

Contingency Modeling Enhancements CRR Alternatives Discussion

Submitted by	Company	Date Submitted
Mike Benn 604.891.6074	Powerex Corp.	February 19, 2016

Powerex appreciates the opportunity to comment upon CAISO’s January 28, 2016 CRR Alternatives Discussion Paper (“Discussion Paper”). The Contingency Modeling Enhancements initiative deals with highly technical issues that are likely to have a material effect on price formation in the CAISO markets. Powerex therefore appreciates CAISO’s extensive efforts to explain the issue through its discussion papers, stakeholder meetings, and individual outreach. Such engagement is critical to ensuring that all stakeholders can evaluate the proposal and provide informed input.

As explained more fully below, Powerex recommends that CAISO implement Option 1(b) as an *initial, interim strategy*. This option appears to present the minimal implementation burden for the CAISO, is fully consistent with the existing framework for the allocation, auction, and settlement of CRRs, and maximizes the quantity of “standard” CRRs that can be fully funded through day-ahead congestion rents. Importantly, this option achieves these objectives without introducing a new and complex CRR paradigm and without the need for additional processes to award new CRR products.

In the future, however, it may be beneficial for CAISO to go beyond Option 1(b). Implementing Option 1(b) now as an initial, interim approach, allows an assessment of whether additional CRR enhancements are necessary or beneficial in light of actual experience with the contingency modeling enhancements. In other words, pursuing Option 1(b) at present in no way precludes future enhancements, including many of the other, more complex, alternatives presented in the Discussion Paper.

Powerex believes that the CAISO has taken appropriate steps in this stakeholder process to try to ensure that implementation of the contingency modeling enhancements does not create *new* revenue inadequacy issues for CRRs. However, Powerex believes it must be acknowledged that CAISO has an existing chronic problem with CRR revenue inadequacy that needs to be addressed. Moreover, Powerex believes that the broader CRR revenue inadequacy issue should be addressed *prior to* implementing any complex CRR enhancements as part of the narrower contingency modeling enhancements. Solutions to the more widespread CRR revenue inadequacy issue may themselves require significant changes to the design of CRRs and/or the CRR auction process, potentially rendering a more complex solution in this stakeholder process moot. For this reason, Powerex recommends that the CAISO implement Option 1(b) as an initial interim approach, and urges CAISO to convene a stakeholder

process to comprehensively evaluate and address the root causes of CRR revenue inadequacy. That stakeholder process should consider solutions to reduce the frequency and magnitude of gross CRR revenue inadequacy, and also consider changes to the CRR auction framework to ensure that CAISO loads are adequately compensated for “backstopping” any gross CRR revenue shortfalls that remain.

1. Powerex Supports Implementation of the Contingency Modeling Enhancements

Under NERC and WECC standards, CAISO must return the grid to a secure state within 30 minutes following a contingency event. This requires CAISO to position generation resources such that they are able to increase output to replace energy transfers over a transmission path identified as a critical contingency. This can mean dispatching a generating unit below its economic level. Currently, CAISO positions resources in this manner through exceptional dispatch or other out-of-market actions. The costs of such actions are therefore not reflected in LMPs, and instead are recovered through uplift payments and charges.

The proposed contingency modeling enhancements will allow the day-ahead market optimization to position resources to satisfy the corrective contingency requirements. This means that actions currently occurring out of market will instead occur within the market clearing process—and will be reflected in LMPs. It also means that all resources that assist in meeting the corrective contingency constraints will be compensated for this service in a uniform and transparent manner.

Powerex supports the core objectives and design of the proposed contingency modeling enhancements, as they will improve price formation in the CAISO markets and will reduce out-of-market compensation and associated uplift payments.

