR revenue inadequacy more closely with the approved methodologies for most other ISOs and RTOs, where congestion revenue shortfalls are allocated to the holders of financial transmission rights rather than uplifted to load.¹⁸

Capacity Reduction in the Annual Allocation

Alongside the move to partial funding, the ISO reduced the percentage of system capacity released in the annual CRR allocation and auction process from 75% to 65%. This change was designed to reduce the likelihood that moving to partial

¹⁷ For more information on the change to auction eligibility requirements for source-sink pairs please see the ISO's April 11, 2018 [tariff amendment filing](#) at FERC.

¹⁸ For more information on the move to allocating revenue shortfalls please see the ISO's October 1, 2018 [tariff amendment filing](#) at FERC.

funding would reduce payments to CRR holders, because reducing the capacity released in the annual allocation increases the probability that CRRs released in the annual process will be feasible. The ISO's Market Surveillance Committee recommended this measure to address the risk that CRRs would be devalued in the auction as the result of the change to the CRR revenue inadequacy allocation.¹⁹ Following the ISO's analysis of a contemporaneous outage season (October through December 2017), the Market Surveillance Committee determined that if the system capacity had been reduced to 65%, monthly transmission infeasibilities would have been lowered by 57%.²⁰

5 Analysis of CRR Market Outcomes Since 2019

The ISO committed to assessing the impacts of the Congestion Revenue Rights Auction Efficiency initiative changes on CRR auction efficiency and revenue adequacy. The ISO has regularly reported on key metrics of CRR market performance in different forums such as the market performance and planning forum, briefings to the ISO Board of Governors, and monthly performance reports. The ISO also furnished targeted reports on the performance of CRRs after the 2019 policy changes in 2020 and more recently in a Market Surveillance Committee session in November 2023.²¹ The report explored different areas of performance including revenue adequacy, auction efficiency, arbitrage between auctions, level of pro-rata funding between allocation and auction CRRs, participation in auction, level of allocation sold in auctions, revenue shortfalls and surplus allocated to CRR and measured demand. As part of that analysis, the ISO identified and eventually implemented an enhancement to reduce the shift factor threshold applicable to aggregated locations, which was implemented on May 2023. The ISO committed to focus on analyzing the root causes of both revenue inadequacy and auction inefficiency and will introduce that analysis in a subsequent meeting during this working group effort.

¹⁹ Opinion on Congestion Revenue Rights Auction Efficiency, Track 1B, at 22-23 (MSC Opinion). The MSC opinion is provided as Attachment G to this filing. The MSC Opinion is also available at http://www.caiso.com/Documents/MSCOpiniononCongestionRevenueRightsAuctionEfficiencyTrack1B-June13_2018.pdf.

²⁰ For more information on the allocation capacity reduction please see the ISO's July 17, 2018 [tariff amendment filing](#) at FERC.

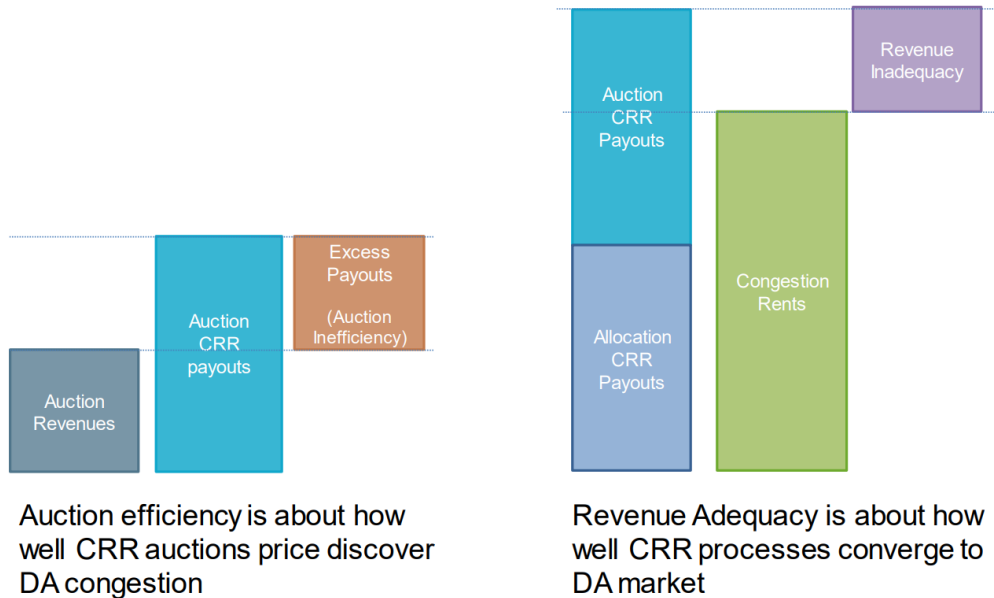
²¹ For more detailed discussion, please see the 2023 Market Surveillance Committee (MSC) update ([video](#), [slide deck](#)) and the 2020 [CRR Market Analysis Report](#)

