Straw Proposal on Non-Credit Issues

Near-term Enhancements to Congestion Revenue Rights (CRR)

November 9, 2009

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1. Introduction

The Federal Energy Regulatory Commission's (FERC) approval of the February 2006 tariff filing in support of the California ISO's new market design, and several subsequent filings and associated orders, established the policy for Congestion Revenue Rights (CRRs) in the ISO's current market. The ISO has released short-term and long-term CRRs for the start of its new market design through the allocation and auction processes for CRRs that have been in effect since April 1, 2009. The ISO is now conducting both annual and monthly CRR allocation and auction processes for the release of prospective CRRs. This experience provides an opportunity to consider refinements in some details of CRR and related processes.

Through the weekly CRR conference calls with market participants and its own evaluation the ISO has identified the issues listed below as candidates for further refinements. The ISO issued an Issue Paper in August 2009 as the beginning of a stakeholder process to address the issues and develop appropriate solutions to them.[1] CRR-related credit issues were addressed by a Straw Proposal in September 2009, resulting in the following status:

CRR Related Credit Issues

- CRR credit policy enhancements: Refinement of current credit requirements for participation in CRR auctions. The ISO has published its Draft Final Proposal prior to presentation to the Board of Governors in December.
- Process for re-selling CRRs of a defaulting CRR holder: The ISO will consider the refinement of this process at a future date, along with remaining non-credit issues.
- Re-evaluation of holding credit requirements for extraordinary circumstances: The ISO's business process has been refined through the stakeholder process, and will be incorporated in the Business Practice Manual (BPM) for CRRs through the BPM change management process.

The ISO is now addressing the non-credit policy and business practice issues that can be addressed in the near-term. The non-credit issues are summarized here and detailed further in later sections of this document:

[1] Two issues that needed early resolution were approved at the July 2009 Board meeting, and filed at FERC: elimination of CRR payment pro-rationing in preliminary settlement statements, and assignment of LMPs for disconnected pricing nodes.

Non-Credit Policy Issues

- Revise load migration process: The current process for transferring CRRs due to load migration between LSEs requires the ISO to handle data on retail end-use customers. These data are not otherwise the type of data for which the ISO is responsible for handling and processing. A revised process will avoid requiring the ISO to receive such data.
- Revise modeling and treatment of trading hubs in CRR allocation: The current CRR allocation process disaggregates a nominated trading hub CRR into separate CRRs for each constituent PNode of the trading hub, resulting in holdings of many small CRRs. A revised approach for allocating and tracking CRRs having a trading hub source or sink will streamline this process.
- Eliminate multi-point CRRs from CRR design: Market participants strongly desire the ability to sell CRRs in the auction, but multi-point CRRs make it difficult to implement the sale of CRRs. Eliminating multi-point CRRs will facilitate the sell function. Having the multi-point function in the CRR system complicates the implementation of almost every new feature that might be desired while offering very little offsetting benefit.
- Weighted least squares objective function: The current CRR allocation software maximizes the release of CRRs by utilizing the most effective nominated CRR, from among the CRR requests, to mitigate congestion in the simultaneous feasibility test. As a result the software does not equitably distribute the reduction from CRR allocation requests among participants. The use of a weighted least squares CRR optimization algorithm would balance equity with maximum CRR release.
- Refinement of tiers in monthly allocation: The current monthly CRR allocation uses two tiers even though the incremental amount of CRRs released after the annual CRR process is limited. The Issue Paper stated a potential solution to move to a single allocation tier, to make the monthly allocation process more streamlined. Stakeholder comments expressed reluctance to accept both the elimination of multi-point CRRs from CRR design and the reduction of the monthly process to a single tier. As a result, the ISO proposes to retain the two-tier monthly allocation process and use a uniform definition of eligibility for CRR requests in both tiers, which the ISO expects will achieve much of the desired streamlining of the monthly allocation process.

Non-Credit Business Process Issues

- Sale of CRRs in the CRR auctions: CRRs cannot be directly sold in the auction. If market participants intend to dispose of CRRs through the auction, participants may purchase CRRs in the auction that are in the opposite direction of the originally released CRR. Alternatively, a market participant may transact a trade through the Secondary Registration System. Implementation of the sell function in the auction software will simplify these transactions for market participants.
- Modeling approaches to reinforce CRR revenue adequacy: In the initial months of operation of the new ISO markets, the ISO has lacked data regarding the impact of transmission outages on CRR revenue adequacy to accurately determine the optimal amount of monthly CRRs for release. As a result there were significant CRR revenue shortfalls in the CRR balancing account for the first three months. Once the

ISO has accumulated sufficient post go-live experience, the ISO will consider ways to improve its modeling of anticipated outages for the monthly CRR release, to better balance the objectives of revenue adequacy and optimum CRR release.

- Tracking of Long Term CRRs in CRR system: The ISO's current process involves manual work-arounds, which will be automated. These processes are internal to the ISO and do not impact either the CRR holdings or the business processes of market participants. The ISO has explained the issues and the proposed process improvements through this stakeholder process, and will proceed to implementation.
- During preparation for the PNP for the 2010 annual CRR process the ISO had issued a technical bulleting to provide clarification of the process for developing "signature data" for the Priority Nomination Process (PNP). The process that was followed is in line with the current Tariff language but some participants felt that additional language should be added to better describe how this process should be done.

This initiative is to develop the principles for business processes that will implement the new or existing policies. Some issues involve software changes, while others are process changes. The principles for business processes will then be documented in the CRR Business Practice Manual, and implemented in Market Operations software and business practices. The ISO's goal is to implement solutions to the CRR-related credit issues by late 2009. The timing of other issues will vary with the complexity of the issue, and will be determined as the needs for policy resolution and software development are assessed.