2. Powerex Supports Aligning the CRR Simultaneous Feasibility Test with the Market Model

Powerex strongly supports CAISO’s efforts to ensure the CRR Simultaneous Feasibility Test (“SFT”) is aligned with the network representation used in the day-ahead markets. Simply put, the contingency modeling enhancements have the potential to reduce the allowable flows over certain transmission paths. This, in turn, can reduce the quantity of flows on which CAISO collects day-ahead congestion revenues. In the absence of any CRRs, this would not pose any challenge to revenue adequacy. But CRRs represent a claim, by the CRR holder, to the congestion price difference between specified points on the grid. If the quantity of CRRs that must be *paid* the day-ahead congestion price difference exceeds the quantity of day-ahead market flows that are *charged* the day-

ahead congestion price difference, CAISO will experience a gross revenue inadequacy.¹

To avoid such an outcome, it is critical that CAISO award CRRs only up to the capability of the transmission system. It does this through the SFT at the time of the annual and monthly CRR process. The SFT will only ensure gross revenue adequacy if the transmission capability used in the SFT does not overstate the transmission capability used to actually run the day-ahead market. If it does not, then congestion revenues collected may not be sufficient to fully fund the settlement of the CRRs that CAISO awarded. In other words, if the SFT and day-ahead market models are not aligned, the CAISO may promise more congestion revenue in the CRR process than the day-ahead market will actually collect.

Indeed, a lack of alignment between the SFT and day-ahead market models has been identified by the Department of Market Monitoring (“DMM”) as one of the root causes of the CRR gross revenue insufficiency that already occurs.² This misalignment can occur for a number of reasons, including (1) the SFT model does not enforce the same constraints as the day-ahead market model; (2) the topology of the transmission grid changes between the time the SFT is performed and the time of the day-ahead market; and (3) the day-ahead market operates with hourly granularity, whereas the SFT is performed for only an on-peak and an off-peak period in each month.

Implementing the contingency modeling enhancements in the SFT is vital to avoiding the first cause of model misalignment and will reduce the potential for gross revenue inadequacy. There remains some potential for gross revenue inadequacy (e.g., due to changes in network topology), but consistent enforcement of constraints is a necessary step to minimizing that potential.

Powerex therefore supports modifying the CRR process to avoid exacerbating the CRR revenue inadequacy challenges that already exist.

3. Implementing Option 1(b) on an Interim Basis Best Meets the Fundamental Purpose of CRRs

The Discussion Paper outlines several possible strategies for ensuring that CRRs allocated or awarded in the CAISO’s forward auctions do not result in revenue inadequacy relative to actual congestion rents collected in the day-ahead market. The simplest of these is Option 1(b), which merely reduces the quantity of CRRs that can be awarded (either through allocation or through the auction).

¹ The term “gross revenue inadequacy” refers to the difference between day-ahead congestion rents collected by CAISO and the CRR settlements that must be paid by CAISO, without considering any revenues realized in the CRR auction.

² CAISO Department of Market Monitoring, *Allocating CRR Revenue Inadequacy by Constraint to CRR Holders* at 8-10 (Oct. 6, 2014) (“CRR Revenue Inadequacy White Paper”), available at http://www.caiso.com/Documents/AllocatingCRRRevenueInadequacy-Constraint-CRRHolders_DMMWhitePaper.pdf

The Discussion Paper presents two additional “paradigms” to allow it to sell additional CRRs without increasing the risk of revenue inadequacy. Under Option 2, standard CRRs are sold up to the (reduced) limits of each constraint (*i.e.*, up to the kc-constraint limit), but additional CRRs can be sold to the extent the CAISO is able to allocate or award a new type of product, the CCRR, in an equal quantity. The CCRR effectively allocates, on a forward basis, liability for the revenue shortfall that would otherwise be experienced if the kc-constraint was binding in the day-ahead market.

Under Option 3, CAISO would effectively decompose the current standard CRRs into a CRR^k and multiple CRR^{kc} products. The former would settle against the congestion price difference due to the transfer limit, whereas the latter would settle against the congestion price difference due to the corrective contingency constraints. For any given day-ahead market solution with congestion between two locations, it is possible for the congestion to be due to the transfer limit (k) binding, to the corrective contingency limits (kc) binding, or both.

