

Opinion on Congestion Revenue Rights Auction Efficiency

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Final, March 15, 2018

1. Introduction

The California Independent System Operator (CAISO) has proposed major revisions to its process for auctioning Congestion Revenue Rights (CRRs) preceding its auction of annual CRRs to be held in July 2018.¹ The proposal follows a year-long exploration of several concerns with the California CRR system as it is currently constructed. The CAISO and its Department of Market Monitoring (DMM) have highlighted, in particular, the fact that CRRs have, on average, sold at auction prices substantially below the value of the revenue streams associated with them. From 2009 through 2017, payouts to auctioned CRRs have exceeded \$1.4 billion while auction revenues for those CRRs was just over \$740 million, a difference of close to \$700 million.² This “auction revenue shortfall” has been declining over time. The CAISO report similarly calculates that the payout to annual CRRs exceeded their auction price by \$48 million over the period January 2015 through May 2017, while the payout to monthly CRRs exceeded their auction price by about \$92 million over the same period.³

The DMM and some load-serving entities (LSEs), who are the residual claimants on congestion revenues if they were not sold at auction, have characterized the auctions as unwilling sales of future revenue streams that are fated to be sold below value due to fundamental

¹ California ISO, Congestion Revenue Rights Auction Efficiency, Track 1 Draft Final Proposal, February 8, 2018, www.caiso.com/Documents/DraftFinalProposal-CongestionRevenueRightsAuctionEfficiency-Track1.pdf; California ISO, Congestion Revenue Rights Auction Efficiency, Track 1 Draft Final Proposal Addendum, March 8, 2018. www.caiso.com/Documents/DraftFinalProposalAddendum-CongestionRevenueRightsAuctionEfficiency-Track1.pdf.

² *Problems in the performance and design of the congestion revenue right auction*, CAISO Department of Market Monitoring, November 27, 2017. Thus, auction revenues have been about half of the value of the congestion revenue payouts. If, however, expressed as a percentage of total congestion revenue, the payout has been a significantly smaller fraction, since day-ahead congestion rents are on the order of \$200M to \$500M/year (from 2012-2015, according to DMM state of the market reports).

³ California ISO, CRR Auction Analysis Report, November 21, 2017 pp. 51-52. Note the \$92 million figure cited above corrects for a typo in this report where net payments for 2017 January – May were reported as -\$11 million but were actually -\$19 million.

flaws in the CRR process. At the same time, CRRs have long been held to be useful, if not critical, instruments for hedging the risk of congestion prices in transmission networks. The development of the paradigm of financial transmission rights (or CRRs) was a fundamental step in shifting US power markets away from inefficient physical transmission rights as a means of providing open access to transmission systems.

If significant value is placed upon CRRs as a hedging tool, especially by parties who do not receive allocated CRRs, then market design changes that eliminate or substantially reduce access to them raise potential concerns about market efficiency and competitiveness. The CAISO Track 1 proposal attempts to balance these concerns with those of DMM and the investor-owned utilities who have argued that CRRs sales are costing their ratepayers an average of about \$75 million per year, although this number is lower in recent years. In addition to changes in outage reporting and other process changes, the proposal would restrict the types of CRRs available for auction by limiting the sources and sinks of the CRRs that would be eligible for sale in the auction.

The CAISO Market Surveillance Committee (MSC) has been asked by the CAISO to provide an Opinion on the Track 1 proposal. The causes of shortfalls in the CAISO's CRR auctions along with possible remedies have been previously discussed at two MSC meetings. These include meetings on Feb. 3, 2017, when the MSC discussed possible analyses to understand the reasons for the revenue shortfalls and to quantify the uses of auctioned CRRs for hedging and trading purposes;⁴ and Feb. 2, 2018, when the CAISO's Track 1 proposal (the present proposal) was first publicly discussed. The MSC has also written opinions previously on CRR auction and allocation as a part of the MRTU design process.⁵

⁴ S. Harvey, Briefing on Analyzing Congestion Revenue Rights Auction Valuation, MSC Meeting, February 3, 2017, www.caiso.com/Documents/BriefingonAnalyzingCongestionRevenueRightsAuctionValuation-MSCHarvey-Feb2017.pdf

⁵ Prior to the implementation of the Market Redesign and Technology Upgrade (MRTU) in 2007, the MSC issued three opinions that addressed CRR allocation. One focused on long-term rights allocation, supporting the ISO's proposal and full-funding of all CRRs (F. Wolak, J. Bushnell, and B. Hobbs, "Opinion on Long-Term Congestion Revenue Rights Proposal", Jan. 18, 2007, www.caiso.com/Documents/FinalOpiniononLongTermCongestionRevenueRights.pdf).

The other opinions included more comprehensive discussions of CRR allocation. The most recent (F. Wolak, J. Bushnell, and B. Hobbs, "Final Opinion on Recent Changes to the ISO Congestion Revenue Rights Proposal," www.caiso.com/Documents/070418_MSCFinalOpiniononCongestionRevenueRights.pdf) emphasized the importance of giving small LSEs access to long-term CRRs at trading hubs. The Opinion also stated the following two principles "which... will limit the extent to which an allocation mechanism might harm market efficiency. One principle ... is to avoid a direct linkage between future market transactions and the assignment of future rights. Such a linkage could distort the investment decisions of a firm because the cost of locating a plant in a congested area would be at least partially offset by the allocation of CRRs from that location to the firm's load. A second principle is that the allocation of transmission rights, rather than an auction of all rights, helps to guard against the ownership of CRRs enhancing the incentive of market participants to exercise local market power. For this reason, we have consistently supported allocating CRRs to LSEs and have recommended against auctioning the majority of the total CRRs available" (p. 3). The concern was with how rights allocation could magnify market power, a point elaborated upon in another opinion (F. Wolak, B. Barber, J. Bushnell, and B. Hobbs, "Opinion on Aspects of the California ISO's Market Redesign and Technology Upgrade (MRTU) Conceptual Filing", September 30, 2005, [2](http://www.caiso.com/Documents/OpiniononAspects-</p></div><div data-bbox=)

In this Opinion, we first provide background in Section 2 on the role of CRRs in restructured electricity markets, the procedures presently used to allocate CRRs, and the Department of Market Monitoring (DMM) / Southern California Edison (SCE) proposals for their reform. Then in Section 3, we discuss several identified issues with CRRs and CRR auctions, before summarizing the CAISO Track 1 proposal in Section 4. In the latter section, we describe and provide comments on the two major features of the proposal, which are changes in outage reporting and restrictions upon the allowed source-sink pairs in the CRR auction. Section 5 presents our conclusions.

2. Background

2.1 *The Historical Role of CRRs in ISO Markets*

Congestion Revenue Rights award to their owner a revenue stream associated with the price difference between two locations in an ISO network.⁶ They were envisioned as a means to provide the financial equivalent of firm transmission service, in the sense that they entitle the holder to use of the transmission network without paying congestion charges.⁷ The transition from physical to financial transmissions rights allowed ISOs to provide market participants non-discriminatory physical access to the grid, while preserving for individual suppliers the financial equivalent of the ability to “deliver” power to customers. In an order conditionally approving market rules of the New York ISO, the FERC concluded that CRRs or “TCCs significantly enhance the open access requirements of the pro forma tariff as an efficient substitute for the reassignment of physical transmission rights that entities obtain under the pro forma tariff.”⁸

A core element of financial transmission rights is that they are financial instruments, not physical transmission rights. This design is essential in order to avoid use-it-or-lose-it

CaliforniaISO%E2%80%99sMarketRedesignandTechnologyUpgrade_MRTU_ConceptualFiling.pdf). This opinion argued for a simple allocation process that would give all CRRs to load, and against use of an auction primarily because of concerns that CRRs could be used to magnify generator market power. “The market participant able to cause the most congestion is willing to pay the most for CRRs that refund these congestion charges... there is the danger that firms, upon purchasing or being awarded a financial CRR, would behave less efficiently than if they did not own that CRR” (p. 18). These market power concerns were subsequently mitigated by CAISO rules prohibiting resources from holding certain CRR positions that would magnify market power (e.g., owning rights that sink into a congested load pocket in which the holder also owns generation). In none of the opinions did the MSC address the possibility that auction revenues would consistently fall short of payouts to the auction rights, or the equity implications if that took place.

⁶ Excluding loss components.