2. Process and Proposed Timetable

The ISO's stakeholder process began with publication of the Issue Paper on August 14, 2009, and discussion of the Issue Paper in a stakeholder conference call on August 21 for the purpose of identifying in collaboration with stakeholders the priority of the issues and to begin identifying and evaluating alternatives. The ISO continued discussion of the Issue Paper in a stakeholder meeting on September 8, 2009. The ISO received written comments from stakeholders after these meetings, which the ISO has considered in formulating this Straw Proposal. The ISO will hold a stakeholder conference call on November 16 to discuss the issues addressed in this paper.

The schedule for issue identification on all issues, and resolution of CRR-related credit issues, is as follows:[2]

[2] Meetings and conference calls concerning credit issues are not included in this table.

Date	Activity or milestone
August 14	Publish Issue Paper
August 21	Stakeholder conference call on CRR-Related Credit Issues in Issue Paper, and preliminary questions on other issues
August 28	Stakeholder comments on Issue Paper
September 8	Stakeholder meeting (or conference call) on CRR-Related Credit Issues Straw Proposal and on Issues Paper for other issues
September 15	Stakeholder comments on CRR-Related Credit Issues Straw Proposal and on Issue Paper for non-credit issues
November 9	Straw Proposal on Non-Credit Issues
November 16	Stakeholder Conference Call on Draft Final Proposal on CRR-Related Credit Issues and on Straw Proposal on Non-Credit Issues
November 23	Stakeholder comments on Straw Proposal
December	Draft Final Proposal on Non-Credit Issues
Implementation dates will vary depending on policy resolution and software development.	

3. Criteria for Evaluating Potential Solution Approaches

The ISO's proposed resolution of all issues will be developed based on consideration of stakeholder inputs, sound market design, and evaluation of the ISO's ability to implement alternative solutions in a timely manner. The specific factors to be considered will be identified separately for each topic area.

4. Issues to be Addressed

In the subsections below, this Straw Proposal describes the issues that need to be addressed concerning policies and business processes associated with CRRs, and the solutions that the ISO believes will resolve the issues. In the discussion below, the ISO includes summaries and analyses of the stakeholder comments that were submitted on the Issue Paper. The ISO invites feedback from stakeholders regarding whether the ISO has appropriately identified solutions that resolve the issues that need to be addressed. The ISO will use this feedback to consider whether further revisions to the Straw Proposals are needed to advance to the publication of the ISO's Draft Final Proposal and further discussion with stakeholders, before the ISO presents its recommendations to its Board of Governors.

4.1. CRR-Related Credit Issues

4.1.1. CRR Credit Policy Enhancements

The ISO's Draft Final Proposal has been published on November 2, to revise the current credit requirements for participation in CRR auctions to improve the ISO's credit coverage and efficiency of collateral usage, to facilitate participation in the auctions. The collateral required for participating in the auction will be sufficient to cover both the payments due to the ISO for winning the auction and the credit requirement for holding the winning CRRs, without requiring the auction winner to post additional collateral in order to hold the winning CRRs.

4.1.2. Process for liquidating the CRRs of a defaulting CRR holder

The ISO tariff section 12.5.1(e) provides authority for the ISO to resell to the market the CRRs that were held by a CRR Holder determined to be in default.[3] The ISO's September 1 Straw Proposal on CRR-Related Credit Issues introduced, for discussion purposes, an approach whereby such resale would be accomplished, and invited suggestions as to how the approach may be improved. The ISO appreciates the comments that stakeholders submitted, which expressed diverse opinions. At this time, the need to proceed with this proposal does not appear to be imminent, and the ISO will consider the refinement of this process at a future date, along with non-credit issues that remain under consideration following the resolution of the issues addressed in this Straw Proposal.

4.1.3. Credit requirements for extraordinary circumstances

Each CRR Holder, whether it obtains CRRs through allocations, auctions, SRS trades or load migration, must maintain an Aggregate Credit Limit in excess of its Estimated Aggregate Liability including the credit requirement for holding the Congestion Revenue Right (CRR) portfolio determined as described in Section 12.6.3 of the Tariff. Credit requirements for holding CRRs are calculated on a portfolio level based on the corresponding CRR auction prices and the credit margin data and re-evaluated in a regular basis. Extraordinary circumstances such as extended transmission outage or other abnormal grid conditions could dramatically increase (or decrease) the payment obligations for a CRR. The ISO has operated under the existing tariff authority and previously published a Technical Bulletin describing its business process. Through discussion of the Issue Paper and Straw Proposal on CRR-Related Credit Issues, the ISO has identified refinements to its business process, and will incorporate then in the BPM for CRRs through the BPM change management process.

[3] Through a separate process, the ISO will document the rules and procedures for declaring a CRR holder in default and for allowing a CRR holder to cure a default.

4.2. Non-Credit Policy Issues

4.2.1. Process for adjusting CRR holdings to reflect load migration

The basis for the allocation of CRRs to Load Serving Entities (LSEs) in the annual and monthly CRR allocation processes is the amount of load served by each LSE. Existing ISO policies for CRR allocation are founded on the principle that, fundamentally, CRRs are associated with the end-use customers served by the LSE, and that the LSE acts on behalf of its end-use customers when it requests and is allocated CRRs. Thus, when end-use customers migrate between LSEs (for example, in the retail Direct Access market), the CRRs that were allocated on behalf of the end-use customers are reassigned from the old to the new LSE.

To perform this transfer of CRRs, the ISO currently performs a two-stage process. First, the ISO receives load migration data from each of the utility distribution companies (UDCs). Using these data, the ISO calculates the net load migration between each pair of LSEs. Second, the ISO calculates the appropriate transfers of CRRs between LSEs. The current process is governed by tariff section 36.8.5 and is described in section 7.3 of the business practices manual (BPM) for CRRs.

The current process for transferring CRRs due to load migration between LSEs requires the ISO to handle data on individual retail end-use customers. These data are not otherwise the type of data for which the ISO is responsible for handling and processing, and the current process requires the ISO to develop business processes that do not serve other ISO functions and that expose the ISO to risks in data management that it would not otherwise face. The ISO seeks to develop alternative arrangements that would be consistent with the current methodology as reflected in the BPM for CRRs but that would not require the ISO to receive and be required to manage such data.

