# Congestion Revenue Rights Auction Efficiency

## Track 1A Draft Final Proposal Addendum

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# 1 Executive Summary

There is evidence that the California ISO's (CAISO's) congestion revenue rights auction produces inefficient outcomes. Since 2014, market participants purchased congestion revenue rights in the auction for an average of $99.5 million per year less than their eventual payouts (termed "net payment deficiency" in this document). On average, market participants purchase congestion revenue rights for 63 cents on the dollar. When day-ahead congestion charges are insufficient to cover the difference, it is allocated as uplift to load serving entities. Auctioned congestion revenue rights are intended for hedging congestion associated with supply delivery in the CAISO's locational marginal price-based day-ahead market. If congestion revenue rights are priced on this basis, then congestion revenue rights auction prices should reflect market participants' expectations of congestion price exposure in the day-ahead market and therefore the expected congestion revenue right payments.[1]

The CAISO proposes several rule changes to the annual congestion revenue rights allocation and auction process for which the CAISO will seek Board of Governors' approval at their March 2018 meeting. This will enable the CAISO to seek Federal Energy Regulatory Commission (FERC) approval of certain changes discussed in this draft final proposal in time for the 2019 annual congestion revenue right processes that will start this summer. The CAISO is also considering process changes it can make under current tariff authority as well as more comprehensive rule changes that it will work with stakeholders to develop over a longer time period.

The CAISO believes it is important to make changes that it can implement for this year's annual auction to reduce congestion revenue rights net payment deficiencies. Congestion revenue rights awarded in the annual auction have accounted for about half of the net payment deficiency. Following the February 13 stakeholder meeting and an initial review of stakeholder comments received on the February 8 Draft Final Proposal, we are proposing to refine the scope of the proposal. The CAISO has removed the two policy proposals from the scope as outlined in Section 5 of this paper for the March Board of Governors meeting.

In its congestion revenue rights auction efficiency analysis report, published in November 2017, the CAISO identified issues impacting the congestion revenue rights market that are considered in this Draft Final Proposal Addendum:

- The CAISO being informed of transmission outages after the time that it conducts the congestion revenue right auction causes it to create misalignments in constraint enforcement, contingency enforcement, and topology between the congestion revenue rights market model and the actual day-ahead market models.

[1] As adjusted for CAISO charges and the time value of money.

- A large portion of net payment deficiencies are associated with auctioned congestion revenue rights inconsistent with their purpose of hedging congestion associated with supply delivery.

Consequently, the CAISO proposes the following refined congestion revenue rights rule changes, now identified as Track 1A:

- Create an additional annual outage reporting deadline to be aligned with the annual congestion revenue rights allocation and auction process to improve the congestion revenue rights model used in the annual process.

- Limit allowable source and sink pairs in the auction to align congestion revenue rights with their primary purpose of hedging congestion associated with supply delivery.

The CAISO will pursue Track 1B, in which it will continue to focus on policy affecting 2019 congestion revenue rights and bring these policy items to the CAISO Board of Governors for approval in the summer of 2018.

# 2 Initiative organization and scope

## 2.1 Initiative organization

In early 2017, the CAISO began a stakeholder initiative to address the congestion revenue rights auction efficiency. The CAISO is concerned about the large payments made to holders of auctioned congestion revenue rights in comparison to the revenues collected when awarding the congestion revenue rights through the auctions.

This initiative is composed of two main phases: analysis phase and policy phase.

The analysis stage culminated in a report outlining many drivers of low auction congestion revenue rights valuations published on November 21, 2017 (*See* CRR Auction Analysis Report).

The CAISO began the policy stage at a stakeholder working group on December 19, 2017. The policy stage is organized into three tracks: Track 0, Track 1, and Track 2.

> The CAISO is focusing **Track 0** on enhancements it can pursue outside of the broader initiative because they do not require changes to the existing CAISO tariff. This draft final proposal does not discuss efforts associated with Track 0.
>
> The CAISO is focusing **Track 1A**, the subject of this draft final proposal, on items that can be implemented in time for the 2019 annual process. To allow time for FERC approval and implementation, the CAISO plans to bring Track 1A policy items to the CAISO Board of Governors for approval at their March 2018 meeting.
>
> The CAISO is also focusing **Track 1B** on items affecting 2019 congestion revenue rights. In this track, the CAISO will pursue policy development that could achieve FERC approval in time for the 2019 annual process, but may be implemented over a longer time horizon or in very short order. The CAISO plans to bring Track 1B policy items to the CAISO Board of Governors for approval in the summer of 2018.
>
> The CAISO is focusing **Track 2** on addressing potential comprehensive design changes in time for CAISO Board of Governors' consideration in late 2018.

## 2.2 Track 1 scope

The CAISO targets the March 2018 Board of Governors' meeting for policies developed in this proposal. It proposes market design rule changes that can improve congestion revenue rights valuations in the annual and monthly 2019 congestion revenue rights auction and allocation processes. Because the CAISO is following a short timeline for this track, it evaluated potential proposals against the following criteria:

1. Policy has potential to make meaningful impact

2. Policy implementable in time for annual 2019 auction

# 3 Stakeholder engagement

This initiative does not fall within the authority delegated to the Energy Imbalance Market (EIM) Governing Body. The initiative will go to the CAISO Board for approval and the EIM Governing Body will have no role in approval.

The initiative proposes to change the rules for the annual and monthly congestion revenue rights auctions and allocation processes, and also to revise the requirements for Participating Transmission Owners in the ISO's balancing authority are to report transmission outages that could affect those auctions and allocations. Congestion revenue rights are settled based on the outcome of the auctions and day-ahead market prices, with no input from the real-time market. Under the Guidance for Handling Policy Initiatives within the Decisional Authority or Advisory Role of the EIM Governing Body and the Charter for EIM Governance, the EIM Governing Body does not have a decisional role in approving these proposed changes because they are neither rules of the real-time market, nor rules that govern any participation in all ISO markets.

The schedule for stakeholder engagement is provided below. The CAISO targets the March 2018 Board of Governors' meeting for **Track 1A** policy items.

| Date | Event |
|---|---|
| 2/3/2017 | Market Surveillance Committee meeting |
| 4/18/2017 | Working group meeting |
| 5/1/2017 | Stakeholder comments due |
| 5/16/2017 | Market Performance and Planning Forum – Analysis Scope |
| 7/18/2017 | Market Performance and Planning Forum – Initial analysis report data release |
| 11/21/2017 | Publish congestion revenue rights auction efficiency analysis report |
| 12/6/2017 | Stakeholder comments due |
| 12/19/2017 | Working group meeting |
| 1/12/2018 | Stakeholder comments due |
| 2/2/2018 | Market Surveillance Committee meeting |
| 2/8/2018 | Publish track 1 draft final proposal |
| 2/13/2018 | Stakeholder meeting on track 1 draft final proposal |
| 2/28/2018 | Stakeholder comments due |
| 3/8/2018 | Publish track 1A draft final proposal addendum |
| 3/21/18-3/22/18 | March Board of Governors' meeting – Track 1A policy |

# 4 Stakeholder comments

To date, stakeholders submitted three rounds of comments on the issues considered in this initiative. They first submitted comments after the April 2017 working group to determine the scope of the analysis phase. They then submitted comments following the release of the congestion revenue rights auction efficiency analysis report in November 2017. Finally, they submitted comments following the December 2017 working group to discuss the analysis and determine the objectives and scope of the initiative's policy phase.

Stakeholders have generally targeted comments on specific findings of the analysis report and potential comprehensive design changes that would be part of the initiative's Track 2.