⁷ Hogan, William W. “Contract networks for electric power transmission.” *Journal of Regulatory Economics* 4.3 (1992): 211-242.

⁸ FERC “Order Conditionally Accepting Tariff and Market Rules...” Docket Nos ER97-1523-000; OA97-470-000 and ER97-4234-000, January 27, 1999 86 FERC ¶61,062, footnote 13, page 6. The FERC’s primary concern with TCCs in that order was the absence of rights longer than six months. The NYISO subsequently revised its proposal to include auctions of both 6 month and longer-term TCCs.

incentives that would discourage efficient participation in the economic dispatch. Because these rights are purely financial, they can potentially be acquired by financial participants that do not use them for hedging and would instead value them as purely financial instruments. These financial firms can utilize their purchased CRRs to create secondary hedging instruments they might in turn sell to market participants, or they may be valued purely as risky, but potentially profitable trades.

The CRR paradigm also provides a mechanism for ISOs to redistribute the congestion revenues it collects from its operation of markets with locational marginal prices. Charging efficient congestion prices produces a surplus for the market operator that can be returned to market participants via CRRs or an alternative design. Although financial transmission rights were designed so they would be funded by the congestion rents collected by the system operator, because of the way CRRs are defined in the CAISO, and in other ISO markets as well, payments to CRRs can exceed the congestion revenues collected, a problem known as revenue inadequacy. Revenue inadequacy is a related, but distinct issue from the auction revenue shortfalls that have motivated the current CAISO proposal. Revenue inadequacy creates an operating deficit whereby ongoing congestion payments to CRR holders exceed congestion revenues. Auction revenue shortfalls, in contrast, equate to selling an asset for less than its expected future payout, adjusting for the time value of money. Of course, payments to CRR holders are only one of many possible uses for CAISO collected congestion revenues. When there is a surplus of congestion revenue net of CRR payments, this surplus is applied to reduce the revenue requirement for ratepayers of the transmission system.

However, congestion revenues, like locational prices, fluctuate with market and network conditions, at times in unpredictable ways. The congestion revenues collected by ISOs therefore constitute an uncertain, or “risk creating,” revenue stream. The market participants paying those congestion prices face the opposite risk position. Importantly, when a CRR, which pays the price difference (or congestion cost) between two locations, is transferred from the CAISO to a market participant that will use the network in those locations, both sides reduce their risk exposure to congestion costs. In other words, when distributed to firms using them as hedging instruments, CRRs reduce risk for both sides and constitute an efficient allocation of risk, particularly when the parties involved are risk averse. The significance of this efficiency benefit will depend upon how risk averse the parties are, and the degree to which annual and monthly CRRs help to reduce those risks.

The ISO, or indirectly the ratepayers who are residual claimants to congestion revenues, are therefore in a unique position to provide CRRs to market participants. They are the natural counter-parties since they have the opposite revenue stream. The DMM has argued that financial firms or other third parties could provide CRRs to those who need them, but these firms would be taking on risk, rather than shedding it, to do so. The costs to the CRR holder would be higher, but it is hard to determine how much higher. We are not aware of quality data on the availability and cost of CRRs provided by third parties, but we are more

skeptical than DMM about the ability of third parties to fulfill CRR needs in the absence of ISO defined instruments.⁹

For firms and individuals engaged in the generation, marketing, and purchasing of power in ISO markets, hedges of locational price differences (congestion costs) can be highly valuable, and the acquisition of hedges an important cost of doing business. When paired with a physical transaction, CRRs provided a similar economic return as would the physical right to “deliver” power from a generation source location to a customer load sink location.

2.2 The Present Distribution of CRRs in the California ISO Market

In the CAISO market, policies have developed to allow load-serving entities initial and exclusive access to some CRRs through a multi-stage allocation process. These policies were developed with at least two motivations. The first was an early concern that CRRs could be used to leverage market power if suppliers in a constrained area were able to purchase CRRs sinking in the constrained area and thereby increase their profits from withholding output and driving up prices in the day-ahead market.¹⁰ If an individual supplier was able to increase the payout to CRRs by exercising market power, it might be willing to outbid other competitors for those CRRs. Given the effectiveness of local market power mitigation, and the overall competitiveness of the CAISO market in recent years, it is not clear how significant this concern remains.

The second motivation for allocation was the connection made between access to congestion rents and obligations to pay for the physical transmission infrastructure. In the CAISO, the capital costs for transmission assets are recovered through a Transmission Access Charge (TAC) applied to load as well as energy that is exported or wheeled through the system. In this sense, load (and other TAC payers) are the transmission “owners”, and it is logical that they would have claim to the congestion rents produced by the assets they helped pay for through their electric rates. These congestion rents could be distributed in several ways: (1) a direct refund of congestion rents in proportion to consumption (or equivalent offsets of other charges to consumers); (2) directly transferring CRRs through allocation, or (3) transferring the revenues raised from CRR auctions.

The first option (proportional refund) would guarantee a balanced refund of congestion revenues to all transmission ratepayers, but it would also eliminate the ability to use congestion revenues to support payments of CRRs. Further, the distribution of the refunded congestion rents could be very different from the distribution of congestion costs as a result of different consumers facing different locational marginal prices (LMPs). Hence, it

⁹ Even if quality data on the cost of third party CRR equivalents (sometimes called basis swaps) were available, it is important to note that these products are being sold in the current market environment where conventional CRRs are allocated and auctioned according to current rules. Firms providing basis swaps could very well be using conventional CRRs to balance their risk exposure. Therefore, a sharp reduction or elimination of conventional CRRs could spill over to the pricing of third-party substitute instruments.

¹⁰ Wolak *et al.*, 2005 and 2007, *op. cit.*

would not provide a mechanism for transmission customers to obtain the equivalent of firm transmission service.

Instead, the primary mechanism applied in California, measured in terms of capacity, has been the direct allocation of CRRs to LSEs. Despite paying TAC, export and wheel-through transmission customers are not eligible for CRR allocations. This differential treatment of external load was argued to be acceptable as external load could access ISO-backed CRRs through the auction process.¹¹ This access would change under proposals by the DMM described below. Currently, the CAISO allocates up to 75% of its modeled transmission capacity through a multi-stage annual allocation process, that includes long-term (10 year) and seasonal year-ahead CRRs. Additional transmission capacity, that the CAISO describes as up to roughly 82% of modelled capacity, is made available in a monthly allocation process. In practice, however, the proportion of congestion rent paid to CRRs awarded in the allocation process has not been in the range of 75-82% but has been only 54.6% over the period January 2015 through May 2017.¹²

If auctions were eliminated, the allocation process could also produce results considered inequitable by some LSEs. It is possible that some LSEs may be able to target and acquire CRRs that are more valuable, in terms of either projected congestion revenues or secondary market value than other LSEs. Neither the CAISO nor DMM has examined the equity of the current allocation process in terms of the relationship between the CRR payments received and congestion charges paid by different categories of load serving entities.

It is only after transmission capacity has been assigned to LSEs in the form of allocated CRRs that any remaining capacity is auctioned in the annual and monthly auctions. The level of overall network capacity made available to the auctions is the same as that made available to the allocations (75% year-ahead and roughly 82% month-ahead). No percentage of network capacity is directly reserved exclusively for sale in the auctions other than ½ of the intertie capacity that is available at the end of the 2nd tier allocation round.¹³ The limitation that allocated CRRs must sink at particular locations may indirectly prevent the allocation of certain CRRs that create flows on some constraints.

At first glance, one might therefore interpret the auctions as the disposing of unwanted capacity “leftover” from the CRR allocation process, rather than a “forced sale” of CRRs.

¹¹ “(E)xternal LSEs will receive a tremendous benefit from the CAISO and its transmission owners in being allowed to acquire CRRs as needed in the CAISO coordinated CRR auctions without being obligated to pay embedded cost charges on a prospective basis. It is likely that most external LSEs will acquire the CRRs they need to hedge potential wheeling through and out transactions in the CRR auction and only pay embedded cost usage charges to the extent they actually use the system.” Prepared Direct Testimony of Scott Harvey and Susan Pope, FERC Docket ER06-615-000. February 2006, pp. 139-140.

¹² We use the May 2017 end date to be consistent with the time period covered by the CAISO November report. Over the period January 2015 through December 2017 the ratio is 57%.

¹³ California ISO, Congestion Revenue Rights Auction Efficiency, Track 1 Draft Final Proposal, February 8, 2018, p. 8.