The ISO will revise the existing process by separating the first part of the process described above into two distinct roles. Rather than the existing initial steps of the UDCs submitting raw data for end-use customers to the ISO, from which the ISO determines the number of end-use customers in each of several customer classes, the ISO is now asking the UDCs to retain the original raw data and report to the ISO the number of end-use customers in each of the customer classes that have transferred between each pair of LSEs. The ISO does not propose to change the existing calculation of average usage per customer in the customer classes, and does not propose to change the methodology of multiplying the average usage times the number of customers in each customer class that have transferred between LSEs. Given the UDCs' reports of the number of end-use customers in each of the customer classes that have transferred between each pair of LSEs, the ISO will calculate the net load migration between each pair of LSEs serving load within each UDC's distribution service territory, just as the ISO does now. The ISO would continue to perform the second part of the process under the revised procedure, to transfer the allocated CRRs between LSEs.

The change to the existing process is that instead of submitting the raw data on individual transfers of end-use customers to the ISO, the UDCs will retain the raw data and report the number of customers who have transferred. This is a reduction in the volume of data that the UDCs must provide to the ISO. The ISO is confident that the UDCs are already able to identify the customer class defined by the ISO, for each customer in the UDCs' territories, because this is a necessary step in the existing calculation of average usage per customer in each of the customer classes. The ISO has assisted the UDCs in setting up the existing process, including the provision of prototype computer software that performs the required calculations, and will continue to provide such assistance when it is needed.

4.2.2. Method for handling trading hubs in the CRR release process

Under the ISO's current procedures, participants in CRR allocations and auctions may request sources reflecting Trading Hubs. However, there are limits to the availability of these and other sources for CRR awards in that the available transmission network capacity is limited to 75% of the full capacity, and the full physical network capacity is further reduced by 6% of the MVA (mega-volt-ampere) rating to account for reactive power and transmission losses. In order for CRRs that have Trading Hubs as their source reflect the congestion charges that market participants would face in the market, the Trading Hubs would need to maintain the same distribution factors among generators that will be used in the Day-Ahead Market. The result of this limitation is that if the requested Trading Hub CRRs were maintained as being sourced at Trading Hubs, a network constraint that limits further awards from a single generator within its Trading Hub would prevent further awards from the Trading Hub as a whole. This can be particularly problematic if a constraint to an individual generator becomes limiting in Tier 1, since no further capacity is then available for awards using Trading Hubs in Tier 2 or Tier 3 of the CRR allocation process.

However, a result that produces a very similar economic value as the Trading Hub can be achieved by converting the Trading Hub's CRR nomination to a portfolio of individual generator nominations, which is the ISO's current practice. The current approach for handling CRR nominations for the allocation process when the CRR source is a trading hub involves unbundling the nominated CRR into multiple, often fractional MW CRRs whose sources are the individual PNodes that comprise the Trading Hub. This approach leads to a proliferation of large quantities of small MW value CRRs, which is both inefficient and burdensome from the perspective of CRR holders and the ISO alike. To explore alternatives to issuing the disaggregated Trading Hub CRRs, the ISO's Issue Paper introduced two alternative solutions (limiting Trading Hub nominations in Tier 1 of the annual CRR allocation, or directly reserving transmission capacity during Tier 1 for allocation in Tier 2), and a stakeholder comment proposed a third alternative that is described below and that appears to avoid the disadvantages of the first two alternatives.

As proposed by PG&E, nominations for Trading Hub CRRs would be treated as follows:

1. All Trading Hub nominations would be disaggregated to their constituent PNodes,
2. The Simultaneous Feasibility Test (SFT) would be conducted such that all the constituent PNodes are awarded in full, and any binding constraints caused by the nominations are mitigated by a counterflow CRR not to exceed the disaggregated CRR MW amount at the corresponding disaggregated PNode,
3. The CRR award would consist of the initial nomination (whose source is the Trading Hub) and the counterflow CRRs specified in the previous item, and
4. The Seasonal Eligible Quantity (SEQ) for subsequent tiers would be reduced by the Trading Hub award minus the counterflow amounts.

PG&E's comment offered the following example:

THX = Trading Hub X consisting of five PNodes when disaggregated

S1 = THX constituent PNode #1 (20% of THX)

S2 = THX constituent PNode #2 (50% of THX)

S3 = THX constituent PNode #3 (15% of THX)

S4 = THX constituent PNode #4 (10% of THX)

S5 = THX constituent PNode #5 (5% of THX)

An LSE nominates a CRR with 100 MW with THX as the source and a DLAP as the sink. Suppose a binding constraint reduces S1 using the current approach. Under the ISO's current methodology, the resulting awards would be:

S1 to DLAP = no award (0 MW)

S2 to DLAP = 50 MW

S3 to DLAP = 15 MW

S4 to DLAP = 10 MW

S5 to DLAP = 5 MW

Total from constituent PNodes to DLAP = 80 MW

That is, currently the ISO would award and track CRRs four CRRs, totaling 80 MW, and reduce the LSE's SEQ for the next tier by 80 MW.

Under PG&E's proposal, the resulting awards would be:

THX to DLAP = 100 MW

DLAP to S1 = 20 MW

Then, the ISO would award and track two CRRs (100 MW from THX to the DLAP, and 20 MW for the counterflow CRR from DLAP to S1), and reduce the LSE's SEQ for the next tier by the net award of 80 MW. PG&E states that its proposal would result in fewer or an equal number of CRR source-sink pairs being awarded unless all the constituent PNodes were partially reduced to a non-zero MW amount due to a binding constraint(s). In that case, one additional source-sink pair would be awarded compared to the current ISO methodology.