Stakeholders have different opinions regarding the value of the congestion revenue rights auction. The investor owned utilities, municipal/state load serving entities and the CAISO Department of Market Monitoring (DMM) generally believe the auction could be replaced by bilateral agreements while non-utility load serving entities, suppliers, marketers, and financial participants on the other hand believe the congestion revenue rights auction conducted by the CAISO serves a critical function.

DMM argues the current congestion revenue rights auction is not a competitive market between willing buyers and sellers, and therefore the design forces load serving entities and their customers to backstop payments to holders of auctioned congestion revenue rights whether or not they are able to or wish to participate in the auction. DMM proposes to eliminate the congestion revenue rights auction and proposes consideration of three potential alternatives: a decentralized market for locational price swaps, a voluntary centralized swap clearing pool, and a voluntary centralized swap clearing pool where the pool takes on market price risk.

As an alternative to the DMM's proposals, Southern California Edison (SCE) proposed that CAISO maintain its auction structure but set auction limits for all transmission constraints to zero. It argues that this will enable the clearing of locational price swaps, but still allow the CAISO to be the clearinghouse. Generally, SCE also supports the DMM's proposals.

Pacific Gas & Electric Company (PG&E) urged the CAISO to quickly pursue reforms to the congestion revenue rights auction and notes that the analysis completed to date provides a basis for at least some major reforms to the congestion revenue rights market design. PG&E also questions the value derived by the CAISO auctioning transmission capacity associated with generator to generator congestion revenue rights as well as rights priced at $0/MW. Generally, PG&E also supports the DMM's proposals.

The Six Cities support the DMM proposals, and also join the CAISO in questioning how much forward contract liquidity or hedging the auctions may be supporting given large volumes of congestion revenue rights awarded to single parties. They also support

prompt implementation of measures that will reduce differences between the models used for the congestion revenue rights auctions and the models used for the day-ahead market and that can be developed quickly and without tariff modifications.

Other stakeholders, such as Calpine Solutions, NRG Energy, Vitol, Inc., Western Power Trading Forum (WPTF), and DC Energy urge the CAISO to focus on competitiveness, liquidity, and better aligning the congestion revenue rights model with the day-ahead market model. Proposals include increasing the frequency of auctions or changing the timing of congestion revenue rights auctions so as to allow market participants to make adjustments to positions and bid prices continuously rather than solely on an annual or monthly basis.

Calpine Solutions states the congestion revenue rights auction provides substantial benefits to consumers. It notes that load serving entities rely on congestion revenue rights auctions to provide consumers with the lowest possible energy cost. It also notes the congestion revenue rights auction process provides load serving entities with the means by which they can hedge congestion costs between specific receipt and delivery points.

Calpine Solutions argues that the divergence in opinion among the various stakeholder classes is almost entirely a function of regulatory and retail pricing constructs rather than any failings inherent in the congestion revenue rights auction process. Calpine Solutions states the entities most in favor of the DMM's proposals are those whose loads are relatively insensitive to energy pricing because they bill their customers using relatively fixed class-based energy rates reflecting the providers' costs of energy aggregated and averaged across long periods of time for the entire customer class. Calpine Solutions also states those entities most in favor of retaining the congestion revenue rights auction are those whose loads are highly sensitive to energy pricing both at the retail and wholesale levels.

DC Energy argues that limiting source and sink pairings to those associated with hedging supply delivery would erode competition and lead to less congestion revenue right auction value. It argues that the perspective that the large volume of paths with a congestion revenue rights awarded to only one auction participant indicates low auction liquidity which results in the auction failing to capture the dynamics of the network topology. DC Energy describes that all congestion revenue rights paths are related to some degree and therefore unique sets of "different awards" may all impact flows on the same transmission constraint. In this way, congestion revenue rights network capacity can be awarded in many configurations, which promotes the overall liquidity of the market. DC Energy supports a potential congestion revenue right auction change that would limit eligible injections/withdrawals on electrically equivalent nodes and notes that the best practice is to programmatically remove bids on electrically equivalent settlement location pairs prior to clearing the congestion revenue rights auction.

Boston Energy Trading and Marketing encourages the CAISO to look for ways to move forward the existing congestion revenue rights auction design, rather than eliminating it

or reducing its importance in the overall market. It suggests the CAISO consider changing the amount of system capacity released in the annual and monthly auctions. It states moving more system capacity to the monthly auctions may provide incremental revenue shortfall improvements as a result of better transmission outage information.

Powerex supports efforts to address inefficiencies in the congestion revenue rights auction framework while preserving the role of congestion revenue rights in providing support for forward contracting arrangements and efficient forward market outcomes. It recommends the CAISO limit its eligible source and sink pairs to only those locations required to efficiently hedge forward contracts for the physical delivery of energy.

WPTF does not support limiting source and sink pairs in any way maintaining it would damage the liquidity of the auction and/or create unintended adverse consequences. It states restricting injection and withdrawal nodes could result in less accurate congestion revenue right auction bidding and further create differences between auction clearing prices and day-ahead market congestion prices.

# 5 Changes to this proposal

The CAISO removed the following two policy proposals from the scope for the March Board of Governors meeting:

- Elimination of certain information from the congestion revenue rights auction and allocation process model disclosure

- Lowering the percentage of system capacity available in the annual allocation and auction to more accurately model the transmission that will ultimately be available.

The CAISO will pursue a Track 1B in which it will continue to focus on policy affecting 2019 congestion revenue rights. In Track 1B, the CAISO will pursue policy development that could achieve FERC approval in time for the 2019 annual process, but may be implemented over a longer time horizon or in very short order. It may continue to consider these two proposals in Track 1B of this initiative.

The CAISO also added the EIM Governing Body authority classification to ***Section 3***.

# 6 Background

## 6.1 General discussion

The CAISO operates a wholesale market where buyers and sellers across many locations transact energy. The market minimizes costs of supply required to meet demand while respecting physical transmission limitations. When demand for transmission exceeds the transmission capacity, termed “congestion,” prices vary to reflect this congestion. The market results in many and varying energy prices across the entire system reflecting the different conditions across the system.

The CAISO employs locational marginal price congestion management design to achieve this least cost dispatch subject to the physical limitations of the transmission system. Because the physical transmission system is made up of many thousands of miles of transmission lines at various voltage levels and hundreds of physical generators, energy prices are settled at over 1,100 pricing nodes. Nodal markets employing locational marginal price congestion management design are incredibly effective at achieving the least cost dispatch and sending efficient price signals.

The CAISO market did not always clear energy in this way. Prior to the implementation of nodal markets, the CAISO employed zonal pricing design in which all generation in larger pre-defined zones received the same price. Fewer market pricing points exposed energy forward contracting activity to less price uncertainty than the current nodal design. However, under the previous market design, the market could dispatch supply within a zone in a manner that overloaded transmission and caused congestion. This would necessitate market operators to manage generator dispatch manually outside of

the market. Consequently, this zonal approach did not produce efficient generation pricing or dispatch.

Locational marginal pricing provides a market mechanism for allocating the short-term use of the transmission system, but it has been argued that it does not by itself provide a framework for market participants to hedge long-term participation in the market. Upon implementation of nodal market designs to gain price and dispatch efficiency, supply and demand are spread out to thousands of pricing nodes exposing market participants to a much higher degree of uncertainty of future congestion charges. Congestion charges can be volatile and actual dispatch costs are not known until the market runs. This uncertainty of future congestion charges under a market-based congestion pricing system creates a need for congestion hedges to enable long-term participation in the market including entities entering into long-term energy and/or capacity contracts or having load serving obligations.[2]

The CAISO has argued that congestion revenue rights are essential to long-term participation in its market and to enable forward contracting by providing a means for market participants to lock in the cost of transmission service on a forward basis. Congestion revenue rights effectively provide the financial equivalent of monthly or annual firm point-to-point physical transmission service under the pro forma OATT. Either approach—whether based on financial rights or physical scheduling rights—enables market participants to obtain certainty regarding the cost of the transmission service. Enabling forward transactions, in turn, reduces reliance on spot markets and is widely recognized as critical to properly functioning electricity markets.