However, there are critical differences between the allocation stage and the auctions. Most importantly, LSEs are restricted to choose from a limited set of source-sink pairs in the current allocation process. Under current market rules, LSEs pay, for energy, a zonal price that is an aggregation of load-node LMPs, or DLAP or CLAP, in their regions. Therefore, most LSEs do not need to hedge LMPs at specific load nodes, and are restricted to selecting CRRs that sink instead at LAPs. As a consequence, each CRR that is selected by an LSE is assumed to impact flows to every load node in its respective LAP region, and therefore impacts a large number of transmission constraints. Therefore, in the allocation process, when only one of these constraints binds at 75% (or 82%) of modelled capacity, no further CRRs sinking at the LAPs are feasible, and hence eligible for allocation, even though the flows associated with allocated CRRs over other constraints on the network may be well below the 75% threshold.¹⁴ This “lumpiness” in the CRR allocation phase is likely a non-trivial source of extra capacity being available in the auction process, where bidders can choose from more precisely targeted CRRs.

The other channel through which additional CRR capacity can be created in the auction is through a willingness by generators or financial participants to take on risk in the form of “counterflow” CRRs.¹⁵ To the extent that generators or financial participants acquire counterflow CRRs that in turn facilitate the sale of additional hedging CRRs, this advances the purpose of the CRR market. No load serving entity is compelled to purchase a CRR supported by the purchase of counterflow CRRs by generators or financial participants. A load serving entity can choose to purchase a CRR supported by counterflow if the price of the CRR is financially attractive. In addition, to the extent that financial participants compete with load serving entities for hedging CRRs, they help converge auction prices and CRR payouts by raising auction prices, so particular load serving entities are not able to buy CRRs at a large discount to the auction price because of a lack of competition for those CRRs from other hedgers.

In addition to allowing financial participants to sell counterflow CRRs and thereby also enable the sale of additional hedging CRRs made feasible by the counterflow CRRs, CRR auctions serve three other roles. First, while the allocation process allows load serving entities to acquire CRRs sourcing at generators and sinking at their DLAP or CLAP, not all load serving entities either own generation or contract for the power of an individual generator. Some load serving entities may instead choose to buy power on a delivered basis, at their CLAP or DLAP, or may choose to buy power at a trading hub.¹⁶ Settling forward contracts

¹⁴ CRRs are restricted to sinking at DLAPS in tiers 1 and 2 of the allocation process but can be designated to sink at the more disaggregated CLAPs in tier 3.

¹⁵ A counterflow CRR is a CRR that is expected to have a negative payout and would sell at a negative price in the CRR auction. In other words, holders would require a payment to take on the obligations associated with the counterflow CRR. The payment to hold such a CRR would be funded by auction participants who are willing to pay for the additional CRRs made feasible by the counterflow CRR.

¹⁶ It can be seen in the 2018 allocation process that a number of smaller load serving entities were allocated CRRs from trading hubs to their load, suggesting that they were seeking to hedge purchases at these trading hubs. These load serving entities were not the large investor owned utilities but smaller load serving entities

at trading hubs is a common practice in most U.S. electricity markets because the common trading point provides more liquidity when the buyer or seller want to buy or sell some of the power covered by the contract.

In order for suppliers to be able to hedge contracts calling for the delivery of power at a CLAP, DLAP or trading hub, the supplier needs to be able to acquire a CRR from its supply source to the point of sale, a CLAP, DLAP or trading hub. The CRRs a supplier would need for this hedging need to be acquired in an auction or from third parties¹⁷(because suppliers are not entitled to participate in the CAISO CRR allocation process), and will be unlikely to correspond to the CRRs allocated to any entity.

Second, the allocation process does not provide a mechanism for load serving entities to sell CRRs that they no longer need for hedging but could be reconfigured in the auction into a CRR that can hedge the congestion charges of another load serving entity or supplier selling to a load serving entity.¹⁸ Third, the auction allows transmission customers that want to sell power out of California or wheel power through California to acquire CRRs that hedge the congestion charges on those transactions.

While more in-depth analysis of the allocation process is required for developing a comprehensive CRR policy in California, there are at least two qualitative implications of the allocation process for the current proposal. First, elimination of an auction would further exclude non-LSE participants from directly purchasing ISO-backed CRRs. It would *not* eliminate all, or even a majority of, CRR capacity, which would remain directly assigned to LSEs. But purchase of those CRRs would require a transaction in which an LSE puts the CRR up for sale. Second, certain types of ISO-backed CRRs simply could not exist if there were not an auction. For example, point-to-point CRRs sinking at trading hubs can only currently be assigned through the auction, given the limitations on the allocation process described above. Also, CRRs sourcing inside the CAISO and sinking at scheduling points for exports can also only be acquired in the CRR auction.

2.3 The DMM and SCE Proposals

Before turning in Section 3 to our discussion of issues associated with revamping the CAISO CRR auction process, we summarize an alternative approach favored by a number of stakeholders.

such as the city and county of San Francisco, the City of Corona, the Port of Stockton, Sonoma Clean Power Authority and Golden State Water Company.

¹⁷ This would require that a load serving entity have nominated a CRR from the generator's node to the LAP that was not needed to hedge supply contracts of that load serving entity.

¹⁸ This cannot be carried out through bilateral trades unless the buyer wanted to hedge congestion between exactly the same source and sink as the seller, which is unlikely. Auction sales allow the buyer to hedge congestion between a different source and sink that create flows on some of the same binding constraints in the auction as the CRR being sold. However, if the auction is designed to have no spare capacity on any constraint as proposed by DMM and SCE, then like the bilateral situation, any sale of a CRR would have to be matched by precisely the same amount of counterflow right in the opposite direction between the same two locations.

While not eliminating the CAISO CRR auctions completely, a proposal by DMM, as well as a related proposal by Southern California Edison,¹⁹ would make significant changes to how the auction is defined and executed. As we understand these proposals, they would limit the transmission capacity available to support the award of CRRs to a level equal to the flows implied by CRRs assigned in the allocation process. In the annual process, at least one-constraint would likely bind at 75% (because that is the maximum available in the allocation process), but others, as described above, could emerge from the allocation well below this threshold. Unlike the current process, under the DMM/SCE design the transmission capacity available on constraints that did not bind in the allocation would no longer be available to support the sale of ISO-backed CRRs to transmission customers. The only way CRRs could be acquired in the auction would be if an LSE (or a third party willing to take on the risk) made available the exact counterflow necessary to enable the new CRR to be awarded without increasing the flows on any transmission element, binding or not, above the flows due to the CRRs awarded in the allocation phase.

Unlike the CAISO proposal described below, this proposal would substantially reduce the capacity of transmission made available to form ISO-backed CRRs, and we also believe would further restrict the types (in terms of source-sink pairs) of ISO-backed CRRs that could be awarded. To the extent that risk-seeking third parties are willing to provide speculative counter-flow, such instruments could be available, but likely at a higher cost than if the CAISO used its available transmission capacity (ATC) to support the award of CRRs. Although the transmission system would have ATC available to support the award of CRRs to suppliers seeking to sell to LSEs at trading hubs, this design would not allow the CAISO to make any CRRs available for sale utilizing this ATC.²⁰ Nor would it make ATC available to support the sale of CRRs that support exports or wheel-through transactions. Furthermore, no ATC would be made available by the CAISO to support the purchase and sale by load serving entities of ISO-backed CRRs for which the CRR purchased and the CRR sold have differing flows on any transmission element.

The DMM/SCE design would very likely be effective in preventing financial market participants from acquiring CRRs at a discount to the expected payout. However, it would also prevent physical market participants from acquiring CRRs at a discount *or* a premium to the expected payout. In other words, while the proposal would effectively eliminate the purchase of speculative CRRs in the auction, it does so at a cost of sharply reducing access to

¹⁹ DMM Proposal, Market Alternatives to the Congestion Revenue Rights Auction, November 27, 2017. www.caiso.com/Documents/DMMWhitePaper-Market_Alternatives_CongestionRevenueRightsAuction-Nov27_2017.pdf; SCE Proposal, www.caiso.com/Documents/SCEComments-CRR AuctionAnalysisReport.pdf, posted on December 11, 2017.