This section references two metrics on the CRR market's performance since the 2019 policy changes. For the purposes of this initiative, CRR market performance effectiveness will be analyzed through auction efficiency and revenue adequacy. Auction efficiency compares auction revenue with congestion payouts for auctioned CRRs. The greater the difference between the two, the higher the auction efficiency. Importantly, this metric does not reflect the value of money over time nor does this metric reflect the inherent risk premium associated with hedging instruments. Therefore, optimal auction efficiency will always be less than 100%, as 100% efficiency implies a negative risk premium, assuming normal macroeconomic conditions.

Revenue adequacy reflects convergence between the CRR market and day ahead market results.²² Revenue adequacy compares total congestion revenue with total payout for both auction and allocated CRRs. Ideally the CRR market should be revenue adequate. If the market is revenue inadequate, CRR payout obligations outweigh congestion revenue, meaning too many CRR obligations were released, reducing the value of the CRR as a hedge. If the market has over 100% revenue adequacy, congestion revenue outweighs CRR payout obligations in the auction and allocation, meaning more opportunities to hedge could have been released. Figure 1 visually defines auction efficiency and revenue adequacy concepts.

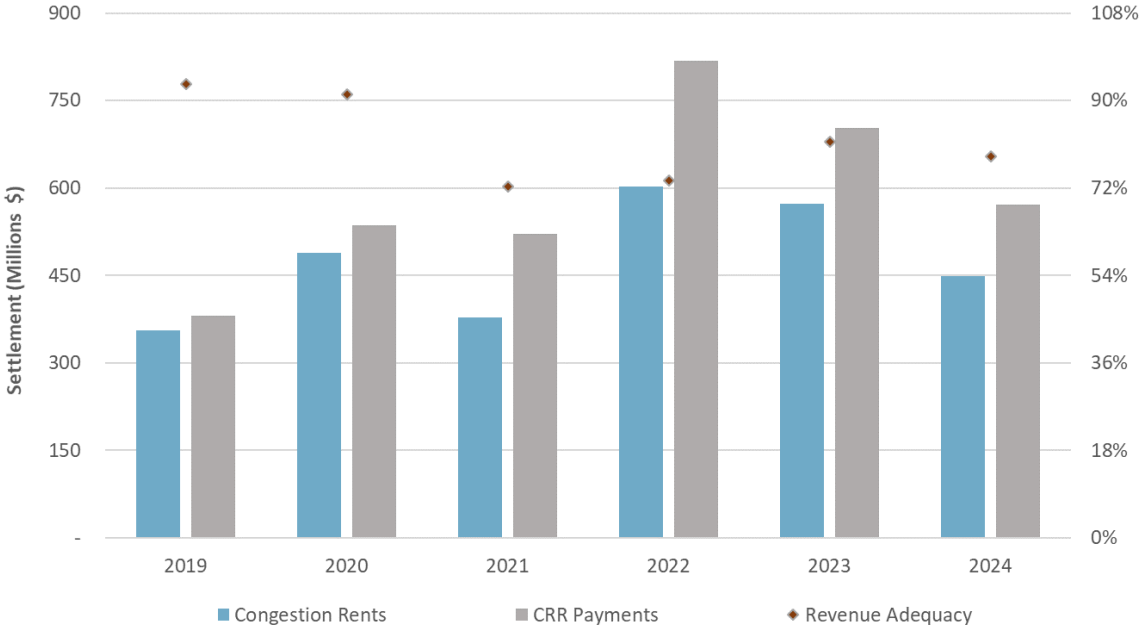
²² In this paper we are using the terms "revenue adequacy/inadequacy" to refer to the difference between the nominal value of CRRs as calculated by the CRR modeling process and the corresponding actual congestion rent accrued in the day-ahead market. In this sense it is possible to compare results from before and after the 2019 program changes, because both of these values are still calculable and together convey how closely the ISO's CRR processes converge to day-ahead market results. The difference is that before the 2019 changes any revenue shortfall was collected as an uplift to load which was then distributed to CRR holders because CRRs were guaranteed full funding. After the changes those revenue shortfalls are allocated to CRR holders instead. So the 2019 changes affected who bears the costs if the face value of CRRs exceeds collected congestion rents, but the underlying issue that remains is reducing or eliminating the frequency and magnitude of cases where the face value of CRRs is higher than the congestion rent in the day-ahead market.