Forward contracts for physical supply do not require that congestion revenue rights be held specifically by load serving entities, as the purchasing party, as opposed to other parties involved in the forward contracting arrangements. There are a variety of potential forward contracting arrangements that lead to a useful outcome for both load serving entities and suppliers, such as contracts for delivery of power at trading hubs or delivery of power to the load location. The congestion revenue rights auction allows all market participants, regardless of their function, size, or location, access to congestion revenue rights, and therefore enables this variety of forward contract arrangements among contracting parties.

Market participants should be willing to pay for the price certainty that congestion revenue rights offer, or, at a certain price, forgo purchase of the product opting instead to take on the day-ahead market price risk. The prices cleared in the congestion revenue rights auction do not appear to reflect the intended purpose of hedging congestion associated with supply delivery in the CAISO's locational marginal price-based day-ahead market.

[2] MRTU Filing, Exh. No. ISO-2 at 24.

## 6.2 Congestion revenue rights

Congestion revenue rights allow market participants to obtain financial protection for the risk of congestion charges associated with the CAISO market's locational marginal price congestion management design. They facilitate long-term contracting by load serving entities and generators by hedging congestion associated with supply delivery in the CAISO's locational marginal price-based day-ahead market.

In general, a congestion revenue right is a forward contract that settles on the day-ahead market energy price difference between two locations (i.e. the cost of congestion).[3] For instance, if location A has a locational marginal price of $30/MWh and location B has a locational marginal price of $50/MWh, the holder of a congestion revenue right from location A to location B will receive $20/MWh (the difference between location A and location B day-ahead energy prices). An entity with supply at location A but with demand at location B would be exposed to $20/MWh in congestion charges if it does not acquire a congestion revenue right from location A to location B. The entity would receive $30/MWh in day-ahead market energy payments for supply at location A, but would be charged $50/MWh for energy delivered to location B in the day-ahead market. This entity can hedge the $20/MWh congestion cost by purchasing the congestion revenue right.

## 6.3 Auction efficiency

To measure congestion revenue right auction efficiency, the CAISO compares the price auction participants pay for congestion revenue rights in the auction to the payment that the right receives in the day-ahead market. For instance, if a market participant can consistently pay 50 cents for a congestion revenue right that pays it a dollar, the auction is not producing an efficient price. For this measure, the CAISO compares the congestion revenue rights payments generated by the day-ahead market to congestion revenue right auction proceeds.

ISO/RTOs, including the CAISO, have traditionally focused on financial transmission right revenue adequacy in addition to auction efficiency. Financial transmission rights are considered revenue adequate when day-ahead market congestion charges are greater than or equal to payments to financial transmission rights. Financial transmission rights will be revenue adequate if the transmission models used in both the auction and day-ahead market are identical.[4] When the auction limits or network models are different, congestion revenue rights may be revenue inadequate.

The purpose of auctioned congestion revenue rights is to hedge congestion associated with supply delivery in the CAISO's locational marginal price-based day-ahead market,

[3] This is a generalized description. Congestion revenue rights actually settle on the difference in the marginal congestion components of the locational marginal prices between two locations.
[4] Hogan, William W. 1992. "Contract Networks for Electric Power Transmission." Journal of Regulatory Economics. See the version at: http://www.hks.harvard.edu/fs/whogan/acnetref.pdf.

including facilitating long-term contracting by load serving entities and generators.[5] Congestion revenue rights enable this by providing a means to lock in the cost of day-ahead market transmission service on a forward basis. This price certainty should come at a cost. If congestion revenue rights are priced on this basis, then congestion revenue rights auction prices should reflect market participants' expectations of congestion price exposure in the day-ahead market and should exceed the expected congestion revenue right payments.[6] Generally, over the long-term, congestion revenue rights prices should reflect the value of the hedge provided against day-ahead market congestion charges.

Historically, CAISO congestion revenue right prices have been low for some congestion revenue rights relative to the eventual payout. Total payouts to auctioned congestion revenue rights in 2014 of $292 million were significantly more than auction revenues of $104 million, resulting in a $187 million net payment deficiency. The congestion revenue rights payouts to auctioned congestion revenue rights reduced significantly in 2015 to $169 million, further reduced in 2016 to $138 million, and increased to $140 million in 2017 (through November). The difference between the auctioned congestion revenue rights payouts and auction proceeds decreased in 2015 to about $60 million, further decreasing in 2016 to about $51 million, followed by an increase to $73 million in 2017 (through November).[7]

***Figure 1*** below compares congestion revenue rights and payouts. The blue line compares the proportion of auction proceeds to congestion revenue rights payments. A value of 100 percent indicates the auction proceeds equal the congestion revenue rights payments. A value lower than 100 percent indicates the congestion revenue rights holder collected a payment above the amount paid to acquire the congestion revenue right in the auctions.

Auction participants consistently purchase congestion revenue rights at a steep discount to eventual payouts. The auction is not producing an efficient price for congestion revenue rights.

[5] MRTU Filing, Exh. No. ISO-2 at 22.
[6] Harvey, Scott. February 2017. "Congestion revenue rights prices and pay outs: Are congestion revenue rights auctions valuing congestion revenue rights as hedges or as risky financial instruments." Presentation at February 2017 California ISO Market Surveillance Committee meeting.
[7] California ISO. November 2017. "Congestion revenue rights auction analysis report." Pg. 49.

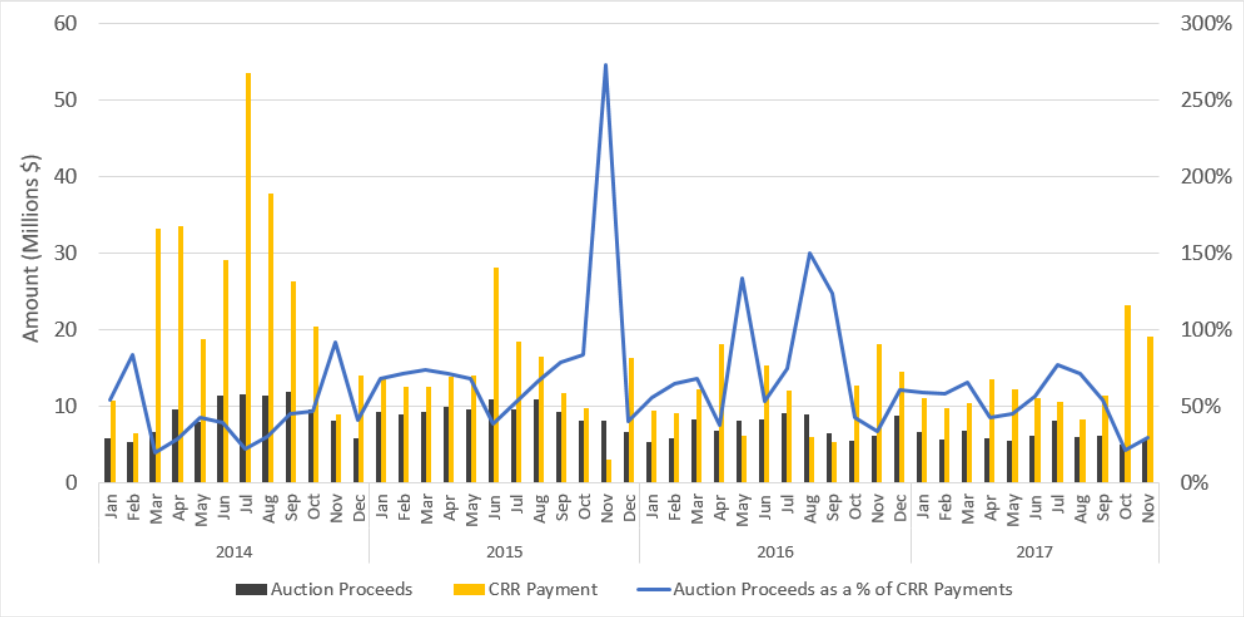


***Figure 1: Auction proceeds versus payouts***

Achieving market valuations consistent with hedging activity is not an abstract hypothetical.