As stated by PG&E, the SFT would need to add constraints to ensure that the counterflow CRRs do not exceed the disaggregated constituents of the Trading Hub, which would be a significant change to the ISO's CRR software. The same result can be achieved by processing the Trading Hub CRR nominations as the ISO currently does, noting which constituent PNodes have been subject to disproportionate reductions as S1 has been in PG&E's example, and then (1) awarding a rebundled Trading Hub CRR based on the proportion to which S2 to S5 could be awarded, and (2) calculating the counterflow CRR from DLAP to S1 as the difference between S1's share of the awarded Trading Hub CRR and the amount that the ISO's current methodology would award to S1. Because the ISO's current methodology would not award less than zero MW of CRR to S1, this modified proposal will not award more counterflow CRR from DLAP to S1 than S1's share of the Trading Hub CRR.

The ISO also notes that as proposed by PG&E, the requested CRR would be granted in full under apparently all conditions, even though the intent appears to be to address only disproportionate impacts on only some constituent PNodes within the Trading Hub. However, it is unlikely that all constituent PNodes of a Trading Hub would be subject to binding constraints unless either (1) there is a binding constraint that completely separates the Trading Hub from the DLAP (for example, Path 26 being binding in the SFT between the SP15 Trading Hub and the PG&E DLAP), or (2) there is a binding constraint that prevents CRRs from being awarded in full to the DLAP regardless of which PNode of the Trading Hub would be designated as the source. These are not conditions under which CRR nominations with Trading Hubs as their source should be fully awarded. By processing the Trading Hub CRR as the ISO currently does and then issuing a rebundled Trading Hub CRR as discussed above, the ISO will avoid issuing

CRRs that would either (1) violate binding constraints that separate the Trading Hub from the DLAP, or (2) violate binding constraints on flows to constituents of the DLAP.

The process proposed by the ISO, as a modification to PG&E's proposal, is:

1. All Trading Hub nominations would be disaggregated to their constituent PNodes, as in the ISO's current methodology,
2. The SFT would be conducted using the ISO's current methodology, and a rebundled Trading Hub CRR award would be computed as a percentage of the Trading Hub nomination, using the highest percentage that has been awarded to a constituent PNode relative to the disaggregated nomination in step 1,[4]
3. The CRR award would consist of the rebundled Trading Hub CRR and counterflow CRRs that are needed to relieve any binding constraints that would be caused by awarding the rebundled Trading Hub CRR, which are calculated as the difference between the PNode CRR awards resulting from the ISO's current methodology and the PNodes' shares of the rebundled Trading Hub CRR, and [5]
4. The Seasonal Eligible Quantity (SEQ) for subsequent tiers would be reduced by the rebundled Trading Hub award minus the counterflow amounts.

Finally, discussion of PG&E's proposal during a stakeholder conference call prior to the submission of written comments included the awarded Trading Hub CRRs, resulting from an annual CRR allocation, being eligible for renewal in the Priority Nomination Process in the following year's annual CRR allocation. This renewal would not apply to the counterflow CRRs. The ISO considers this addition to the proposal to be beneficial to market participants, and includes it as part of this straw proposal.

4.2.3. Elimination of multi-point CRRs

The current CRR process allows for multi-point CRRs, i.e., CRRs that can be defined by multiple sources or multiple sinks or both (current rules vary between the allocation and auction). Multi-point CRRs were originally proposed early in the design of the CRR release process, before the stakeholders and the ISO agreed on the tiered structure of the CRR allocation process that was eventually filed and approved by FERC. The last point is important to illustrate the reason why multi-point CRRs were created, namely, to enable participants in the CRR allocation process to assign different priorities to the CRRs they nominate so that the

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[4] The typical result is expected to be that all but a few constituent PNodes will receive the same percentage of CRR awards relative to the disaggregated nomination. To the extent that a few of the constituent PNodes are awarded at a higher percentage than the rest, the ISO's proposal gives the benefit to the award of the Trading Hub CRR.

[5] The ISO currently envisions performing this step as post-processing, between running of the SFT and publication of CRR awards, in order to facilitate its software implementation within a reasonable timeframe. A nuance of modeling is that some small CRRs that would be rebundled back to Trading Hub CRRs will still be lost due to truncation of the SFT results, e.g., down to 0.001 MW. The ISO would be unable to track counterflow CRRs below such a level. Thus, in the proposed post-processing, the ISO will apply truncation to the disaggregated nominations like it is applied to the awards, and then calculate the counterflow CRRs as the difference between the truncated nomination (after adjusting the nomination by the highest percentage of any CRR that is awarded by the SFT) and the truncated award. The ISO will discuss examples of this calculation step during the November 16 stakeholder conference call.

simultaneous feasibility test (SFT) would reduce lower priority nominations first when reductions are needed to achieve simultaneous feasibility. The ability to designate priorities was important in the context of the single-step process for allocating CRRs that was under consideration at that time. With the adoption of the three-tier annual allocation process, however, the tier structure now provides the opportunity for parties to designate their priorities through their choice of which CRRs to nominate in each tier. Thus the primary motive for having multi-point CRRs no longer exists, and the ISO is now considering that they should be eliminated from the CRR design.

In addition to the argument above, there is another reason for eliminating multi-point CRRs. The ISO has previously committed to providing a "sell function" in the CRR auction system, whereby a CRR holder can offer a previously-acquired CRR for sale in the auction and can thereby eliminate from its CRR holdings as many MW of that CRR as are sold in the auction (see the next section for a full discussion of the sell function). The ISO has determined, through discussions with its vendor, that in order to move forward expeditiously to implement the CRR sell function it will be much more complex and costly to implement this functionality if the CRR system must continue to support multi-point CRRs. The complexity and cost of having this functionality impacts almost every aspect of the CRR software.

Finally, multi-point CRRs have had extremely limited use since the start of the CRR market, and the ISO therefore believes that it would not impose any detriment to the market to eliminate this feature. To provide some context for how often the multi-point CRR alternative was selected, for the 2009 annual CRR Allocation and CRR Auction we had a total of just over ½ of 1% (.007) of the total CRRs released as multi-point CRR. For all these reasons, the ISO now believes there is reason to eliminate multi-point CRRs.