Figure 1: Auction Efficiency and Revenue Adequacy



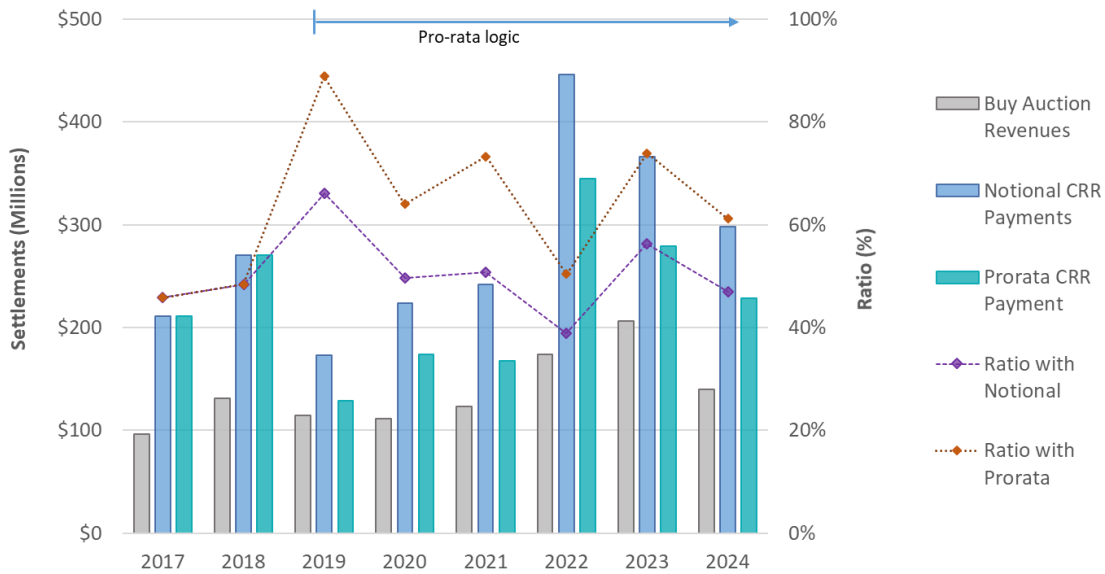
As shown below, the ISO’s CRR auction yields have historically been lower than auction payouts and revenue has been inadequate. Congestion rents collected in the day-ahead market have been consistently below the nominal value of the CRRs. From 2019 through September 2024, system-level revenue inadequacy has been at 81% with a total shortfall of \$684 million or about \$101 million per year. Prior to the 2019, revenue inadequacy was allocated to measured demand (load serving entities and exports). As discussed in the previous section, revenue inadequacy has been allocated to CRR rights holders since the 2019 changes. The ISO distributes the inadequacy by calculating each CRR’s contribution to the total shortfall by constraint. The CRR’s type (auction, allocation) is not considered when calculating revenue inadequacy contributions. Figure 2 shows annual revenue adequacy. Note that both CRR payments and congestion rents have increased system-wide since 2019. This increase is driven by an increase in the volume of allocation CRRs being sold over time. Load serving entities continue to successfully sell allocation CRRs in auctions, with average percent of CRR offerings cleared over 90%.

Figure 2: Revenue Adequacy from 2019-2024



From 2019 through September 2024, auction efficiency has been at about 65%, a moderate improvement from pre-2019 auction efficiency. Reducing the difference between auction revenues and CRR payments improves auction efficiency. Pro-rata adjustments reduced payouts by over \$420 million, improving auction efficiency by driving down the difference between revenues and payments. Excluding pro-rata adjustments, auction efficiency averaged 50%. These levels highlight underlying auction efficiency questions that will be in scope for this initiative. Additionally, over time, CRR purchasers may better predict the pro-rata logic’s revenue impacts and compensate by bidding less for CRRs, reducing the auction efficiency.