- The monthly auction price of a New York ISO Zone G to Zone J TCC has averaged 111.7% of the day-ahead market payout over the period June 2000 through December 2016.

- The monthly auction price of a PJM western hub to PECO FTR has averaged 137% of the day-ahead market target payout over the period May 1999 through December 2016.

- The monthly auction price of a PJM western hub to PECO FTR has averaged 143% of the day-ahead market prorated payout over the period January 2005 through December 2016.

These valuations are consistent with the market valuing these products as hedges priced at a premium to the expected payout.[8]

## 6.4 Specifics of the CAISO congestion revenue rights processes

The CAISO conducts both an annual and a monthly congestion revenue rights allocation and auction process to issue congestion revenue rights which cover specific periods of time. Market participants can receive seasonal congestion revenue rights in the annual process which cover seasonal periods of the upcoming calendar year. For

[8] Harvey, Scott. February 2018. "CRR Prices and Pay Outs: Are CRR Auctions Valuing CRRs as Hedges or as Risky Financial instruments?"

each of these seasons, market participants can receive on-peak and off-peak products. Additionally, market participants can receive monthly congestion revenue rights in the monthly process which cover every day of the upcoming calendar month. For the upcoming month, market participants can receive on-peak and off-peak products. Market participants also use the monthly process to reconfigure their seasonal congestion revenue rights received in the annual process.

### *6.4.1 Annual process*

The CAISO conducts the annual congestion revenue rights allocation and auction process once a year, mid-year, which releases congestion revenue rights that cover the upcoming calendar year. The annual process occurs well in advance of the term of the congestion revenue rights released. For instance, the CAISO releases congestion revenue rights for the first quarter of the upcoming calendar year approximately five months prior to that quarter and releases congestion revenue rights for the last quarter of the upcoming calendar year approximately 14 months prior to that quarter.

Through the annual process, the CAISO releases seasonal congestion revenue rights for four seasonal periods and two time-of-use periods, on peak and off peak. These seasonal/time-of-use periods coincide with the calendar quarters (season 1 – January through March, season 2 – April through June, season 3 – July through September, and season 4 – October through December).

The annual process, results in seasonal releases that cover the upcoming calendar year. Market participants request congestion revenue rights for each season and for a time-of-use period (on-peak and off-peak). This means that there are actually eight congestion revenue right products that are released through the annual process: an on-peak and off-peak congestion revenue right for each of four seasons in the upcoming calendar year.

The figure below shows that the CAISO conducts its annual congestion revenue right allocation and auction process approximately five months prior to the prompt year and awards eight products.


***Figure 2: Mid-year annual process awards CRRs for upcoming calendar year***

The annual process occurs in five consecutive rounds:

1. First allocation round which the CAISO refers to as the “priority nomination process”
2. Second allocation round which the CAISO refers to as “tier 2”
3. Third allocation round which the CAISO refers to as “tier 3”

4. Allocation round for long-term rights which the CAISO refers to as "tier long-term"
5. Auction round which the CAISO refers to as the "congestion revenue rights auction"

In the first allocation round, the market rules allow load serving entities that acquired rights in the immediately previous year's annual allocation process the opportunity to re-acquire those rights that were previously allocated. The market rules limit the congestion revenue right source, sink, and quantities based on the load serving entity's allocation in the previous year and account for other factors including load migration. The CAISO releases congestion revenue rights for all four seasons and two time-of-use periods in this round and releases congestion revenue rights corresponding to a total of 75% of system capacity.

In the second and third allocation rounds, load serving entities request rights from any generation source location to any load location limited to a qualified megawatt value based on historical and forecasted demand; this limitation is only on the sink location. The CAISO awards congestion revenue rights for all four seasons and two time-of-use periods in these rounds. The CAISO releases a total of 75% of system capacity. After the second allocation round the CAISO reserves half of the un-allocated intertie capacity for the auction round. If no intertie capacity is left after the second allocation round, nothing is reserved for the auction round.

In the allocation round for long-term rights, the CAISO releases long-term congestion revenue rights, which provide the ability to obtain allocated congestion revenue rights for a period of ten years. The terms of these rights begin on the first of the year*, the year after* the upcoming calendar year. For instance, in its annual process occurring mid-year 2017, the CAISO awarded 10 year rights with terms from January 1, 2019 through December 31, 2028. In this process, the CAISO releases a total of 60% of system capacity.

In the auction round, all market participants may bid for rights from any biddable pricing point on the CAISO system to any other biddable pricing point on the CAISO system. The auction maximizes revenues and awards congestion revenue rights for all four seasons and two time-of-use periods. The CAISO releases a total of 75% of system capacity.

In all annual allocation rounds and the auction, the CAISO limits the release of total system capacity to 75%. In the nomination round for long-term rights, the CAISO limits the release of total system capacity across the 10-year horizon to 60%. Any previously awarded long-term rights produce transmission flows that are accounted for in every round of the process.

To prepare for its annual allocation and auction process, the CAISO gathers load serving entity demand information, existing transmission rights information, transmission ownership rights information, transmission facility outage information, and new/retiring transmission facility information. It develops load metrics and qualified nomination quantities for each load serving entity to use in the nomination rounds, accounts for

existing transmission rights and transmission ownership rights, and incorporates known transmission topology information into its congestion revenue rights model.

Participating transmission owners are currently not required to report outages that could have significant impact on congestion revenue rights revenue adequacy in time for the annual process. However, some transmission owners do report major maintenance in time for the annual process. When available, the CAISO uses this outage information to study the transmission system. It determines which constraints should be enforced in the congestion revenue rights market model, which contingencies should be enforced in the model, derives special nomogram definitions and line limitations, determines interface limitations, and determines which outages should be represented as out-of-service transmission elements in the model. The CAISO uses the developed model to conduct the annual congestion revenue right allocation and auction process.

The CAISO currently shares its developed model with market participants prior to accepting nominations and bids in its annual congestion revenue right allocation and auction process. The information includes constraint enforcement status, contingency enforcement status, and which particular outages the CAISO chose to model as out-of-service transmission elements. The CAISO also shares all known transmission outage information as of the time that it releases the final model.

In the allocation rounds, the CAISO maximizes the quantity of congestion revenue rights awarded subject to the modeled transmission topology, associated transmission limitations, nodal group limitations, and the 75% system capacity limitation. Load serving entities receive an award of a congestion revenue rights associated with a source and a sink location.

In the auction round, the CAISO maximizes the total bid value subject to the modeled transmission topology, associated transmission limitations, nodal group limitations, and the 75% system capacity limitation. Market participants receive an award of a congestion revenue rights associated with a source and a sink location.

### *6.4.2 Monthly process*

The CAISO conducts monthly congestion revenue rights allocations and auctions twelve times a year in advance of each month. Within each monthly congestion revenue rights allocation and auction process, the CAISO performs a distinct process for each on-peak and off-peak period.