²⁰ The proposal would allow market-participants such as generators to offer counterflow CRRs at prices that would incorporate the risk associated with offering such CRRs, but the proposal would not allow additional ATC to support the award of additional CRRs. The proposal could therefore be interpreted as withdrawing ATC that supports CAISO-backed CRRs and replacing those CRRs with speculative counterflow CRRs offered at higher prices.

ISO-backed hedging CRRs, and of locking in the rigidities of the current allocation process discussed above.

This design is supported by a number of load serving entities but the supporters do not appear to include most of the smaller load serving entities that acquired CRRs sourcing at trading hubs and sinking at LAPs in the allocation process, such as the city and county of San Francisco, Golden State Water Company, Port of Stockton, Western Power Authority, or City of Corona. It is also strongly opposed by load serving entities serving direct access customers, and some smaller LSEs such as the LSE-CRR Auction Supporters Group. Load serving entities that depend on meeting their load in part by purchasing power at trading hubs, in turn depend on the suppliers they contract with for power being able to sell them power at the trading hubs. However, under the SCE/DMM design there would be no mechanism for suppliers to acquire CRRs sinking at trading hubs and supported by the available ATC of the transmission system to hedge congestion charges on their trading hub sales.

The SCE/DMM design would allocate the available ATC at a zero price to the load serving entities using their owned and contracted generation to meet their load, but the design would prevent the CAISO from making ATC available to support the award of CRRs, at any price, to suppliers selling to LSEs at trading hubs. While the SCE/DMM proposal would allow the resale of CRR source-sink pairs held by an LSE to other market participants, source-sink pairs that a load serving entity did not acquire would not be available for purchase. Moreover, if the vast bulk of the CRRs were allocated to the large load serving entities at each LAP, they would have no obligation to make those CRRs available for sale to any other LSE, or supplier. The DMM has remarked upon the incentive problems and regulatory constraints that limit regulated LSE participation in the auction, yet this proposal relies upon such participation as the only channel through which CAISO-backed rights could be reconfigured, or redistributed to non-LSEs.²¹ Further, if the current rules limiting the allocation of CRRs to load serving entities to those sinking at LAPs, there does not appear to be any way that CRRs could be acquired to hedge export or wheel through transactions.

If one accepts the premise articulated by FERC that ISO-backed CRRs are a form of firm-transmission service, then under the DMM/SCE proposal there would be no such firm transmission service offered by the CAISO to support power sales at trading hubs when ATC permitted it. The only way to sell power at trading hubs would be the use of “non-firm transmission” that includes the volatile costs of congestion.

While the DMM/SCE proposal might appear to benefit large California load serving entities by reducing the auction revenue shortfalls, it can also be construed as restricting forward access to the CAISO transmission grid. This can have unpredictable negative consequences to wholesale markets. If an analogous policy were to be permitted by FERC allowing the denial of forward access to the transmission system outside California to California LSEs and those selling to those LSEs, it would be likely to adversely impact California power consumers.

²¹ *Problems in the performance and design of the congestion revenue right auction*, CAISO DMM, p. 24.

3. Identified Issues with CRRs and the CRR Auction

In this section we discuss the issues that have been identified with the CRR process, and also areas in which further analysis would be helpful in gaining a better understanding of the underlying causes of these outcomes. The primary issue of concern in this proceeding is what is called the “auction revenue deficiency.” As discussed above, this is distinct from, but related to revenue inadequacy. As stated above, the CAISO and the DMM have shown in a number of reports that the average payout to CRRs acquired in CAISO auctions has materially exceeded the auction revenues from the sale of these CRRs.²² This outcome can be a result of the unpredictability of congestion patterns in any particular month, and it is precisely this variability that is the reason load serving entities and suppliers enter into forward power contracts need CRRs to hedge congestion risk. However, the CAISO and DMM analyses have shown that the payments to CRRs have exceeded the auction revenues on average over a large number of auctions, so the relationship between auction revenues and payouts in these analyses reflects more than just the variability of congestion patterns.²³ The CAISO data shows that the total payments to auctioned CRRs over the period January 2015 to May 2017 was \$365.3 million, compared to auction revenues of only \$220.1 million, indicating that the CRRs overall sold for only 60.3% of the expected payout (around 54% for the monthly CRRs and 69% for the seasonal CRRs).

As discussed above, the core purpose of financial transmission rights (CRRs, FTRs and TCCs) is to support forward contracting by load serving entities and other market participants by facilitating the parties’ ability to hedge potential future congestion charges. We agree with the view that the purpose of a CRR auction is to support this core purpose of facilitating hedging of congestion costs and thereby promote open access to the transmission grid. The goal is *not* to facilitate the selling of financial (or physical) transmission rights that have little or no value as hedges at a large discount to their expected value.

This holds several implications for the interpretation of CRR market results. While some of the CRRs in the auction may be acquired in order to hedge congestion risk and might be valued at a premium to the expected payout, this is not the case overall. Instead, the overall pattern is one of CRRs being valued by buyers as risky financial instruments and purchased at a discount to the expected payout that materially exceeds the time value of money.²⁴ While the instance of any specific CRR selling for less than its subsequent congestion revenue value is not sufficient evidence that it was sold for less than its expected value (which

²² See for example, California ISO, CRR Auction Analysis Report, November 21, 2017 pp. 49-56, California ISO Department of Market Monitoring, 2016 Annual Report on Market Issues and Performance, pp. 200-204.

²³ Neither the DMM nor CAISO comparisons of auction revenues and CRR payouts for annual CRRs account for the time value of money difference in the timing of payments for and to annual CRRs.

²⁴ Because annual/seasonal CRRs are paid for as much as a year before any payout would be received, there is a time value of money benefit from receiving these advance payments. The rates of return for transmission owners are in the range of 10% or less, however, which are too low to account for more than a small portion of the difference between auction revenues and CRR payouts.

can't be observed), the persistent pattern of overall auction revenues falling below overall congestion payouts is evidence that this effect is dominating the aggregate auction outcomes.

One question in understanding auction outcomes is the extent to which there are structural factors contributing to a relatively low demand for CRRs as hedging instruments in CAISO CRR auctions, thereby yielding low auction prices. This could in part be because the focus has to date been on the auction, and the most valuable hedging CRRs are likely acquired in the allocation process. The value and payout of these allocated CRRs is not included in these comparisons. In addition, because the portion of load served by regulated utilities is much higher in California than in regions like NYISO, PJM or ISO New England, there might be less demand for congestion hedges because of elements of CPUC regulation that discourage regulated utilities from acquiring CRRs in auctions²⁵ or because CPUC regulations do not incent regulated utilities to hedge congestion risk.²⁶ Since no statistics have been compiled on the valuation of CRRs acquired in the allocation process, we cannot assess whether CRRs in general are not valued as hedges or whether it is particularly the CRRs purchased in CAISO auctions that are not valued at the margin as hedges but as risky financial instruments.²⁷

While one possibility is that CRRs are typically sold at a discount to the expected payout because there is a general lack of demand for congestion hedges in CAISO auctions, another possibility is that the low valuation of CRRs is specific to the CRRs sold in the auction and reflects the payout to CRRs that have little value as hedges. CRRs have been structured in California to provide load serving entities a perfect hedge for congestion charges between the CRR source and the CLAP or DLAP at which the load serving entity buys power, without regard to the impact of transmission outages, loopflows or changes in load distribution factors for the CLAPs and DLAPs on the extent to which the transmission grid is able to support the payments to the CRR holder. Because of this CRR design, load serving entities and suppliers selling to load serving entities have no hedging incentive to acquire generator-to-generator CRRs that would have a payout in any of the following circumstances:

- (1) when particular outages occur, and the outage causes constraints to bind that were not binding in the CRR auction model or causes the CRR to have an increased shift factor in the day-ahead market over constraints that did bind in the CRR auction,
- (2) when there are loopflows modeled in the day-ahead market that change the available transmission, or

²⁵ This could be the case, for example, if the regulated utility's shareholders were at risk for losses on CRR purchases while profits would be passed through to rate payers.

²⁶ This might be the situation if, e.g., the regulated utility was able to pass through any congestion charges in its rates, so that rate payers had to bear the congestion risks.

²⁷ Because all CRRs are priced in auctions, allocated CRRs could be valued at both seasonal and monthly auction prices and this valuation compared to the payout, but neither comparison has been carried out by the CAISO or DMM.

(3) when the distribution of load in the day-ahead market causes different constraints to bind in the day-ahead market than in the allocation or auction.