Figure 3: Auction Efficiency from 2019-2024



6 Stakeholder Items from the Roadmap

As a part of the Stakeholder Catalogue process, the ISO received multiple proposals related to the CRR reforms which stakeholders (and the DMM) believed should be prioritized. As a part of the working group effort, we recommend providing time for each of these items (as well as additional topics identified by stakeholders) to be explored further. Ideally, coming out of the working group process, all stakeholders would have a common understanding of the different perspectives related to the current challenges. From there, we can work on policy solutions that best address the goals and problems statements identified by stakeholders.

Below is a chart describing the Stakeholder Catalogue Submissions related to Congestion Revenue Rights:

Entity	Key Takeaway	Description of Scope Item
ISO Department of Market Monitoring	Stop offering CRR positions on behalf of transmission ratepayers at \$0 offer prices. Alter CRR auction design so that trades only take place between willing sellers bidding into market for financial contracts.	Since the ISO implemented CRR reforms in 2019 aimed at reducing the losses paid by transmission ratepayers, ratepayers have lost \$312 million and have received 67 cents in auction revenues per dollar paid out. Under the current CRR market design, the ISO uses a transmission model that creates large amounts of price-taking CRR supply which transmission ratepayers are obligated to back. The ISO should stop offering CRR positions on behalf of transmission ratepayers at \$0 offer prices and enable trades to only take place between willing sellers bidding into a market for these financial contracts.
California Department of Water Resources	Split on-peak TOU into super-peak (HE 17-HE21) and on-peak (HE07-HE16, and HE22).	The current ISO CRR market design defines two time periods for the Time of Use (TOU): on-peak and off-peak. On-peak covers HE07 to HE22, with off-peak covering the remainder. With the addition of more renewable generation, the ISO load demand curve now has two peaks rather than one. The value of the current on-peak CRR has diminished considerably due to the large fluctuations in the ISO load demand curve that results in large fluctuations in LMP (MCC) pricing. As a result, from HE07 to HE16, LMP (MCC) prices are very low. Starting at HE17 when solar generation starts diminishing and the

		ISO's load demand starts increasing, ISO LMP (MCC) prices become high. This initiative would explore splitting the on-peak TOU into the super-peak TOU (HE 17 to HE21) and regular on-peak TOU (HE07 to HE16 and HE22). This would bring continuity and equilibrium to the CRR market by making CRR revenues more predictable and transparent.
California Department of Water Resources	Study how much the GDF has helped improve CRR auction efficiency. If improvement provided by GDF is minimal in comparison with the improvement provided by the features implemented from the ISO Track 1B proposal, then the GDF should be removed from the monthly CRR allocation process.	The use of the GDF reduces LSEs' ability to adequately hedge its congestion rents by reducing the amount of CRRs LSEs could request in the monthly CRR allocation process. This is exacerbated for LSEs that rely on hydro or resources with variable output power forecasts. For these LSEs, participation in the annual CRR process is limited by forecast difficulty, so they request most of their CRR in the monthly CRR allocation processes when they can more accurately estimate their congestion rents. Eliminating GDF would enable these LSEs to be better able to hedge their DA congestion rents with CRRs.
California Department of Water Resources	Explore ways to revise the counter-flow CRR methodology used for allocating CRRs sourced at the trading hubs.	The counter-flow methodology was implemented to maximize the number of direct flow CRRs allocated from the trading hubs (THs) to the sink nodes when market participants to the CRR allocation processes request such CRRs. There were many cases when CDWR had requested direct flow CRRs from the THs to CDWR sink nodes and received an excessive amount of CF-CRRs. This excessive amount of direct flow CRR and CF-CRR could impact CRR auction

		efficiency since when settled, the CF-CRR might not be the same value with the direct flow CRR due to changes in the ISO grid that occurred when the CRR market is settled. This initiative would explore ways to revise the CF-CRR methodology used for allocating CRRs sourced at the trading hubs since the current method contributes to the revenue imbalance of the CRR balancing account.
Western Power Trading Forum	Initiate stakeholder process to address issues leading to inefficient CRR outcomes or hinders the ability for CRRs to be an effective risk mitigation tool.	Investigate root causes of current revenue inadequacy, and which are causation-based and which are unrelated to the CRR market. Investigate if market participants are able to use CRRs as congestion hedges given high levels of underfunding. Consider reforming constraint-based allocation to help preserve function of CRRs and ensure allocation is still aligned with cost causation.