The CAISO conducts the monthly process once a month and awards congestion revenue rights that cover the upcoming calendar month. The monthly process occurs in advance of the term of the congestion revenue right awarded. For instance, the CAISO begins its monthly process for congestion revenue rights with terms including the last day of the upcoming calendar month approximately 60 days prior to that day.

Through the monthly process, the CAISO releases congestion revenue rights for two time-of-use periods with terms covering the upcoming calendar month. Market participants request or bid for congestion revenue rights for each time-of-use period.

***Figure 3*** below shows that the CAISO begins its monthly process approximately four weeks prior to the relevant month and awards two products.

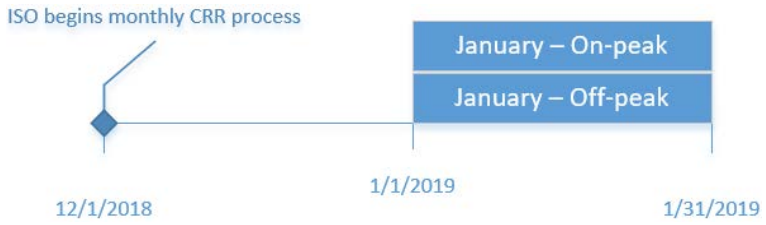


***Figure 3: Monthly process awards CRRs for upcoming calendar month***

The monthly process occurs in three consecutive rounds:

1. First allocation round which the CAISO refers to as “tier 1”
2. Second allocation round which the CAISO refers to as “tier 2”
3. Auction round which the CAISO refers to as the “congestion revenue rights auction”

In the first and second allocation rounds, load serving entities request rights from any generation source location to any load location limited to a quantity based on historical and forecasted demand. The CAISO awards congestion revenue rights for both time-of-use periods in these rounds. The CAISO releases congestion revenue rights representing a total of 100% of system capacity minus a pre-determined de-rate factor which generally limits the available system capacity to approximately 82.5%. After the first allocation round the CAISO reserves half of the un-allocated intertie capacity for the auction round. If no intertie capacity is left after the first allocation round, nothing is reserved for the auction round.

In the auction round, all market participants may bid for rights from any biddable pricing point on the CAISO system to any other biddable point on the CAISO system. The auction maximizes collected revenues and awards congestion revenue rights for both time-of-use periods. The CAISO releases congestion revenue rights representing a total of 100% of system capacity minus a pre-determined de-rate factor which generally limits the available system capacity to approximately 82.5%.

In both monthly allocation rounds and the auction, the CAISO limits the release congestion revenue rights to approximately 82.5% of total system capacity (depending on the pre-determined de-rate factor used). Any previously awarded rights produce transmission flows in the model that are accounted for in every round of the process.

To prepare for its monthly process, the CAISO gathers load serving entity demand information, existing transmission rights information, transmission ownership rights information, transmission facility outage information, and new/retiring transmission facility information. It develops load metrics and qualified nomination quantities for each

load serving entity to use in the nomination rounds, accounts for existing transmission rights and transmission ownership rights, and incorporates known transmission topology information into its congestion revenue rights model.

Participating transmission owners report outages that could have significant impact on congestion revenue rights revenue adequacy 30 days prior to the month that the outage is scheduled to start. They report outages of at least 24 hour duration on all transmissions facilities operated at greater than 200 kV. They also report outages of certain facilities, specified in CAISO operating procedures, operated at less than 200 kV. The CAISO uses this outage information to study the transmission system. It determines which constraints should be enforced in the congestion revenue rights model, which contingencies should be enforced in the model, derives special nomogram definitions and line limitations, determines interface limitations, and determines which outages should be represented as out-of-service transmission elements in the model. The CAISO uses the developed model to conduct the monthly congestion revenue rights allocation and auction process.

The CAISO currently shares its developed congestion revenue rights market model with market participants prior to accepting nominations and bids for its monthly congestion revenue rights allocation and auction process. These disclosures include constraint enforcement status, contingency enforcement status, and which particular outages it chose to model as out-of-service transmission elements. The CAISO also discloses all known outage information as of the time that it releases the final model.

In the allocation rounds, the CAISO maximizes the quantity of congestion revenue rights awarded subject to the modeled transmission topology, associated transmission limitations, nodal group limitations, and the system capacity limitation. Load serving entities receive an award of a congestion revenue right associated with a source and a sink location.

In the auction round, the CAISO maximizes the total bid value subject to the modeled transmission topology, associated transmission limitations, nodal group limitations, and the system capacity limitation. Market participants receive an award of a congestion revenue right associated with a source and a sink location.

## 6.5 Certain aspects of other ISO/RTO financial transmission rights markets

All ISO/RTOs in the United States of America operate financial transmission rights markets. Each market is designed differently, however, they all release obligations to pay or be paid based on day-ahead market congestion. ***Table 1*** below summarizes certain aspects of financial transmission rights processes employed at each organization.

***Table 1: Certain aspects of other ISO/RTO financial transmission rights markets***

| ISO/RTO | Outage reporting | FTR network model disclosure | Total system capacity released 4 to 16 months forward | Eligible bid-pairs |
|---|---|---|---|---|
| CAISO | **Facility type:**<br>• All facilities greater than 200 kV<br>• Special list of facilities less than 200 kV<br><br>**Timing:**<br>• Annual maintenance plan due by October 15 each year for all facilities under ISO control<br>• Outage of facilities meeting the criteria above due 30 days prior to the month the outage begins | Includes facilities modeled as out-of-service, constraint enforcement status, and contingency enforcement status | 75% | All biddable pricing points |
| ERCOT | **Facility type:**<br>• All facilities greater than or equal to 60 kV<br><br>**Timing:**<br>• 12 month rolling outage plans with continuous updates | Includes facilities modeled as out-of-service, constraint enforcement status, and contingency enforcement status | 40-55% | All non-electrically similar pricing points |
| ISO-NE | **Facility type:**<br>• All facilities greater than or equal to 115 kV<br>• All 69 kV facilities that are not interties<br><br>**Timing:**<br>• 24 months to 21 days in advance of the outage start with incentives to encourage submittal at least 90 days in advance of the outage. | Includes facilities modeled as out-of-service, constraint enforcement status, and contingency enforcement status | 50% | All pricing points |
| MISO | **Facility type:**<br>• All facilities greater than or equal to 100 kV<br><br>**Timing:**<br>• 24 month rolling outage plans with continuous updates | Includes facilities modeled as out-of-service, constraint enforcement status, and contingency enforcement status | ~60% | All pricing points that are not at the same bus. |
| NYISO | **Facility type:**<br>• All facilities under ISO control impacting system transfer capability<br><br>**Timing:**<br>• Two-year annual transmission facilities outage schedules due October 1.<br>• Due 30 days prior to the month the outage begins | Includes facilities modeled as out-of-service, constraint enforcement status, and contingency enforcement status | 5-100% | All biddable pricing points |

| | | | | |
|---|---|---|---|---|
| PJM | **Facility type:**<br>• All facilities that can effect ISO monitored elements<br><br>**Timing:**<br>• Outages of greater than 30 day duration due February prior to planning cycle (up to 16 months in advance)<br>• Outages of greater than 5 day duration due before the first of the month 6 months prior to the month the outage begins<br>• Outages of less than 5 day duration due before the first of the month, one month prior to the month the outage begins | Includes facilities modeled as out-of-service.<br><br>All in-service constraints assumed enforced.<br><br>Does not share contingency enforcement status. | 100% | All non-electrically similar pricing points |
| SPP | **Facility type:**<br>• All ISO controlled facilities<br><br>**Timing:**<br>• Due 10 business days prior to the scheduled model posting date | Y | 0-60% | All non-electrically similar pricing points |

The CAISO compared its transmission element outage reporting rules to those employed by other ISO/RTOs as related to financial transmission rights. The CAISO requires submittal of an annual maintenance plan by October 15 of each year. Also, it generally requires monthly submittal of outages by 30 days prior to the start of the month of the outage on transmission facilities with voltages greater than 200 kV and that have duration greater than 24 hours. Other ISO/RTOs generally require outage reporting on all facilities under their control. Some require 2-year maintenance plans.