Based on comments received, it appears that stakeholders were concerned that eliminating multi-point CRRs as well as eliminating tier 2 of the monthly CRR Allocation would not be beneficial so the ISO has determined that the best course of action would be to retain both tiers of the monthly CRR Allocation, along with some modified nomination rules, and eliminate the multi-point CRR. The modified nomination rules that are being proposed will be discussed in section 4.2.5 below. Removal of the multi-point CRR will improve the ease with which the ISO can implement other features requested by participants, such as the auction sell feature and Weighted Least Squares (WLS).

4.2.4. Weighted least squares objective function in the SFT

There are two basic objective function formulations that can be utilized for allocating CRRs:

- Maximizing CRR MW (Max CRR)
- Weighted Least Squares (WLS).

The ISO's CRR allocation process currently utilizes the Max CRR formulation. The ISO's Issue Paper considered moving to a WLS formulation because, when a constraint becomes binding in the simultaneous feasibility test (SFT) for the allocation and some CRR nominations must be curtailed, the Max CRR formulation will minimize the quantity of curtailed nominations, which will tend to impose most if not all of the curtailment on a single allocation participant. Under this formulation the nomination that is most effective in relieving the constraint will be curtailed completely before going to the next most effective nomination. In contrast, the WLS would distribute the curtailment across all CRR nominations that are effective in relieving the congestion, and thus would spread the curtailment among multiple allocation participants. The

WLS may be a more equitable formulation for the CRR allocation process. Details of the optimization issues were presented in the Issue Paper, and are repeated below to facilitate further discussion.[6] Stakeholder comments on the Issue Paper asked the ISO to include additional examples, which the ISO will address during the November 16 conference call.

Since publication of the Issue Paper, the ISO has determined that implementing the WLS objective function may be a significant change to the existing CRR software, and must consider whether the benefits of implementing this change would be sufficient to justify its cost. The ISO has also observed that its Market Initiatives Roadmap identifies a number of changes in the CRR auction processes that may occur in upcoming years, including but not limited to a conversion from CRRs to Auction Revenue Rights. Whether the ISO will make such changes has not been determined yet, but if such changes limit the time for which the enhanced software would be used, the benefits of implementing WLS could be limited. Among the possibilities is that WLS could be incorporated into the CRR processes that are used in future years, but in a different way than would be implemented now in the CRR allocation process.

The ISO is continuing to evaluate the extent of the implementation effort for WLS, and continues to invite stakeholder input on the level of priority that the implementation of WLS should have, as well as on the proposal's details.

4.2.4.1. Optimization Formulations

Let X_i represent the MW value of a Point-to-Point CRR. We let $\overline{X}_i$ represent the nominated value. In both the Max CRR and WLS formulations, X_i, represents the control variable. We assume there are N control variables. The Max CRR and the WLS optimization formulations are shown in Table 1 below. Note that only Point-to-Point nominations are considered for simplicity.

[6] This problem is relevant to the allocation process only, not to the CRR auction. In a CRR auction the auction participants use their bid prices to convey their value on each CRR, and the auction objective is to maximize the financial surplus resulting from clearing the auction. As a result, when there is a congested constraint the SFT will curtail CRR bids based on the participants' bid prices so as to minimize the reduction in the financial surplus. In an allocation process there are no economic bids, so all nominated CRRs are identical from a financial perspective.

Table 1. Max CRR and the WLS formulations

Formulation Part	Maximizing CRR MW	Weighted Least Squares Mathematical Equation	Terminology/Notes
Objective function	$\max\left(\sum_{i=1}^{N}\alpha_i \cdot X_i\right)$	$\min\left(\sum_{i=1}^{N}\alpha_i\left(\overline{X}_i - X_i\right)^2\right)$	α_i are proxy weighting factors with $\alpha_i \geq 0$
Flow Constraints for each constraint, *l*	$\sum_{i=1}^{N} X_i \cdot SF_{i,l} \leq OTC_l$		$SF_{i,l}$ is the shift factor (calculated from the Full Network Model) for the i^{th} control variable on the l^{th} constraint. OTC_l is the limit for the l^{th} constraint.
Control Variable upper and lower bound constraints for each variable, X_i	$0 \leq X_i \leq \overline{X}_i$		

4.2.4.2. Analysis of the Max CRR Objective Function

For a simple situation of one overloaded constraint (due to the application of the nominations at the nomination MW value to the Full Network Model), the control variable that has the largest positive shift factor on the overloaded constraint will be reduced exclusively to alleviate the constraint. This means that this control variable could be set to zero MW and if the constraint is still overloaded, the optimization formulation will then look at the next highest shift factor to adjust. Thus, the CRRs that are the most effective (have the highest shift factor) in alleviating a constraint are adjusted first.

The reason that the most effective CRR nominations are adjusted first is that this reduces the total amount of CRR MW the least. The objective function is to maximize the CRR MW and the adjusting the most effective CRRs maximizes the CRR MW.

Max CRR Example

Assume to CRR nominations that create an overload on an enforced constraint (constraint *k*). Assume the overload to be 5 MW. Assume the α_i are unity. Assume nomination #1 to be 100 MW and the nomination #2 to be 50 MW. Assume $SF_{1,k}$ = 0.5 and $SF_{2,k}$ = 0.2. In this case, the control variable #1 (has the shift factor $SF_{1,k}$) will be used exclusively to alleviate the constraint overload since ($SF_{1,k}$ = 0.5) > ($SF_{2,k}$ = 0.2). In this case, control variable #1 is reduced by overload/ $SF_{1,k}$ = 5/0.5 = 10 MW. In this case, the CRR MW cleared is 100 – 10 + 50 = 140 MW.

If control variable #2 was used to alleviate the constraint, the reduction to control variable #2 would be overload/ $SF_{1,k}$ = 5/0.2 = 25 MW. In this case, the CRR MW cleared is 100 + 50 - 25

= 125 MW, which is less than the total cleared using control variable #1. Thus, adjusting control variable #1 maximizes the CRR MW.