Powerex strongly concurs with the comments of the Market Surveillance Committee (“MSC”), stating that the primary purpose of CRRs was to protect the users of the grid from uncertain congestion charges.³ CRRs eliminate uncertainty associated with physical deliveries of energy on the CAISO grid, and are critically necessary to support forward contracting for energy. Powerex makes extensive use of CRRs to support its deliveries of low-carbon and renewable energy to the CAISO grid.

Each of the Discussion Paper paradigms should be evaluated against this core purpose of CRRs. Under Option 2, in order to be fully protected against congestion between two locations on the grid, a market participant would need to acquire CRRs and also *avoid* receiving any CCRRs, as these will effectively rescind a portion of the CRR revenues. Based on the discussion during the February 11, 2016 MSC meeting, it is unclear if there are market participants that *would* be willing to be allocated CCRRs, or what they would charge to accept such a liability in the auction. Resistance to receiving CCRRs is likely to be especially high during the initial implementation of the contingency modeling enhancements, when uncertainty regarding the frequency and magnitude of kc-constraint congestion will be greatest. Ultimately, if CAISO is unable to allocate or award any CCRRs, then the quantity of standard CRRs that can be awarded remains limited by the kc-constraints. In that case, Option 2 yields the same result as Option 1(b).

Under Option 3, in order to be fully protected against congestion between two locations on the grid, a market participant would need to acquire CRR^k and CRR^{kc} in equal quantities; any “mismatched” quantities would provide only limited protection to day-ahead congestion charges.⁴ Of course, the “matched” quantity of CRR^k and CRR^{kc}

³ The comments were made verbally during the MSC’s February 11, 2016 meeting.

⁴ Powerex notes that the allocation of congestion between MCC^k and MCC^{kc} may be highly unpredictable, even if the total congestion is very similar. For instance, the two-node example in Figure 2 results in both k-limit congestion and kc-limit congestion. If the bid price of G1 was \$40 rather than \$30, however, k-limit congestion would be entirely eliminated, and the entire congestion price difference would be due to the

products that CAISO can award will be limited by the kc-constraints, which is the same as the quantity of standard CRRs that can be awarded under Option 1(b). Indeed, from the CAISO's perspective, Option 3 can be viewed as Option 1(b), augmented by additional sales of CRR^k only. As discussed above, however, there will be considerable uncertainty regarding the respective contributions of the k-limit and kc-limits to congestion price differences between two locations on the CAISO grid. Powerex therefore expects that the CRR^k product, on a standalone basis, will be of limited initial value as a hedge for physical deliveries.

The introduction of two products, as is necessary under both Option 2 and Option 3, introduces additional complexity in terms of the process for awarding the new products to market participants. The Discussion Paper outlines three basic approaches, common to both paradigms. Under the "a" variant, each of the two CRR products is allocated or auctioned independently. Load serving entities may request CRRs independently of CCRRs, or CRR^k independently of CRR^{kc}. In the auction, market participants would be permitted to submit different bid quantities and prices for each of the two products.

This approach would give market participants *some* opportunity to attempt to achieve the combination necessary to fully hedge day-ahead congestion costs, but this outcome is still uncertain. Recall that fully hedging congestion requires a CRR and *no* CCRR (under Option 2); or acquiring equal quantities of CRR^k and CRR^{kc}. The needs of physical users of the grid would be most directly addressed by modifying the allocation and auction process to permit a participant to request or bid for a "package" of CRR products. For instance, a market participant could be allowed to bid for a CRR only to the extent it receives no CCRRs; otherwise, it does not wish to purchase any CRRs. Similarly, a market participant could be allowed to bid for 1 MW of CRR^k together with 1 MW of CRR^{kc}, but 0 MW for one without the other. The Discussion Paper has not examined mechanisms to permit requesting or bidding for "tied" CRR products, but even the prospect of allocating or awarding the two CRR products independently is described as "very difficult to implement" and as requiring "heavy changes to the core CRR market systems."⁵ Powerex notes, however, that if the primary demand from market participants is for full congestion hedges—CRRs with no CCRR, or matched quantities of CRR^k and CRR^{kc}—neither Option 2 nor Option 3 (even with an enhancement to request "tied" CRR products) will necessarily be able to provide a greater quantity of complete hedges than the far simpler Option 1(b).