The CAISO compared its rules for disclosing the network model used in the congestion revenue right allocation and auction process to the financial transmission right model disclosure rules employed by other ISO/RTOs. Most ISO/RTOs, including the CAISO, disclose the specific outages they model, the specific constraints they enforce, and the specific contingencies they enforce in their allocation and auction processes. Some ISO/RTOs, such as the Southwest Power Pool and PJM, enforce all constraints on all facilities in their congestion revenue right allocation and auction processes, so they share constraint enforcement status by virtue of sharing the underlying facility information. Notably, PJM does not share contingency enforcement status in their model disclosure.

The CAISO reviewed the total system capacity released as financial transmission rights by other ISO/RTOs in a timeframe covering from four months after their annual process to 16 months after their annual process. The CAISO reviewed this window of time to find approximately how much system capacity has been released in other markets as compared to the CAISO's annual congestion revenue right allocation and auction process. For instance, as of the CAISO's annual process time, it releases congestion

revenue rights for 75% of transmission capacity for the following calendar year (the time period covering four months after the annual process to 16 months after the annual process). Southwest Power Pool releases financial transmission rights for 60% of system capacity for the time period covering 4 months after its annual allocation and auction process to 12 months after its annual process and 0% of system capacity after that. NYISO releases financial transmission rights for 100% of system capacity for the time period covering from 4 to 6 months after its annual allocation and auction process, 30% for 6 to 12 months after, and 5% for 12 to 16 months after. ERCOT releases financial transmission rights for 40-55% of system transmission capacity and ISO-NE releases financial transmission rights for 50% of system capacity.

The CAISO reviewed the allowable node-pair bidding locations enforced by other ISO/RTOs in their financial transmission rights auctions. The CAISO currently allows auction participants to bid from any biddable pricing point to any other biddable pricing point. Most other ISO/RTOs limit the allowable node-pairs to those that are not electrically equivalent.

# 7 Proposals

In this section, the CAISO proposes four changes related to its congestion revenue rights allocation and auction processes that are intended to reduce the congestion revenue right net payment deficiency.

- In ***Section 7.1***, the CAISO proposes to create an annual outage reporting deadline to be aligned with the annual congestion revenue rights allocation and auction process to improve the congestion revenue rights model used in the annual process.

- In ***Section 7.2***, the CAISO proposes to limit the congestion revenue right source and sink combinations that market participants can purchase in the auctions to better align the congestion revenue rights product with the purpose of hedging congestion charges associated with supply delivery in the CAISO's locational marginal price-based day-ahead market.

## 7.1 Create annual outage reporting deadline for annual congestion revenue rights process

### *7.1.1 Discussion*

In order for the CAISO to accurately maintain its congestion revenue rights model and minimize congestion revenue rights net payment deficiencies, it must receive certain outage information in time for the CAISO to perform the necessary analysis and reflect the outage in the congestion revenue right market model.

For both the annual and monthly auctions, the CAISO maintains a default congestion revenue rights model that includes a list of constraints enforced by default, a list of contingencies enforced by default, and a default network topology.

The CAISO conducts a monthly outage coordination process in which it analyzes known planned maintenance outages to determine (1) which constraints to enforce in the congestion revenue rights market model, (2) which contingencies to enforce in the congestion revenue rights market model, and (3) which outages to model as out-of-service in the congestion revenue rights market model. These determinations are added to the congestion revenue rights model *default* constraints, contingencies, and topology.

The final list of constraints, contingencies, and outages modeled in the each congestion revenue rights auction is a combination of the default information plus supplemental information that depends on planned maintenance outages that will occur during the period for which a particular auction is selling congestion revenue rights.

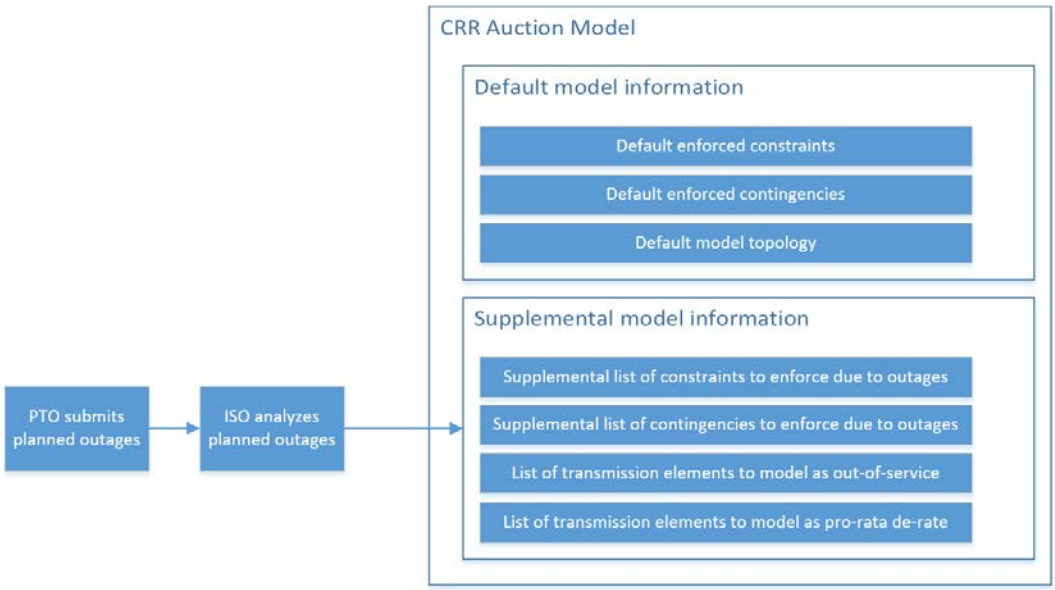


***Figure 4: Congestion revenue rights model maintenance***

### 7.1.1.1 Enforced constraints

The *Congestion Revenue Rights Auction Efficiency Analysis Report* (termed "the analysis" in the remainder of this discussion) found that many constraints contributing to net payment deficiency were not enforced in the annual and monthly auctions but did contribute to congestion in the day-ahead market. This means that because the CAISO lacked sufficient information on outages, its engineering analysis did not identify that the constraint should be enforced in the auction in addition to default constraints. A constraint that is not enforced in the congestion revenue rights market model cannot produce auction revenues because the constraint will not bind and thus will not be priced.

### 7.1.1.2 Enforced contingencies

The congestion revenue right market model represents transmission path capacities as constraints. The analysis found that many constraints contributing to net payment deficiency were enforced but not-binding (i.e. did not result in congestion) in the annual and monthly auctions but did result in congestion in the day-ahead market.

There are two possible reasons that a constraint is enforced but does not bind in the congestion revenue right auction. The first reason is there is not enough flow over the constraint in the congestion revenue right model run in the auction for it to bind. The second reason is the CAISO did not enforce a contingency in the congestion revenue right market model that would limit the allowable flow over the constraint. The CAISO may not have enforced the contingency in the congestion revenue rights market model because its analysis, based on known outage information, did not indicate the contingency would have to be enforced in the day-ahead markets.