Note that any combination of adjusting both control variables #1 and #2 will result in a cleared MW amount that is less than 140 MW.

In situations where the two shift factors are very close to each other, e.g., $SF_{1,k}$ = 0.50 and $SF_{2,k}$ = 0.49, the control variable with the slightly larger shift factor will be reduced first. This is an unattractive feature of the Max CRR objective function.

4.2.4.3. Analysis of the WLS Objective Function

Assume the α_i are unity. Based on the nominated amounts, assume an overload on k^{th} constraint with the overload equal to ΔV_k. Assume, in fact, the k^{th} constraint is the only enforced constraint in this formulation. $\Delta V_k = \sum_{i=1}^{N} \overline{X}_i \cdot SF_{i,k} - OTC_k$. Thus, the control variables must be reduced. Let $\Delta X_i = \overline{X}_i - X_i$ and $\Delta V_{k,i} = \Delta X_i \cdot SF_{i,k}$. $\Delta V_{k,i}$ is the reduction of the flow on the k^{th} constraint due to the reduction in the i^{th} control variable, ΔX_i. Assume that all shift factors are positive with respect to the constraint overload. The solution of least squares optimization problem provides the following relationships.

The reduction of the overload is attributed to each control variable, $\Delta V_{k,i}$, as follows:

$$\Delta V_{k,i} = R_{i,k} \cdot \Delta V_k$$

$$R_{i,k} = \frac{SF_{i,k}^{\ 2}}{\sum_{j=1}^{N} SF_{j,k}^{\ 2}}; \sum_{i=1}^{N} R_{i,k} = 1$$

The reduction of the each control variable is as follows:

$$\Delta V_{k,i} = SF_{i,k} \cdot \Delta X_i$$

$$\Delta X_i = \frac{1}{SF_{i,k}} \cdot \Delta V_{k,i} \Rightarrow \Delta X_i = \frac{1}{SF_{i,k}} \cdot \frac{SF_{i,k}^{\ 2}}{\sum_{j=1}^{N} SF_{j,k}^{\ 2}} \Delta V_k$$

$$\Delta X_i = \frac{SF_{i,k}}{\sum_{j=1}^{N} SF_{j,k}^{\ 2}} \Delta V_k$$

WLS Example

Assume a problem with just two control variables. The above equations become.

$$\Delta V_{k,1} = R_{1,k} \cdot \Delta V_k; \Delta V_{k,2} = R_{2,k} \cdot \Delta V_k$$

$$R_{1,k} = \frac{SF_{1,k}{}^2}{\left(SF_{2,k}{}^2 + SF_{1,k}{}^2\right)}; R_{2,k} = \frac{SF_{2,k}{}^2}{\left(SF_{2,k}{}^2 + SF_{1,k}{}^2\right)}$$

$$\Delta X_1 = \frac{1}{SF_{1,k}} \cdot \Delta V_{k,1} \Rightarrow \Delta X_1 = \frac{SF_{1,k}}{\left(SF_{2,k}{}^2 + SF_{1,k}{}^2\right)} \Delta V_k$$

$$\Delta X_2 = \frac{1}{SF_{2,k}} \cdot \Delta V_{k,2} \Rightarrow \Delta X_2 = \frac{SF_{2,k}}{\left(SF_{2,k}{}^2 + SF_{1,k}{}^2\right)} \Delta V_k$$

Let

$SF_{1,k}$ = 0.5; $SF_{2,k}$ = 0.2; ΔV = 10 MW, i.e., the overload is 10 MW. Let the nominated amount for control variable #1 be 100 MW and for control variable #2 be 50 MW.

$$R_{1,k} = \frac{0.5^2}{0.5^2 + 0.2^2} = \frac{0.25}{0.25 + 0.04} = \frac{0.25}{0.29}$$

$$R_{2,k} = \frac{0.2^2}{0.5^2 + 0.2^2} = \frac{0.04}{0.25 + 0.04} = \frac{0.04}{0.29}$$

Note that $R_{1,k} + R_{2,k} = 1$

$$\Delta V_{k,1} = \frac{0.25}{0.29} \cdot 10;\ \Delta V_{k,2} = \frac{0.04}{0.29} \cdot 10$$

$$\Delta X_1 = \frac{0.5}{0.29} \cdot 10;\ \Delta X_2 = \frac{0.2}{0.29} \cdot 10$$

Table 2 Summary of the WLS example

Control Variable #	$SF_{i,k}$	$\Delta V_{k,i}$	ΔX_i
1	0.5	$\frac{0.25}{0.29} \cdot 10$ = 8.62	$\frac{0.5}{0.29} \cdot 10$ = 17.24
2	0.2	$\frac{0.04}{0.29} \cdot 10$ = 1.38	$\frac{0.2}{0.29} \cdot 10$ = 6.90
Total Flow Reduction of Overload		10	

In the WLS formulation, the reduction on the flow on the constraint is pro-rated based on squares of the shift factors. Both the numerator and denominator are composed of shift factors squared.

The reduction in the actual control is pro-rated based on shift factor (not squared). The higher the shift factor value relative to others the more the control will be adjusted. Thus there is a ***sharing*** of reduction as compared to the Max CRR method in which the most effective control variable is reduced first.

4.2.4.4. Example with Results from WLS and Max CRR

If the example above was optimized using Max CRR (this is the optimization currently employed in the allocation process), X_1 will be reduced by 20 = 10/0.5, where 0.5 is the shift factor for X_1. This control variable has a larger shift factor than the other and this is why it is adjusted first to alleviate the constraint. If the second control variable was used, it would be reduced by 10/0.2 = 50. Table 3 below provides a comparison of the WLS and the Max CRR methodologies using the above example.