If CRRs that have little value to load serving entities or their suppliers as congestion hedges are offered in the auction, one would expect they would be valued as risky financial instruments and sold at a discount to the expected payout. It is important to understand that this outcome is not necessarily a result of a lack of competition among the purely financial auction participants. No matter how intense competition is among the financial auction participants, they will not value CRRs at a premium to the expected payout; pure financial players will only be willing to buy positively valued CRRs at a discount to the expected payout. A lack of competition would increase the discount to the expected payout but more competition from financial market participants will not eliminate the discount. Competition between financial market participants and hedgers (because of shared transmission constraints) might result in a higher valuation of CRRs that are valued as hedges, but only by a few load-serving entities or suppliers. However, competition from financial participants cannot eliminate the discount for CRRs that are valued only as financial instruments.

Moreover, the more complex it is to analyze and value CRRs, the more costs financial players must incur to participate, and the larger the difference between the auction price and day-ahead market payout must be in equilibrium to enable those participants to recover their costs. The same is also true for load-serving entities that might value these CRRs as imperfect hedges. The more complex it is to value these CRRs as improving their congestion hedges, the lower the premium will be that the load serving entity would be willing to pay (or the larger the discount it would need to receive) for the CRRs relative to the expected payout.

Finally, to the extent that transmission outages cause differences between the transmission model used in the auction process and that used to determine CRR values in the day-ahead market, there is a potential for auction participants to acquire CRRs that create little if any flows on constraints modeled in the auction, and hence are valued near zero, but create large flows on transmission elements that will bind on the day-ahead market when particular outages occur.²⁸ Because in the CAISO CRR design the transmission grid model used in the auction differs from the grid model that will determine CRR values in the day-ahead market, the hedging CRRs acquired by load serving entities and suppliers in the allocation and auction may not create very large flows on such constraints in the auction model, and the constraints may not even be enforced in the auction model. If this is the case, these constraints will not bind in the auction so that the price of CRR flows on these constraints in the auction will be zero.

²⁸ The price of a CRR in the CRR auction is determined by the flow the CRR creates on the constraints that bind in the auction solution, times the shadow price of each auction constraint. If a CRR creates no flows on any constraint that binds in the auction, it would have a zero price. If a CRR can be acquired between any pair of nodes in the transmission model, it might be possible to identify and select CRRs that turn out to create minimal flows on binding constraints and hence sell at a low price.

This outcome was seen for a variety of constraints in the CAISO analyses of the CRR auction outcomes, particularly during the typical maintenance months of October through December.²⁹ In a number of cases, more than a million dollars of CRR payments were made to CRRs sold in the annual and monthly auctions for constraints that were not modeled in the auctions and hence the constraint could not bind in auction and was valued at zero in determining CRR prices. Indeed, in a number of months more than all of the auction revenue shortfall appears to be accounted for by the payout to CRRs creating flows on constraints that did not bind in the annual and monthly CRR auctions. Sometimes this amount of payout arose from a single constraint that did not bind in the CRR auctions because it was not modeled.³⁰

The CRRs sold in the auction that created these flows may have also created flows on other constraints that did bind in the auction so that the CRRs were likely not sold at a zero price. They were, however, potentially sold at a very large discount to the day-ahead market payout.³¹ The potential for this kind of outcome in which CRRs that create flows on constraints that bind in the day-ahead market but do not, or cannot, bind on that constraint in the CRR auction (and hence do nothing to improve auction valuation) is increased by rules and policies that require the California ISO to disclose the details of the auction model a number of days prior to the auction, and do not allow the California ISO to change the model to reflect additional outages. This auction structure allows market participants who are not seeking hedges to identify CRRs that will create flows on transmission elements that will bind when outages occur, but create little if any flows on transmission constraints enforced in the auction model. These CRR bids do nothing to improve CRR auction values, they are in fact structured precisely to avoid having that impact.

²⁹ California ISO, CRR Auction Analysis Report, November 21, 2017, Tables 13-23.

³⁰ For example, see the discussion of December 2016 in Section 4.2 below. Similarly, in January 2017 the net payment to auction CRRs in excess of auction revenues was \$4.5 million. The CRR payments to a single constraint that was not enforced in the auction 23040 Cross Trip accounted for \$5.7 million of payments to auctioned CRRs, and another constraint, OMS4622069 TL50003 accounted for another \$1.2 million. In February 2017, the net payout to auctioned CRRs in excess of auction revenues was \$4.1 million. The constraint 7820 TL23040 IV SPS NG that was not enforced only accounted for \$1.6 million of this shortfall but there were a number of constraints that were not enforced that contributed to the overall shortfall. The overall shortfall was \$3.6 million for March 2017, with a single constraint that was not enforced, 7820 TL23040 SPS NG, accounting for \$3.4 million of this and one other unenforced constraint 31486 Caribou 115 30255 Caribou M 1 XF 11 accounting for another \$.8 million. In April 2017 the CRR payout exceeded auction revenues by \$7.7 million, and a single constraint that was not enforced, 6410 CPS NG, accounted for a net payout of more than \$6.7 million. One other constraint that was not enforced, OMS3831815 TMS DLO accounted for roughly another \$.7 million. The CAISO analysis in Section 7 of the November report also shows large payouts on other constraints that were enforced, but did not bind in the auction. This outcome can arise simply because congestion patterns are different from expected but it can also arise because Generator-to-generator CRRs are acquired in the auction that create small flows on the constraint on the auction grid but create large flows and payouts on these constraints on the day-ahead market transmission grid because of outages that were not modeled in the auction.

³¹ It would be possible to identify which FTRs created flows on these constraints in the auction and compare the FTR prices to the payouts but this would require rerunning the auction for force these constraints to bind so that shift factors would be calculated.

4. The CAISO Proposal

The changes proposed by the CAISO would be applied to the next auction of annual CRRs where, barring changes, 75% of the system capacity is made available through a sequential process of allocation and auctioning. The CAISO also plans to implement changes to the auctions for monthly 2019 CRRs. As mentioned above, the annual auction has been responsible for \$48 million in net auction revenue shortfalls over the period January 2015 through May 2017.³² These changes are therefore targeted at the annual auction both because of its prominence in auction revenue shortfalls and because the auction will be the first in the next cycle of CRR auction distributions. The CAISO will consider further comprehensive design changes, including those that might impact monthly auctions, in its Track 2 process during the rest of 2018.³³

There are two components of the changes proposed for Track 1. These include changing the timeline for transmission outage reporting and changes to the allowable source and sink pairs that can be sold in the auction. We discuss each of these components below.

4.1 Timeline for Transmission Outage Reporting

One source of both revenue insufficiency (CRR payments in excess of congestion rents collected) and net auction payment deficiencies (CRR auction prices below the subsequent revenue stream associated with them) has been the mismatch between constraints that are represented in the network model used by the auction and those that are actually incorporated in the network model used to clear the day-ahead market whose prices are used to settle CRRs. This is a fundamental consideration when defining the true capacity of the network. When constraints are not included in the auction model, they cannot bind and therefore cannot impact the availability and prices of CRRs. If those constraints do bind in the daily market, then there is a potential that more transmission capacity has been sold in the form of CRRs, than actually exists. Moreover, if auction participants know that a particular constraint that will bind during an outage is not enforced in the auction model, they can structure their CRR bids to create flows on the transmission element that is not modeled but have little or no impact on modeled constraints. Alternatively, if they know that a particular unmodeled outage would increase the shift factors of particular CRRs on constraints that would bind in the day-ahead market, they can structure their bids to acquire CRRs that have no value as hedges on the auction grid but would be entitled to large payouts during the outage. Either bidding strategy can contribute to both revenue insufficiency and low auction prices relative to payouts for CRRs sold in the auction.

There are several potential options for mitigating these problems, some of which may be

³² California ISO, CRR Auction Analysis Report, November 21, 2017, p. 52.

³³ CAISO, CRR Auction Efficiency Track 1 Draft Final Proposal, p. 4.

considered during Track 2. For Track 1 the CAISO has highlighted a basic problem with constraint modeling in its annual auction; the fact that auction is held before transmission owners are currently required to notify the CAISO of planned outages for the following year. Currently, the CAISO deadline for submitting comprehensive annual maintenance plans is October 15 of the previous year,³⁴ whereas its annual CRR process is run in August of the previous year. In order to best capture the known future availability of transmission facilities in time for the annual auction, the CAISO is therefore proposing an additional deadline for outage reporting relevant to the CRR auction of July 1.