#### 7.1.1.3 Modeling of out-of-service equipment

The analysis found that many transmission outages contributing to revenue insufficiency had durations of less than 10 days. By default, the CAISO models all outages with durations of at least 10 days in the congestion revenue rights auction market model. However, it lowers available transmission capacity for outages lasting less than 10 days. The analysis shows that the de-rate methodology may not be sufficient at capturing the impact that the outage has on congestion in the congestion revenue rights auction.

#### 7.1.1.4 Outage reporting

The analysis found that transmission owners do not report over half of outages on transmission equipment of at least 200 kV equipment on-time. This directly impacts the CAISO's operations engineering analysis used to determine supplemental constraints, supplemental contingencies, and network topology used in the congestion revenue rights auction model. The CAISO cannot perform an accurate analysis with less than half of the required information to perform such analysis.

The late reporting contributes to congestion revenue right net payment deficiency because constraints and contingencies not enforced in the congestion revenue right market model, but that are ultimately enforced in the day-ahead market, cannot contribute to congestion revenue right auction prices but result in day-ahead market congestion payments to associated congestion revenue rights. Similarly, network topology differences between the congestion revenue right market model and the day-ahead market can result in day-ahead congestion that is not priced in the congestion revenue right auction.

#### 7.1.1.5 Other ISO/RTOs

The CAISO reviewed outage reporting rules employed by other ISO/RTOs. The CAISO requires submittal of an annual maintenance plan by October 15 of each year. Also, it generally requires monthly submittal of outages on facilities with voltages greater than 200 kV and of duration greater than 24 hours by 30 days prior to the start of the month of the outage. Other ISO/RTOs generally require outage reporting on all facilities under their control. Some require 2-year maintenance plans.

### *7.1.2 Proposal*

The CAISO must receive outage information in time to perform its analysis and incorporate outages in its congestion revenue rights market model so that later reflecting outages in the day-ahead market does not contribute to net payment deficiencies.

While the analysis certainly points to an issue with monthly outage reporting, in track 1 of this initiative, the CAISO is mainly focused on congestion revenue rights with 2019 terms and beyond.

The CAISO currently does not have a requirement for advanced submittal of outages that could potentially impact the congestion revenue rights model on a timeline consistent with the annual congestion revenue rights allocation and auction process. The CAISO proposes to require submittal of planned outages that could potentially impact the congestion revenue rights model by July 1 of each year.

The existing outage reporting requirements related to the monthly outage submittal timelines currently include transmission elements (facilities) that may have no impact on congestion in the congestion revenue rights model. For instance, a single breaker outage that does not remove a transmission line, bus, or transformer from service does not impact the congestion revenue rights model. While the tariff clearly defines the facilities and durations of outages that transmission owners are required to report, it does not specify the specific types of outages.

The CAISO proposes to define which subset of outages are required to be reported for congestion revenue rights purposes. For purposes of creating an accurate congestion revenue rights model, the CAISO proposes to require transmission owners to only report outages of equipment that results in a bus outage, a split bus, transmission line outage, or a transformer outage on equipment as currently defined in the tariff. The CAISO will make this same clarification related to its proposed requirement to submit outages that could potentially impact the congestion revenue rights model by July 1 of each year.

The CAISO proposes to receive outage information in time for its annual congestion revenue rights process and make further clarifications on the types of outages required to be reported.

1. The CAISO will require submittal of outages that could potentially cause congestion revenue inadequacy for the following calendar year by July 1.

2. The CAISO will require this plan to only include outages of transmission facilities impacting the congestion revenue rights model as defined in the CAISO Tariff Section 36.4.3.

3. While the ***facilities*** and ***outage duration*** that are required to be reported for congestion revenue rights modeling purposes are already defined, the CAISO will update the criteria to only include ***outages*** that could potentially cause congestion in the day-ahead market such as a bus outage, a split bus, a transmission line outage, or a transformer outage.

## 7.2 Limit allowable source and sink pairs in the auction

### *7.2.1 Discussion*

For both the annual and monthly auction processes, the CAISO allows market participants to source and sink their congestion revenue rights bids at generator locations, load locations, trading hubs, pricing nodes, and import/export scheduling points.

As discussed earlier in ***Section 6.1***, the intent of congestion revenue rights is to enable market participants to hedge congestion charges associated with supply delivery. Congestion revenue rights with sources and sinks that are not related to supply delivery do not further this core objective.

One example of a transaction that appears to be unrelated to supply delivery is a congestion revenue right that sources at a generator point and sinks at another generator point. While, these types of transactions theoretically can add value to the auction because they can place counter-flows on the system that may enable more congestion revenue rights to be sold in the auction, we have seen in practice that these transactions have resulted in an overall $186 million congestion revenue right auction net payment deficiency since 2014. This represents over half of the congestion revenue rights net payment deficiency.

In addition, further analysis indicates that these types of transactions do not provide competitive or counter-flow value in the auctions. The CAISO conducted an analysis that found that, in aggregate, generator-to-generator type transactions do not add counter-flow or competitive flow value to the auction. This is because the CAISO's analysis found bids for generator-to-generator congestion revenue rights do not enable more non-generator-to-generator rights to clear in the auction and do not increase average auction prices.

A common argument is that bids for generator-to-generator rights place counter-flows on the system that enable more non-generator-to-generator type bids to clear in the auction. However, the CAISO found otherwise. Generator-to-generator awards account for over 50% of transmission capacity awarded as congestion revenue rights. In a representative season, 46,000 MW of generator-to-generator rights bids cleared in the auction while 37,000 MW of non-generator-to-generator rights bids cleared the auction. The CAISO found that when it re-ran the congestion revenue rights auction while removing generator-to-generator bids from the auction, 50,000 MW of non-generator-to-generator rights bids cleared. This shows that 13,000 MW more of non-generator-to-generator congestion revenue rights bids can clear the auction without the generator-to-generator bids. Without the generator-to-generator bids, cleared non-generator-to-generator bids increased from 25% to 33% of transmission capacity for which bids were submitted.

Not only are bids for generator-to-generator congestion revenue rights hindering bids for non-generator-to-generator congestion revenue rights from clearing in the auction, they are also hindering bids for congestion revenue rights that sink at load serving entity aggregation points from clearing. In the representative season, 8,900 MW of congestion revenue rights sinking at load points clear in the auction. A common argument is that generator-to-generator bids place counter-flows on the system that enable more congestion revenue rights to sink at load serving entity load aggregation points. However, the CAISO found that when it removes generator-to-generator type bids from the auction, bids for 16,000 megawatts of rights sinking at load points clear the auction. This shows that bids for 7,100 more megawatts of congestion revenue rights sinking at load points can clear the auction without the generator-to-generator bids.

In addition to generator-to-generator bids not allowing more non-generator-to-generator bids to clear the auction they also do not help improve auction pricing. In its simulation, the CAISO observed that without the generator-to-generator bids, average auction prices increase from $113/MW to $117/MW suggesting that the generator-to-generator bids are also not placing meaningful transmission flows that improve competition for capacity over constraints for which non-generator-to-generator transactions also place flows. If they were, the average auction prices would have increased without the non-generator-to-generator bids.

The auction can still achieve the potential benefits of the competitive flow or counter-flow that these generator-to-generator bids offer in other ways. For instance, a bid for a congestion revenue right that sinks at a trading hub places counter-flow on the system because the trading hub distributes the sink energy to hundreds of generator nodes across the system. This will inevitably place counter-flow that may enable another congestion revenue right award from a generator to a load aggregation point.