Table 4 provides another example where the shift factors are very close to each other. The shift factor for control variable 2 is changed from 0.2 to 0.49. Using the same binding constraint as in Table 3, the unconstrained flow on the constraint that was enforced in Table 3 would be the sum of (shift factor * nominated amount) for the two CRRs, which is (0.5 * 100 MW) + (0.2 * 50 MW) = 60 MW. After the reduction of 10 MW, the enforced limit is 50 MW. Using a shift factor of 0.49 instead of 0.2 for the second CRR, the unconstrained flow is (0.5 * 100 MW) + (0.49 * 50 MW) = 74.5 MW, and the required reduction is 24.5 MW. Because of the similar shift factors, the reduction in awards is distributed by similar amounts between the two CRRs, in contrast with the current Max CRR method that reduces only the most effective CRR.

Table 3 Example with WLS and Max CRR

			WLS Method			***Max CRR Method***		
Control Variable	$SF_{i,k}$	***Nominated Amount***	$\Delta V_{k,i}$	ΔX_i	***Cleared Amount***	$\Delta V_{k,i}$	ΔX_i	***Cleared Amount***
1	0.5	100	(0.25/0.29) 10 = 8.62	(0.5/0.29) 10 = 17.24	82.76	10	20	80
2	0.2	50	(0.04/0.29) 10 =1.38	(0.2/0.29) 10 = 6.90	43.10	0	0	50
Totals		150	10	24.14	125.86	10	20	130

Table 4 Example with WLS and Max CRR with Shift Factors Closer Together in Value

			WLS Method			***Max CRR Method***		
Control Variable	$SF_{i,k}$	***Nominated Amount***	$\Delta V_{k,i}$	ΔX_i	***Cleared Amount***	$\Delta V_{k,i}$	ΔX_i	***Cleared Amount***
1	0.5	100	(0.25/0.4901) 24.5 = 12.497	(0.5/0.4901) 24.5 = 24.995	75.005	24.5	49	51
2	0.49	50	(0.2401/0.4901) 24.5 = 12.003	(0.49/0.4901) 24.5 = 24.495	25.505	0	0	50
Totals		150	24.5	49.490	100.510	24.5	49	101

Under both methods the overload is removed. However, in the WLS method, the control variables share in the reduction, whereas in the Max CRR method the control variable with the larger shift is reduced to alleviate the constraint. A very important result is that under both cases, 10 MW of overload was removed from the constraint. The amount of removal does not change with the change in the method. The real difference is in which control variables are used and in what amounts to remove the overload.

The results in Table 4 show a much more equal sharing in the reduction for the WLS as opposed to the Max CRR.

Also, if the shift factors were equal, the Max CRR method would pro-rate the reductions based on the nominated amount. This is not explicitly shown in the optimization formulation. In fact, since the Max CRR formulation is a linear program, equal shift factor would result in a degenerate solution case in which there is not a unique solution (an infinite number of combinations for reductions in control variable #1 and #2 would work). However, the pro-rationing is properly handled in the soft ware.

In the WLS, if the shift factors were equal we see the reduction would be equally shared between the two control variables even though the nominated amount for control variable #1 is twice as large as the nominated amount for control variable #2. In the WLS formulation the proper pro-rationing would be managed by determining the proxy weights based on the nominated amounts. However, this part of the formulation is not provided in this paper.

4.2.5. Refinement of tiers in monthly allocation

Based on comments that have been received from various CRR participants the CAISO understands that the current monthly CRR process can take a considerable amount of time and resources for entities to participate in the allocation and auction processes. Through the stakeholder comments that were received the ISO has determined that since there was no support for completely removing a tier from the allocation process that it might be possible to improve the monthly allocation process by refining some of the rules. A couple of proposed rule changes would include:

- Allow sub-LAPs to be nominated in tier 1 of the monthly allocation since the Default LAPs are often limited in tier 1.
- Allow LSEs to nominate 100% of the difference between the Monthly CRR Eligible Quantity (MEQ) and any previously allocated CRRs for tier 1 and have tier 2 be available to fill in where nominations were not adequately covered in tier 1.

4.3. Non-Credit Business Process Issues

4.3.1. Sale of CRRs in the CRR auction

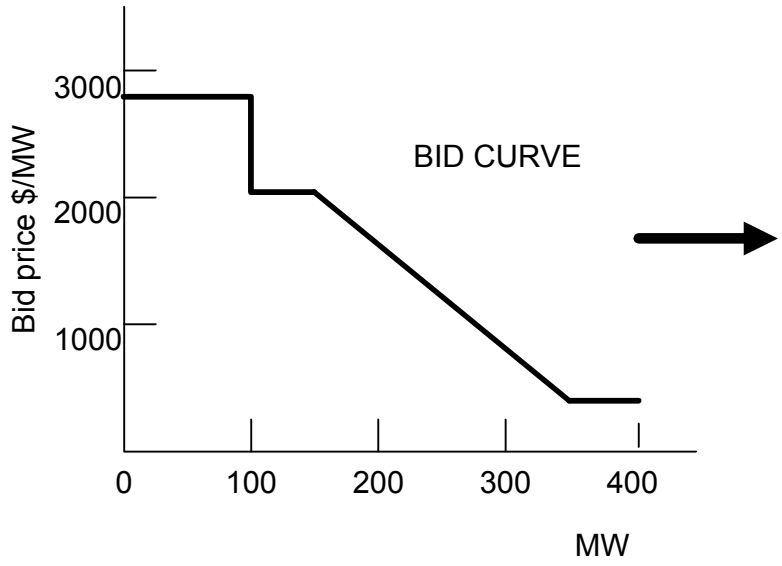
Currently a CRR holder that wants to liquidate a CRR holding cannot sell it directly, but must instead try to buy an opposite and offsetting CRR in the auction and, if successful, continue to hold both the original CRR and its opposite or try to sell it through the Secondary Registration System (SRS). Stakeholder comments submitted have supported moving forward with the

auction sell feature with additional information being requested by participants. Listed below is some additional information on how the ISO would envision implementing this feature. The ISO would appreciate any comments on the topics listed below or any additional items.