Discussion

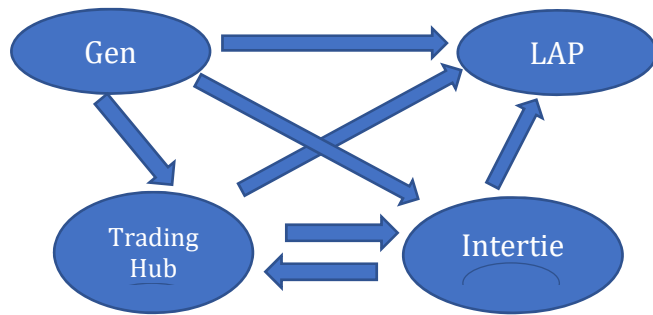
There is an inherent trade-off between earlier reporting deadlines and the quality of information that can be collected in time to meet those deadlines. The main downside of the proposal is that the state of information as of July the year prior to the operating year will be of much lower quality than would be the case closer to the operating month. With respect to the annual auction, even partial or imperfect information about future maintenance plans is likely better than no information at all. However, there are limits to the transmission owners' ability to provide accurate information this far in advance of the outage, as the need for some outages may not be known that far in advance. While earlier notification of known outages strikes us as a common-sense step with regards to the annual auction, the need for some outages would not be known at that point in time and will have to be scheduled closer to the operating month. Hence, a secondary October reporting date will be retained, and the CAISO auction modeling will need to allow for the possibility that other outages will need to be scheduled closer to the operating month.

There is also the question of enforcement. The CAISO has reported that for the monthly process only 43% percent of planned outages were reported by their required reporting date and the CAISO did not have time to evaluate all of these outages for adjustments to the monthly auction model. While this is clearly problematic, significant penalties for missing deadlines could lead to speculative or overly conservative estimates. This would in turn raise the question of enforcing the quality of reported information. It is therefore not clear if the gains of more heavy-handed enforcement of reporting would be substantial.

4.2 Restrictions on Allowable Source and Sink Pairs

The most significant change to the CRR paradigm proposed by the CAISO is to introduce limitations on the types of nodes eligible to be either a source or sink for CRRs sold in the CRR auction. Figure 1 provides an illustration of the source-sink combinations that are proposed to be allowed in this proposal. In contrast, the CAISO currently allows auction participants to bid from any biddable pricing point to any other biddable pricing point.

³⁴ CAISO *op. cit.*, p. 24.



The proposal would eliminate “non-delivery pair” bids, a term that refers to source-sink pairs that are not related to supply transactions. Among the types of CRR bids that would not be allowed would be “gen-to-gen” CRRs, which both source and sink at supply nodes.³⁵ This latter category accounts for the largest single source of CRR capacity awarded during the auction phase. The CAISO reports that gen-to-gen transactions “have resulted in an overall \$186 million congestion revenue right auction net payment deficiency since 2014.”

The CAISO argues that many CRRs between non-delivery pairs would have limited value in hedging resource-to-load transactions. This is because, such CRRs could not, on their own, match or offset the congestion risk associated any physical transaction. The only way that non-delivery CRRs could contribute to hedging is when they are combined with other instruments, either ISO-backed CRRs or purely financial, to form additional hedging products. We discuss the potential hedging uses of these CRRs sourcing and sinking at these other locations below.

Discussion

This is the most substantive and controversial element of the CAISO’s proposed changes. The logic behind this restriction is strong: non-delivery pair CRRs account for the vast majority of the auction revenue shortfall.³⁶ Moreover, allowing sales of CRRs sourcing and sinking at these non-delivery locations likely contributes substantially to the ability of financial market participants to buy CRRs that create flows on transmission elements that bind during outages but are not modeled as constraints in the auction. Further, this allowance can also enable purchases of CRRs that had small shift factors on binding constraints in the auction model, yet had large shift factors on binding constraints in the day-ahead market during transmission outages. It is therefore anticipated that eliminating the auctioning of such CRRs would substantially reduce the auction revenue deficiency.³⁷ Ideally,

³⁵ CAISO, CRR Auction Efficiency Track 1 Draft Final Proposal, p. 32.

³⁵ *Ibid.*

³⁶ Recent CAISO calculations provided to us indicate that \$280 million, or 82%, of the overall auction revenue shortfall since 2014 can be attributed to non-delivery pairs. As noted above, generator-to-generator CRRs alone account for \$186 million. See California ISO, Congestion revenue rights auction efficiency, Feb 13, 2018 pp. 8, 10.

³⁷ These changes are also likely to improve auction revenue adequacy.

such a change would focus bidding on a smaller sub-set of CRRs that will create flows on constraints modeled in the auction and therefore increase competition and, in all likelihood, auction revenues for the remaining eligible pairs.

Total auction *revenue* would very likely decline with the enforcement of these source-sink restrictions in the auction, but it is anticipated that the decline in auction revenues will be smaller than the decrease in CRR payouts. It is anticipated that many fewer CRRs will likely be sold in annual and monthly auctions as a result of this change. The intention of the proposal is for the reduction in the sale of CRRs to then lead to a large reduction in the overall congestion payments to CRRs sold in the auction, thereby bringing the auction revenues more in line with the CRR payout. The degree to which the overall CRR payout will be reduced is uncertain, but there is evidence lending support to the expectation that the reduction in CRR payouts will exceed the reduction in auction revenues. The fundamental drivers of demand for hedging CRRs are different than those for speculative ones. It is reasonable to expect that hedgers would be willing to pay a premium (over expected revenues) for hedging CRRs, while speculators would require a discount over expected value to accept the risk associated with a speculative CRR. In other ISOs, specific CRRs associated with hedging (e.g. delivery) pairs connecting major source and sink hubs have consistently cleared at prices above their subsequent payout.³⁸

While the elimination of CRRs sourcing and sinking at Gen nodes could in the abstract materially increase, rather than decrease, differences between auction clearing prices and day-ahead market congestion payouts on the CRRs sold in the auction, the CAISO's analysis has shown that a very large portion of the net payout is to constraints that did not bind in the auction and often were not even enforced. The Gen to Gen CRR bids therefore did nothing to converge auction prices with market payouts with regards to those constraints. For example, Table 23 for December 2016 shows that there were net payouts to monthly and annual CRRs of over \$8 million due to the constraint OMS4379177 IVALLEY BNK81 NG2 which was not enforced in the auction. This one constraint accounts for more than all of the difference between auction revenues and CRR payouts in December 2016, which was \$5.7 million.³⁹

At the same time, selling less CRRs, while reducing revenue shortfalls, might also reduce the various market benefits provided by CRRs that have been discussed above. Several stakeholders have noted the ways that non-delivery pair CRRs can be combined with each other or delivery-pair CRRs to create new hedges. Such flexibility will be reduced. However, CAISO analysis indicates the perception that the auction itself produces substantial counterflow that directly unlocks ISO-back hedging (delivery-pair) CRRs is not accurate.

³⁸ CRRs (or equivalent instruments) associated with the New York ISO Zone G to Zone J, and the PJM western hub to PECO sink have sold in auctions at prices on average higher than payouts over 10 to 15 year periods (S. Harvey, February 2018. "CRR Prices and Pay Outs: Are CRR Auctions Valuing CRRs as Hedges or as Risky Financial Instruments").

³⁹ California ISO, CRR Auction Analysis Report, November 21, 2017, pp. 135 and 145. See also the note above discussing similar patterns in the CAISO analysis of payouts to non-binding and not enforced constraints in other months.

According to the CAISO's calculations, eliminating generator-to-generator CRRs, the dominant form of non-delivery pair CRRs, allowed for an *increase* in the sale of non-generator-to-generator pair CRRs in a resimulation of the 3rd quarter of 2018. This provides support for the argument that non-delivery point CRRs are not providing direct hedging value through the auction.

While there is reason to expect that the direct impacts of this change will produce the desired effect of reducing auction revenue shortfalls while preserving, or even expanding, the availability of hedging CRRs in the auction, it is much more difficult to predict the indirect impacts of this change. A number of concerns have been expressed with the limitations on source-sink pairs proposed by the CAISO. Some of these concerns appear to be valid, some would require further discussion to understand, while some others appear inconsistent with the data compiled by the CAISO in its detailed analysis of auction outcomes.