There appears to be little or no competitive benefit from the sale of congestion revenue rights with sources and sinks that are not related to supply delivery. In its analysis, the CAISO showed that roughly half of auctioned congestion revenue rights are between source and sink locations for which the auction awarded congestion revenue rights to only a single purchaser, or that were between two supply points. These also appear to be the types of congestion revenue rights for which there is limited competition in the auction—and hence are sold at low prices—and where even a few hours of high congestion can lead to significant payouts. Narrowing the allowable source and sink pairs in the auction will reduce the potential combinations of source and sink pairs, increasing competition for congestion revenue rights on sources and sinks related to supply delivery.

Finally, sources and sinks that are not related to supply delivery are most typically purchased for financial speculation on future congestion charges, rather than being purchased to hedge congestion charges associated with supply delivery, such as hedging a forward contract. The CAISO's analysis showed that 56% of all transmission

capacity awarded as generator-to-generator congestion revenue rights went to financial intermediaries.

While the purpose of congestion revenue rights is hedge supply delivery including supporting forward contracting for supply to loads, this does not mean that only actual suppliers or load serving entities should be permitted to acquire congestion revenue rights. Indeed, speculative market participants can serve an important role in promoting competitive congestion revenue rights auction outcomes and robust price discovery by increasing demand for under-valued congestion revenue rights on sources and sinks associated with supply delivery.

The CAISO reviewed the allowable node-pair bidding locations enforced by other ISO/RTOs. The CAISO allows auction participants to bid from any scheduling point to any other scheduling point. Most other ISO/RTOs limit the allowable source and sink pairs to those that are not electrically equivalent.

### *7.2.2 Proposal*

The CAISO proposes to continue to support the core purpose of congestion revenue rights as a means to provide hedges for supply delivery. It proposes to not only eliminate generator-to-generator source and sink combinations, but to limit the allowable source and sink pairs to only those associated with supply delivery ("delivery pairs"). This proposal strikes a balance between providing sufficient flexibility for non-participating transmission owner load serving entities, generator owners, and marketers the capability to obtain hedges for supply delivery while not allowing the opportunity for completely strategic bidding aimed at exploiting the congestion revenue rights auction.

The CAISO proposes to only accept congestion revenue right bids sourcing and sinking in the following ways: (1) from a generator bus to a load serving entity load aggregation point, a trading hub, or scheduling point; or (2) from a trading hub to a load serving entity load aggregation point or scheduling point; or (3) from scheduling point to a load serving entity load aggregation point or trading hub. It also proposes to allow market participants that acquire these congestion revenue rights in the allocation or auction processes to sell those rights back into auctions. Currently the congestion revenue rights auction does not have an explicit sell feature for congestion revenue rights (congestion revenue rights are currently "sold" by obtaining a congestion revenue right in the opposite direction) but this will be added as part of the scope of these policy changes.

The CAISO conducted analysis and found that, in aggregate, node pairs not associated with supply delivery ("non-delivery pairs") do not add counter-flow or competitive flow value to the auction, while costing $280 million in net payment deficiencies since 2014, an average of $17.5 million per quarter.

These allowable bid combinations as proposed by the CAISO are reasonable combinations that will allow hedging supply delivery. Some market participants have

argued that allowing bids for other node-pair combinations increase the value of the congestion revenue rights by either (1) providing counter-flow so that more bids for congestion revenue rights corresponding to the supply delivery clear the market, or (2) providing pricing discipline to the market by providing flows over constraints for which they are competing with delivery pair bids. However, as described below, the CAISO believes the non-delivery pair bids do not enable more delivery pair bids to clear and do not provide pricing benefits. Thus no longer allowing non-delivery pair bids will enable congestion revenue right auction participants to obtain hedges for supply delivery while eliminating a significant contributor to the congestion revenue right auction net payment deficiency.

Non-delivery pairs are not enabling more transactions associated with supply delivery to clear in the auction. Non-delivery pair awards account for over 79% of transmission capacity released as congestion revenue rights. In the representative season analyzed by the CAISO, 66,000 MW of bids for non-delivery pair rights cleared the auction while 17,000 MW of bids for delivery-pair rights cleared the auction. A common argument is that non-delivery pair bids place counter-flows on the system that enable more delivery-pair type bids to clear in the auction. However, the CAISO found that when non-delivery pair bids are removed from the auction, bids for 22,000 MW of delivery-pair rights clear. This means that bids for 5,000 MW more delivery-pair congestion revenue rights can clear the auction without the non-delivery pair bids. Without the non-delivery pair bids, cleared delivery pair bids increased from 25% to 33% of transmission capacity for which bids were submitted.

Not only are non-delivery pair bids hindering more delivery pair bids from clearing in the auction, they are also specifically hindering bids that sink at load aggregation points from clearing. In the representative season analyzed by the CAISO, 8,900 MW of congestion revenue rights sinking at load points cleared the auction. A common argument is that non-delivery pair transactions place counter-flows on the system that enable more congestion revenue rights to sink at load serving entity load aggregation points. However, the CAISO found that when it removes non-delivery pair type transactions from the auction, 12,700 MW of bids for congestion revenue rights sinking at load points clear the auction. This shows that an additional 3,800 MW of bids for congestion revenue rights sinking at load points would have cleared the auction without the non-delivery pair bids.

For reference, today 3,800 MW of bids for counter-flow sourcing from the load serving entity load aggregation points cleared the actual annual auction (the fact that the quantity of counter-flow awarded in the auction today and the increased quantity that is awarded in the simulation is the same is just a coincidence). This means that even with the 3,800 MW of counter-flow awarded today, the auction still clears 3,800 MW less congestion revenue rights sinking at load serving entity load aggregation points than an auction without non-delivery pair bids.

The non-delivery pair bids are also not providing pricing discipline to the congestion revenue right market by placing flows over constraints for which they are competing with

delivery-pair bids. When the CAISO removed non-delivery pair bids from its simulation, net auction revenues increased from $113/MW to $147/MW, indicating that, in aggregate, the non-delivery pair transactions are not placing meaningful competitive flows on constraints for which they compete with delivery pair transactions. If they were, average auction prices would have been greater with the non-delivery pair bids.

The CAISO expects the non-delivery pair transaction activity required for hedging for supply delivery to shift to the proposed allowable source and sink pairs, increasing auction competitiveness while providing sufficient opportunity to market participants to obtain hedges. One example of bidding behavior expected to shift to delivery pairs is market participants that currently anticipate it would be too competitive to obtain hedges sinking at a load serving entity load aggregation point that instead opt to sink at another, less competitive, similarly priced location "nearby." Another example are participants that use combinations of source and sink pairs to particularly target constraints between their supply point and the load point rather than compete for a congestion revenue right directly from their supply point to the load point. Under the CAISO proposal, market participants seeking these kinds of hedges would instead bid competitively for the allowable source and sink combinations which will still enable them to obtain a hedge for their supply delivery.

The core purpose of congestion revenue rights can be achieved, and auction competitiveness increased, by refining the allowable source and sink locations of congestion revenue rights obtained in the auction. The CAISO proposes to modify its allowable source and sink pairs for auctions of congestion revenue rights with 2019 terms and beyond, as follows

1. The CAISO will only accept bids sourcing and sinking in the following ways:

    a. From a generator bus to a load serving entity load aggregation point, a trading hub, or a scheduling point; or

    b. From a trading hub to a load serving entity load aggregation point or scheduling point; or

    c. From a scheduling point to a load serving entity load aggregation point or trading hub.

2. After a market participant receives congestion revenue rights, it will be able to sell those awarded rights back into a subsequent congestion revenue rights auction.

# 8 Next Steps

The CAISO will bring this policy to the March 2018 Board of Governors meeting.