The Discussion Paper also outlines two additional allocation processes, in which market participants have considerably less control over the combination of CRR products they

kc-limit. In that scenario, holding a CRR^k would provide no protection at all to the \$10/MWh difference in marginal congestion prices at the two locations.

⁵ Discussion Paper at 22.

are awarded. At one extreme, variant “c” allocates the secondary CRR product (*i.e.*, CCRR or CRR^{kc}) *pro rata* on the basis of the allocation or award of the primary CRR product (*i.e.*, CRR or CRR^k). This makes it virtually impossible for a market participant to only obtain “clean” congestion hedges between two locations. Under Option 2(c), a participant receiving CRRs will be certain to also receive some quantity of CCRRs, whereas under Option 3(c) a participant receiving CRR^k will receive a lesser quantity of CRR^{kc}.⁶

A third variation “b” would allocate the secondary CRR product using the same bids submitted for the primary CRR product. This somewhat improves a market participant’s ability to influence their allocation of the two products, but results in the patently odd situation in which two participants pay the same clearing price for a different bundle of CRR products. For instance, under Option 3(b), a market participant receiving 100 MW of CRR^k will pay the same amount as a market participant receiving 100 MW of CRR^k *and* 100 MW of CRR^{kc}, even though the latter is clearly a higher-quality bundle of CRR products.

Powerex stresses that the options in the Discussion Paper should be primarily evaluated based on their ability to provide physical users of the grid with a forward hedge against uncertain congestion costs. The ability to offer a full congestion hedge—*i.e.*, a conventional CRR—supported only by day-ahead congestion revenues is limited by the corrective contingency limits; neither Option 2 nor Option 3 avoids this limitation. Those options do provide mechanisms to either support additional CRR quantities by allocating counterflow liability (Option 2), or to award CRRs for only a portion of the congestion price difference (Option 3). The value of these new products, and the success of these options, is entirely unknown at this time, as there is no information regarding how the contingency modeling enhancements will affect congestion prices in the day-ahead market. Implementing either option, however, will be difficult and involve “heavy changes” to the CRR systems.

In Powerex’s view, the most sensible immediate course of action is to adopt Option 1(b). This option entails the lowest effort and complexity necessary for CAISO to provide an appropriate amount of full-hedge standard CRRs, which is the product most consistent with the needs of physical users of the grid. This option can also readily be extended if, in light of actual experience with the contingency modeling enhancements, stakeholders and CAISO see value in expanding the CRR products that are offered in the future.

4. Powerex Supports CAISO Initiating a Stakeholder Process to Comprehensively Evaluate and Address CRR Revenue Adequacy

It has long been known that CRRs experience chronic gross revenue inadequacy. In the third quarter of 2015, for instance, net day-ahead congestion revenues were \$64.5 million, but payments to CRR holders totaled \$99.4 million, leading to a gross revenue

⁶ The above assumes that there is more demand for CRR products than can be satisfied, which would be the rational expectation across constraints that bind with any regularity.

inadequacy of \$35 million.⁷ In an October 2014 white paper, DMM reported “over \$200 million in CRR revenue inadequacy in CAISO over the last twelve months.”⁸ In short, the CRR process systematically awards more CRRs than can be funded from the congestion rents collected in the day-ahead market.

There are multiple reasons for CRR revenue inadequacy; it is a broad topic that goes well beyond the scope of the current initiative. While CAISO’s proposals in this initiative will help ensure that the contingency modeling enhancements do not make the problem worse, additional measures will be necessary to more fully understand and address the issue.

Powerex strongly supports CAISO convening a stakeholder process focusing on the issue of CRR revenue inadequacy. As noted in DMM’s 2014 white paper, there are numerous root causes that result in the CRR SFT regularly overstating the transfer capability actually available in the day-ahead market. Improving the accuracy of the SFT model is a critical step to minimizing the potential for revenue inadequacy.