First, several market participants have pointed out that the purchase of Generator-to-generator CRRs can be used to effectively change the source of a Generator to LAP or generator to trading hub CRR held by a market participant.⁴⁰ Thus, a CRR from node A to the Trading Hub plus a CRR from node B to node A is financially exactly equivalent to a node B to Trading Hub CRR. The purchase of generator-to-generator CRRs is therefore potentially useful to physical market participants in adapting their congestion hedges to changes in generation contracts or outages over the year. However, the number of generator-to-generator hedges being purchased during the year exceeds their possible use for this purpose of adjusting congestion hedges by an order of magnitude. Instead, these generator-to-generator CRRs account for a large portion of the payout in excess of CRR auction values. The CAISO would likely be able to accommodate the sale of smaller amounts of generator-to-generator CRRs in the long run by implementing some restrictions on allowed purchases,⁴¹ but these changes would need to be implemented in future auctions after the short-run changes have been implemented and the current substantial imbalance between auction revenues and CRR payments corrected.

Second, there has been an opinion expressed that generator-to-generator CRRs can be used to reduce exposure to particular nodes in the current trading hub.⁴² It is not clear why this is desirable from a hedging perspective for transactions at the trading hub. If there is a need for the development of new trading hubs with somewhat different definitions than the current hubs, that is a discussion the CAISO could have with stakeholders perhaps

⁴⁰ See, for example, DC Energy, Comments on Draft Final Proposal, February 28, 2018; Financial Marketers Coalition, Comments on Draft Final Proposal, February 28, 2018; and Appian Way Energy Partners Comments, February 28, 2018.

⁴¹ The CAISO could implement bid validation that would only allow a CRR holder to submit a generator-to-generator CRR bid for a CRR sinking at the source of a generator to a LAP, a generator to a tie or a generator to trading hub CRR held by the market participant submitting the bid. Such a design would allow the purchase of generator-to-generator CRRs to restructure existing CRRs without allowing the use of generator-to-generator CRRs to create flows on constraints not modeled in the auction.

⁴² See Comments of Calpine Energy Solutions LLC, February 28, 2018.

followed by implementation additional trading hubs in future auctions. However, that would be a discussion best held after the changes proposed by the CAISO have been implemented.

Third, it has been observed that generator-to-generator CRRs could be used to create so-called “dirty” hedges, i.e. a set of CRRs that do not perfectly hedge congestion between a resource and a LAP or trading hub but provide a partial hedge, if incremental generator to LAP CRRs cannot be awarded.⁴³ This is possible, but the patterns of CRR flows on unenforced and non-binding constraints portrayed in the CAISO report suggests that the primary focus of these generator-to-generator CRRs is not hedging, and there is no evidence that these CRRs have material value as hedges given that they are sold at a large discount to the expected payout. Once the changes proposed by the CAISO have been implemented and the current substantial imbalance between auction revenues and CRR payments corrected, consideration could be given to whether there is a need to make additional changes that might enable increased hedging.

A fourth concern with the CAISO proposal is that it would prevent market participants from bidding to provide counterflow CRRs, for example from a trading hub to a generator or from a LAP to a generator.⁴⁴ This will be the case, but it is a necessary part of the CAISO’s design. If the CAISO were to allow the purchase of such counterflow CRRs, market participants could construct generator-to-generator CRRs by purchasing a CRR from a generator to a trading hub and then buying a counterflow CRR from the trading hub to another generator. If both bids cleared, the two CRRs would be completely equivalent to holding a generator-to-generator CRR. While the need to submit separate for the two CRRs would complicate bidding,⁴⁵ allowing these bids would give rise to the kind of concerns DMM expressed about bidding strategies that would circumvent the intended restrictions.⁴⁶ Since the fundamental characteristic of generator-to-generator CRRs is that the auction price is much less than the CRR payout, there is not much incentive for market participants to buy counterflow CRRs and taken on a position for which they would be paid less than they would pay out. The CAISO’s resimulation of a season of CRR auctions found that there were 3800 megawatts of counterflow CRRs but the overall impact of non-delivery CRRs was to reduce the number of CRRs that cleared between the primary locations for supply hedges.⁴⁷

After the CAISO implements these Track 2 reforms and observes the degree of improved convergence between CRR auction prices and day-ahead market payouts, it will be able to

⁴³ See NRG Energy Inc, Comments on Draft Final Proposal, February 28, 2018.

⁴⁴ See, for example, Appian Way Energy Partners Comments, February 28, 2018.

⁴⁵ If the bidder submitted two separate price capped bids, one might clear while the other bid not, leaving the bidder with a position it did not intend to take, while if the bidder submitted price taking bids it could end up paying more than it intended for the CRR if the CAISO enforced a constraint that the bidder did not expect.

⁴⁶ See CAISO Department of Market Monitoring, Comments on the Congestion Revenue Rights Auction Efficiency Track 1 Draft Final Proposal, February 28, 2018.

⁴⁷ “Congestion Revenue Rights Auction Efficiency, Track 1 Draft Final Proposal,” February 8, 2018, p. 35.

consider refinements in bidding rules that could be implemented on a longer time frame that could allow the submission of some counterflow CRR bid without unraveling the effects of the source-sink restrictions.

Other commenters have pointed to the source-sink restrictions proposed by the CAISO will make it more difficult or costly to hedge unspecified congestion exposures.⁴⁸ It is anticipated that the source-sink restrictions proposed by the CAISO will make it more difficult for CRR purchasers to hedge congestion on particular transmission elements (such as those that are not modeled in the auction). However, that inability does not prevent market participants from bidding for CRRs that hedge the congestion risks that either physical market participants or those selling them financial hedges would incur.

Commenters have also suggested that generator-to-generator CRRs helps CRR auction prices reflect constraint costs but the CAISO data in Section 7 shows that much of the CRR payout is to constraints that are not enforced in auction, so generator-to-generator bids cannot cause them to bind and impact prices, but they do increase the CRR payout. In addition, the CAISO analysis in Section 7 of the November CRR Auction Analysis Report shows that many of the other constraints that accounted for large payouts did not bind in the auction, so the ability of auction participants to submit generator-to-generator CRR bids did not cause the expected payout to these constraints to be reflected in constraint prices.

A number of commenters suggest that instead of imposing the source-sink restrictions proposed by the CAISO, the CAISO should limit the auction changes to eliminating the sale of CRRs between essentially identical locations.⁴⁹ While such changes should be made, the CAISO's analysis has shown that their impact on the difference between auction revenues and CRRs payouts would have been relatively limited.⁵⁰

To summarize, CAISO analysis indicates that the majority of the auction revenue shortfalls are presently attributable to the types of CRRs that would be eliminated under this proposal. Several stakeholders have raised concerns that this reduction in the allowed sources and sinks for CRRs could lead to unintended consequences through changes to bidding behavior and to financial transactions outside of CAISO markets. There may be some secondary impacts from these changes, but the CAISO analysis shows that whatever the benefits that may be foregone because of these unintended consequences, there is a very large intended consequence of taking a first step towards reducing and eventually eliminating the discrepancy between auction revenues and CRR payouts. Moreover, we note that this change is a less dramatic change to the landscape of auctioned CRRs than the solutions supported by DMM and the investor-owned utilities.

⁴⁸ See, for example, Comments of Boston Energy Trading and Marketing, February 28, 2016.

⁴⁹ See for example, Appian Way Energy Partners Comments, February 28, 2018, NRG Energy Inc, Comments on Draft Final Proposal February 28, 2018; DC Energy, Comments on Draft Final Proposal February 28, 2018; Comments of Financial Marketers Coalition, February 28, 2018.

⁵⁰ We understand from the CAISO that while these CRRs accounted for around 12% of the auction revenue shortfall in 2015, they accounted for less than 5% in 2016 and less than 0.5% in 2017.

Conversely, the magnitude of the reduction in the difference between auction revenues and CRR payouts and the increase in congestion rents flowing to transmission rate payers that will be achieved by the CAISO design is also uncertain as it depends in part on how CRR auction participants change their behavior in future auctions. Therefore, while the full effects of this change cannot be understood with *ex ante* simulation alone, we support this measure as targeting the CRRs that are the least likely to provide market benefits and the most likely to induce auction revenue shortfalls. As with all of the measures currently proposed by CAISO, we support an in-depth evaluation of their impacts and pursuit of further, or even reversal of these, changes as warranted by the analysis. The impact of the DMM/SCE proposal and the congestion rents flowing to transmission rate payers is also uncertain because this depends not only on auction revenues and CRR payouts but also on the congestion rents collected in the day-ahead market. Changes which hinder the ability of external suppliers to hedge forward sales at CAISO trading hubs will likely impact forward sales patterns as well as CRR purchases and by reducing imports could both reduce congestion rent collections and raise day-ahead market prices.