7 Proposed Problem Statements

The problem statements in this section are based solely on the feedback received in the catalogue from stakeholders and can be a starting point to begin discussions for the CRR Working Group. Stakeholders are encouraged to present their own problem statements to working group meetings and to submit comments on proposed problem statements. The ultimate goal of the working group and initiative is to develop viable, timely, and implementable solutions for our CRR processes.

1. Auction Efficiency: The ISO CRR auction has been yielding only roughly 65 cents per dollar of congestion revenue. As such, auction prices are not reflecting market participants' congestion price exposure in the day-ahead market.

2. Revenue Inadequacy: Pro-ration of CRRs hinders the ability for CRRs to be an effective risk mitigation tool.

- Pro-rated funding may result in settlements reversal adding to the participant risk.

3. Limited Allocation: the ISO's application of a Global Derate Factor reduces LSEs' ability to adequately hedge congestion.

4. Product Definition: the ISO's current Counterflow CRR allocation process and On/Off peak definitions adversely impact hedging of congestion risks.

8 Next Steps

Comments on both this paper and the November 14th working group meeting are requested by Thursday, December 12, 2024. A template for comments will be published shortly after the meeting. The ISO looks forward to further conversation with stakeholders on these topics.

Appendix: Benchmarking to Other CRR Programs in the US

The California ISO's CRR process shares core concepts with corresponding Auction Revenue Right (ARR) allocations and Financial Transmission Rights (FTR) structures at other ISOs. To the extent that working group participants find it helpful, the ISO can provide benchmarking comparisons to these other ISO structures to further inform working group discussions. The ISO provides an overview of the Midcontinent Independent System Operator's (MISO) ARR program below as an example of this, and encourages feedback from working group participants about whether to include further comparisons in future working group meetings.

Like the California ISO's CRR process, MISO's structure allows participants to hedge for day-ahead market congestion and settles its auctions between a

source and a sink. MISO has separate ARR and FTR processes.²³ MISO's annual ARR allocation has two rounds. MISO's allocation prioritizes baseload resources²⁴ who may request up to 50% of peak usage. Then, in the second round, all market participants may request ARR entitlements up to 100% of peak usage.

Following allocation, MISO conducts annual and monthly FTR auctions. The annual process auctions FTRs by season, split equally over three rounds. One-third of transmission capacity is auctioned in Round 1, half of the remaining transmission capacity is auctioned in Round 2, and all remaining transmission capacity is auctioned in Round 3. ARR holders may convert feasible ARRs into FTRs during the first round of the annual auction. In the monthly auction, MISO may sell residual FTR capability or counter-flows to "buy back" capability on an oversold transmission path. FTR holders may also sell their FTRs.

MISO settles imbalanced settlement differently than the California ISO. If day-ahead congestion revenue is less than the FTR holders' entitlement, all FTR holders are paid on a pro-rata basis. Any excess day ahead congestion revenue is passed on to FTR holders who did not receive their full FTR target revenue allocation. Once FTRs are fully funded, the remaining excess revenue is distributed to all transmission customers proportionally based on billing. Excess FTR auction revenue is distributed to load serving entities with unallocated ARR entitlements. When there is inadequate revenue from the FTR auction, ARR proceeds are reduced in proportion across ARR holders. Recent assessment of MISO looked at the competitiveness of its FTR auctions²⁵

Finally, MISO's FTR annual action consists of 2 products: peak and off-peak for four seasons. MISO's peak is defined as 7am EST to 10pm EST Monday through Friday, excluding holidays. All other times are considered "off-peak".

²³More information about MISO's ARR and FTR process can be found here: [Independent Evaluation of MISO's Auction Revenue Rights and Financial Transmission Rights](#), p.30; and [ARR and FTR Markets](#)

²⁴ Baseload Reserved Source Set (BRSS): approved resources with a capacity factor greater than or equal to 50%. The capacity factor is the ratio of the actual energy produced by a generator compared to the generator's maximum possible energy production. For external resources, the scheduling factor is used instead. [2024 Reserved Point Source Workshop](#)

²⁵ Information available at [20241010 MSC Item 07 ARR-FTR Enhancements Timeline652152.pdf \(misoenergy.org\)](#)