A second but potentially more important concern is the performance of the CRR auction process. As noted in DMM’s quarterly report and elsewhere, auction revenues are roughly sufficient to fund the gap between day-ahead congestion revenues and CRR payments. This should offer no comfort, however, as it means that the CRR auction has resulted in California loads giving up the right to receive the day-ahead congestion revenues (which they would receive anyway, absent any CRRs being awarded), but receive negligible net revenues in return. That is, the CRR auction revenues they do receive are almost entirely offset by the cost of funding the chronic CRR gross revenue inadequacy. The implication is that, on average, the aggregate CRRs sold in the auction have been sold for a fraction of the day-ahead congestion value that the CRR holders have ultimately received.

Low auction revenues for certain CRRs are unquestionably a bad deal for California loads. CRR auction participants have often been able to obtain CRRs across isolated, illiquid constraints at auction prices that are often a very small fraction of the potential congestion revenues. This should raise serious questions about whether the CRR auctions should facilitate such outcomes. In Powerex’s view, there is generally robust competition for CRRs on paths that are used as direct hedges for physical deliveries into, out of, and within the CAISO grid. These are typically paths from generators or import locations to load aggregation points and export locations, and may include liquid trading hubs as intermediate locations. On average, CRRs covering these paths generally sell at a relatively high percentage of the expected day-ahead congestion costs. But CRRs are also available between nodes that permit financial participants to speculate on specific and isolated constraints on the CAISO grid. These CRRs often do

⁷ CAISO Department of Market Monitoring, *Q3 2015 Report on Market Issues and Performance*, November 16, 2015, at 18-20 and Tbl. 1.5, available at <http://www.caiso.com/market/Pages/MarketMonitoring/MarketIssuesPerformanceReports/Default.aspx>

⁸ CRR Revenue Inadequacy White Paper, at 2 (identifying revenue inadequacy for September 1, 2013 through August 18, 2014 period).

not represent hedges for physical deliveries, but rather financial speculation on which constraints are or are not likely to bind in the day-ahead market. To be clear, Powerex does not claim that this is an inappropriate use of CRRs, but there are typically much fewer entities competing to obtain CRRs across each of these isolated constraints, and hence entities are able to acquire these CRRs at very little cost, with the potential for significant payoffs. Moreover, awarding these CRRs does nothing to improve the commitment and dispatch of physical resources in the CAISO markets (in contrast to properly implemented and functioning convergence bidding). Consequently, neither the operational efficiency of the CAISO markets nor the ability of market participants to hedge the congestion cost of physical deliveries are enhanced by offering CRRs on every possible combination of nodes on the CAISO grid. A stakeholder process evaluating CRR revenue adequacy should explore, among other issues, whether the CRR allocation and auction is structured in a manner that (1) is consistent with the core purpose of CRRs as hedging instruments; and (2) promotes maximum participation—including by financial entities—to acquire CRRs on paths that are used to hedge physical deliveries.

5. Powerex Would Appreciate Additional Clarification of Certain Aspects of the Contingency Modeling Enhancements

In order to better understand specific areas of the proposed Contingency Modeling Enhancements, Powerex would appreciate additional discussion with CAISO on the following areas:

- Enforcement of the corrective contingency constraints depends on the ramp rates of generating units.⁹ How will this be performed in the SFT, which models injections and withdrawals at the POD and POR of each CRR that is requested or bid in the auction?
- Regarding the example in Section 3.2 of the Discussion Paper, does the corrective contingency case also enforce a *downward* ramping constraint at G1 (whose output must be *reduced* by 350 MW within 30 minutes)? Would the solution to this example change if the ramp rate of G1 was 10 MW/min?
- Will enforcement of the corrective contingency constraints be affected by convergence bids, or only by physical loads and resources?
- Do the unique arrangements under the COI operating agreement require modifications to the proposal, similar to the modifications that were necessary to the full network model expansion proposal?

⁹ See, e.g., Discussion Paper at 9 and Fig. 2, providing an example of how corrective contingency constraints are enforced, and the importance of unit ramp rates to that solution.