5. Conclusions

At this stage, there are three broad policy directions that the CAISO could take:

- 1) Continue the status quo with only minor modifications to the auction,
- 2) Eliminate the auction in its current form, leaving it as only a trading platform for “voluntary” transactions (as in the DMM / SCE) proposal, or
- 3) Make substantial revisions to the auction structure that try to maintain its hedging benefits while significantly reducing losses to transmission ratepayers. These revisions could either be intended to be permanent, or could instead be provisional, intended to reduce losses while the CAISO further analyzes possible changes and develops a more finely tuned proposal that may include further restrictions on auction sales in some respects, but allow more auction participation in other respects.

The CAISO proposal falls in the third category. The changes to the auction are far more than minor adjustments. However, they preserve the ability of non-LSEs to directly access the ISO-backed CRR market in order to hedge sales to load serving entities at LAPs or trading hubs by purchasing CRRs sourcing at generators or the ties and sinking at LAPs and trading hubs. They also maintain some of the other flexibility attributes provided by the current auction process, such as exporting, wheeling, and even non-contracted merchant generation. The changes can also be viewed as provisional, and could be supplanted or supplemented by changes as part of Track 2 of the CRR auction reforms or subsequent proposals. We support this proposal for the detailed reasons provided above, which are summarized below.

At this time, we do not support the DMM / SCE proposal for the reasons provided in Section 2.3. In particular, it would be counter to the open access principles that motivated the creation of congestion revenue rights as a hedge in the first place; replacement hedges would

likely be available only at a much higher prices for market participants who do not participate in the free allocation stage of CRR allocation; and caution should be the rule when considering market changes that would profoundly affect the availability and cost of transmission hedging services. If the Track 1 and 2 changes prove to be ineffectual in reducing CRR auction losses, then the DMM / SCE proposal is one alternative that could be considered.

The auction, as it is currently implemented, has produced a revenue shortfall that has ranged from 50 – 75 \$million over the last three years. Total congestion revenues during this period have been several times as large. At the same time, CRRs are viewed by many, including ourselves, as providing benefits to the operation and efficiency of wholesale markets. While it is extremely difficult to quantify the exact contribution that auctioned CRRs provide to the market, it does not have to be substantial to make a difference. The total wholesale cost of serving load, as calculated by DMM, ranged from 7.5 to 12.1 \$billion annually between 2014 and 2016. The CAISO's CRR auctions need to contribute less than one percent to wholesale market efficiency to offset the entire auction revenue shortfall, thereby actually producing a net benefit to ratepayers, and would be able to provide a larger net benefit when the auction revenue shortfall is reduced by the CAISO Tracks 1 and 2 proposals.

While it is extremely difficult to quantify the impacts of the changes proposed by the CAISO in Track 1, we note that qualitatively, they are consistent with the goal of preserving access to congestion hedging instruments for all load serving entities, including the smaller load serving entities that appear to be more likely to purchase power at trading hubs, while minimizing ratepayer losses. Most plausible hedging transactions require rights consistent with the physical flow of power or with financial supply deliverability at trading hubs, and those instruments will be preserved under the proposal. While it is possible that other types of CRRs play some role in supporting hedging, as well as speculation, we know of no reliable way to quantify the contributions these types of CRRs make to the hedging function. The CAISO auction analysis does show us, however, that these rights have been responsible for the largest net revenue shortfalls over the last several years. By contrast, an earlier proposal to reduce overall capacity available in the annual auction targets all types of CRRs, and strikes us as more likely to have limited the availability of hedging as well as speculative instruments in timeframes relevant to some forward contracts. Furthermore, limiting the combinations of CRRs should theoretically concentrate the flows over fewer constraints so they could increase prices relative to payouts.

While the proposal is qualitatively a step in the right direction, the exact quantitative impacts are uncertain. It is unclear to us how effective the source-sink restrictions will be in limiting the sale of CRRs that have little value as hedges and are sold in the auction at low prices relative to the expected payout. By how much the source-sink restrictions will improve the balance between auction prices and CRR payouts is uncertain. Nevertheless, these changes are, we believe, likely to reduce the auction revenue shortfall without substantially harming market efficiency, and the CAISO can undertake additional analysis to guide additional changes over the coming weeks. While the annual auctions for 2019 will begin this summer, the largest differences between auction revenues and CRR payouts are

in the monthly auctions and additional design changes could be implemented in those auctions prior to the annual auctions for 2020.

Even if the CAISO Track 1 proposal is effective in reducing purchases of CRRs at large discounts to the expected payout by financial market participants, it still may not eliminate all or even most of the difference between auction prices and CRR payouts. The market structure of retail supply in California, combined with the aggregation of demand node pricing to load aggregation points, could be contributing to relatively low demand for hedging instruments, at least by LSEs. To the extent that low auction prices, and auction revenue shortfalls are due to low hedging demand, the CAISO changes will not change these outcomes as they are not a result of the CAISO's auction design.

We note that this proposal is only a first step in a longer process of evaluation of the CRR auction and its broader market impacts. Analysis of the effects of the proposed changes, some of which have not been experienced in US markets before, will provide valuable insight toward whether further changes are necessary, or if elements of the proposal should be revisited. As an interim step, therefore, we believe that this option makes considerable sense as a way to reduce the sale of undervalued CRRs in the short-run and provide some evidence of how some kind of auction modifications impact the relationship between auction value and CRR payouts. Therefore, we support the CAISO proposal as a reasonable incremental step, that stands a good chance of limiting auction revenue shortfalls while still preserving the main underlying function of the CRR auction. These changes, together with any Track 2 changes that are implemented, will need to be given some reasonable period of time to be in place before their success is evaluated. As part of the Track 2 stakeholder process, we strongly suggest that, first, that a wider range of alternatives for reducing auction losses be considered.

One alternative should include establishing a minimum price or per unit fee for auctioned CRRs. Data provided to us by ISO staff indicate that 7% of the auction losses in the past four years were comprised of payments made to CRRs that sold at a zero price.⁵¹ Another would be to look at the structure for funding the auction revenue shortfall. We note that the problem that is the focus in this initiative--the auction revenue shortfall--is fundamentally a transfer payment issue from one set of market participants to another, in contrast, the proposals to address this transfer could have additional negative impacts on the efficiency of the market. While there are reasons to believe that the efficiency impacts associated with the CAISO proposal would be acceptable, those associated with the DMM/SCE proposal could be more substantial. If the source of the problem constitutes an unacceptable transfer from one group to another, the solution could involve another transfer or fee that would offset these losses without significantly compromising the CRR market.

Our second suggestion is that careful analyses be made of potential CRR auction revenues relative to payouts, categorized by source-sink pair, under alternative auction designs for the 2014-2017 period. This would best be done by running historical bids through implementations of alternative auctions (including elimination of certain source-sink pairs,

reductions in annual auction quantities awarded, and minimum price or bid fees). This should be done for the entire four year period in order to minimize the impact of sample error upon the conclusions. We note that the results of such analyses should be interpreted carefully, because bidding behavior may change as a result of reforming the auction, so that the anticipated reductions in losses might not be realized. Nevertheless, these simulations of the performance of alternative auction designs using historical bids will provide a better indication of the potential reduction in losses than the analyses that are presently available.

A third suggestion is that the CAISO analyze the extent to which there is a general undervaluation of hedging CRRs in CAISO markets, rather than simply a low valuation of CRRs that have little value as congestion hedges.

Fourth, as the Track 1 changes are implemented, the CAISO should assess the extent to which these changes have been effective in reducing the payout to CRRs whose shift factors and day-ahead market payouts are inflated by outages, and consider whether changes in the way CRRs are settled might contribute to improved outcomes.

To summarize, we support the CAISO proposal, but anticipate that further changes will be necessary to either supplement or supplant those proposed here. Whatever changes are made should continue to support the ability of small and non-LSEs to access a market for ISO-backed CRRs. We suggest several analyses that can quantify the impact of these and other potential changes, and advise these be undertaken as part of the Track 2 process.