- The CAISO would allow the sale of CRRs acquired through either the auction or allocation but allocation CRRs would need to take on the "Financial CRRs" that would be required through the current SRS
- If a CRR Holder were selling into the auction at a negative value, meaning the CRR Holder would be paying to sell the CRR, then there would need to be collateral requirements established to ensure that this payment could be made.
- The bid curves are slightly different for the buy and sell. The bid curve of a sell offer must start from zero MW and must be monotonically increasing. The maximum MW amount in a bid curve of a sell offer must be less than or equal to the available MW of the fixed PTP CRR.

Buy Bid Curve

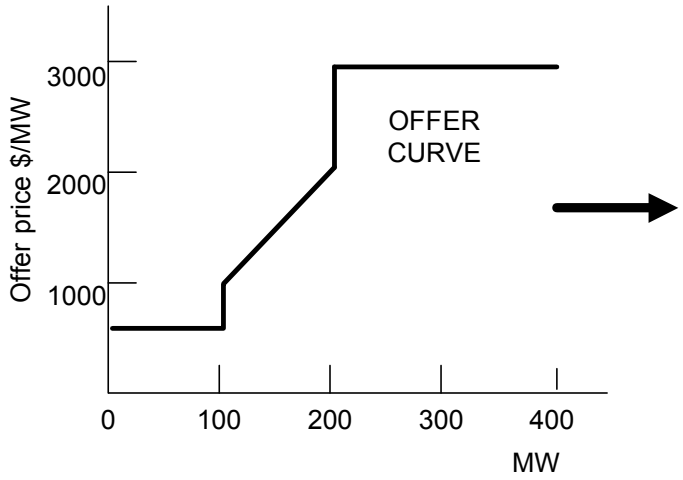
The buy bid price specifies the maximum price the MP is willing to pay for the CRR. If the clearing price is less than the bid price, the MP will be awarded all MWs that he bid for. If the clearing price is equal to the bid price, a partial MW amount will be awarded.



MW	Price
0	2800
100	2800
100	2000
150	2000
350	400
400	400

Sell Offer Curve

The sell offer specifies the minimum price the MP wants for the CRR being sold. If the clearing price is greater than the offer price, the MP will sell all MWs that have been put up for sale. If the clearing price is equal to the offer price, the MP will sell a partial MW amount.



MW	Price
0	600
100	600
100	1000
200	2000
200	3000
400	3000

- The CRRs being offered for sale must be for the same term and equal to or less than the MW amount of the CRRs held.
- The CRR sell function would be performed through the current Auction Portfolio Editor available in the existing CRR MUI

4.3.2. Modeling approaches to reinforce CRR revenue adequacy through transmission outages consideration

CRRs were revenue inadequate in the ISO markets for the months of April and May 2009, leading the ISO to further consider its modeling approaches to reinforce CRR revenue adequacy in light of transmission outages. A notable characteristic of these months is that they are the time for completion of transmission maintenance work before the summer season begins. Since then, the ISO has limited the quantity of CRRs that are released in the monthly CRR process, and the revenue inadequacy has been less of a concern that it was in these initial months. However, the CRR revenue adequacy has remained variable during the subsequent months and has been uncertain during the summer when critical forced outages have occurred, and there has not been a great level of comfort that any particular month would end in revenue adequacy. The concern for revenue adequacy continues to be present as transmission maintenance activity has resumed in the fall, and as winter storms cause outages.

The ISO therefore intends to review and possibly reconsider the factors that determine the quantity of CRRs it releases to determine whether any changes are needed, in particular to the amount of network capacity that is made available for CRRs. The ISO will be considering, among other things, (1) what improvements can be made to the modeling of outages in the monthly CRR model and (2) possible reduction of the 75% capacity availability level in the

annual CRR process. As stated in the Issue Paper, this is a topic that may take some time to resolve, because the ISO believes that at least 12 months of operational experience in the new market structure will be necessary before the ISO can establish more than interim values for the amount of CRRs to release in the monthly CRR process. Then, the ISO will examine this issue further.

4.3.3. Tracking of Long Term CRRs in the CRR system

As per Tariff requirements, section 36.8.5, load migration is also reflected in Long-Term CRRs. LT CRRs have a life spanning nine years. Currently, due to system limitations LT CRRs are defined within the CRR system for a rolling two-year life. For instance, for LT 2009-2018 the CRR system has only records of CRRs for 2009 and 2010. By the start of next year, CRRs for 2009 will expire and then records for CRR 2011 will be created, and so on, until reaching 2018. Due to this shortcoming, CRR transfers to reflect load migration are only reflected on the currently existing two-year span of LT CRRs. With the current configuration, when reaching the start of a new year, LT CRRs will have their life extended one more year, but these newly created CRRs will not have reflected any load migration that have already affected LT CRRs up to that point on time. In this case, load migration is only reflected in the current two-year life of the CRRs. For this reason, an enhancement of the CRR system is needed to keep track of LT CRRs and systematically reflect load migration on them for their whole life span.

The Issue Paper stated the ISO's assessment is that the proposed change affects only the internal processing of CRRs and remains within the established tariff and policy. No stakeholder comments have differed with the ISO's assessment regarding this process improvement, and thus the ISO will proceed to make this refinement in its processes. When this new function has been implemented the ISO will notify CRR participants. The only change that CRR Holders will see is that instead of only seeing two years of Long Term CRRs through the CRR system, they will be able to see all applicable years of the Long Term CRRs.

4.3.4. Clarification of process for submission of PNP "signature data"

During preparation for the PNP for the 2010 annual CRR process the ISO had issued a technical bulletin to provide clarification of the process for developing "signature data" for the Priority Nomination Process (PNP). The process that was followed is in line with the current Tariff language but some participants felt that additional language should be added to better describe how this process should be done. The ISO will include suggested Tariff language for this issue when any necessary Tariff language is submitted for the other topics addressed in this document.