



California Independent
System Operator Corporation

California ISO

Process to Reevaluate CRR Credit Requirements under Extraordinary Circumstances

March 12, 2009

Version: 1.0

Table of Contents

- 1. Background 4
- 2. Holding Credit Requirements under Normal Conditions..... 5
- 3. Extraordinary Events 6
 - Unexpected Events with Short Duration 7
 - Expected Events 8
- 4. Reevaluation of Credit Requirements 9

Acronyms

BPM	Business Practice Manual
CM	Credit Margin
CRR	Congestion Revenue Right
DAM	Day-Ahead Market
FNM	Full Network Model
IFM	Integrated Forward Market
LMP	Locational Marginal Price
LT	Long-Term
RTM	Real-Time Market
SRS	Secondary Registration System
TOU	Time of Use
TCV	Total CRR Value / Credit Requirement
TD	Trade Day

1. Background

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 of the Congestion Revenue Right (CRR) portfolio determined as described in Section 12.6.3 of the Tariff. Credit requirements for CRRs are calculated on a portfolio level and re-evaluated in a regular basis using the net MW of CRRs, the corresponding CRR auction prices and the credit margin data. The main challenge to quantify credit requirements for this kind of financial instruments is that CRRs depend on future and volatile congestion prices. Credit margin data captures the historical volatility of CRR values. The computation of Credit Requirements is based on historical measures of volatility and CRR auction prices. There is no guarantee that future congestion will follow historical patterns or that auction prices will truly reflect the CRR values.

Extraordinary circumstances such as extended transmission outage or other abnormal grid conditions could dramatically increase (or decrease) the payment obligations for a CRR. Although, over time, the CAISO will be able to incorporate historical outage information in the calculations of historical expected values, that calculation may not adequately cover near-term anticipated prospective obligations associated with extraordinary events that could dramatically change the risk profile of a CRR portfolio. Accordingly, in the March 25, 2008 Issue Paper, the CAISO suggested it might clarify its tariff authority so that the CAISO could impose additional credit requirements under any extraordinary circumstance.

Most stakeholders submitting written comments on April 8th favored the concept for adjusting CRR holding credit requirements due to extraordinary circumstances, but several commentators also recommended that the CAISO clearly establish in advance the methodology it would use to calculate the increased credit requirements. The requirement to have the CAISO develop in advance the methodology for such calculations was rejected by FERC. Under the tariff, CAISO may request additional security when warranted but we will have to provide the justification at that time. Although CAISO expects to develop these methodologies, CAISO will have the ability to request the security at any time if there are concerns to need it subject its justification even if it is different from one of the CAISO's pre-developed methodologies. Under the scenario where CRR holding credit requirements vary, CAISO through its Finance department and following its standard credit policy will determine if sufficient collateral exists to cover the additional liability, and if a collateral call will be made. CAISO believes that it has the authority to request additional security in the event it finds that existing credit coverage is not sufficient to cover the prospective liabilities. CAISO also finds reasonable and appropriate to engage in additional discussions with stakeholders in a future stakeholder process to develop a methodology for calculating credit requirement under such circumstances. In this context, this

paper is intended to be a starting point for such a process. The provisions of this paper are intended to be consistent with the Tariff and the applicable Business Practice Manuals (BPMs). If provisions of this paper nevertheless conflict with the Tariff or BPMs, the CAISO is bounded to operate in accordance with the Tariff.

2. Holding Credit Requirements under Normal Conditions

CRR holding credit requirements are computed systematically for each CRR holder based on its entire CRR portfolio within the CRR system. The goal of the credit requirement computation is to determine whether a CRR holder has sufficient credit to cover its own expected negative congestion revenue from its CRR portfolio. Under normal conditions, credit requirements will be re-evaluated once a week. This is to account for changes in both the CRR portfolios and the auction prices which in general will make the credit requirements vary over time even under normal conditions¹.

For any CRR in the H -th CRR holder's portfolio, regardless of their origin (allocation, auction, load migration or SRS trades), the associated credit requirement is calculated as follows:

$$CR_{i,p}^H = - \sum_{m=1}^{M_{i,p}} \sum_{d=1}^{D_{i,m,p}} \lambda_{i,d,m,p} MW_{i,d,m,p}^H + \frac{\sum_{m=1}^{M_{i,p}} \sum_{d=1}^{D_{i,m,p}} CM_{i,d,m,p}^{Daily} \times MW_{i,d,m,p}^H}{\sqrt{\sum_{m=1}^{M_{i,p}} D_{i,m,p}^H}}, \quad \forall i, p, H \quad (1)$$

where the super-index H stands for H -th CRR holder; the sub-index i stands for the i -th CRR in the holder's CRR portfolio; the sub-index p is for TOU period; the set M_{ip} comprises the remaining months in the term of i -th CRR for TOU period p ; the set $D_{i,m,p}$ is the number of days the i -th CRR has in month m and TOU period p ; $MW_{i,d,m,p}$ is the volume (MW) of the i -th CRR on day d in month m and TOU period p ; $CM_{i,d,m,p}^{Daily}$ stands for the daily credit margin (\$/MW-Day) for the i -th CRR on day d in month m and TOU period p ; $\lambda_{i,d,m,p}$ is the daily auction price (\$/MW-Day) of the i -th CRR on day d in month m and TOU period p . Daily prices are the daily average of the respective annual and monthly auction prices. Auction prices are the APNode Clearing Prices determined through the CRR auction processes. Only the monthly CRRs use the monthly auction prices and the rest of the CRRs (the seasonal, Long-Term (LT), or Secondary Registration System (SRS) CRRs) use the non-monthly auction prices. Notice that both the

¹ Over time some CRRs will eventually expiry and new CRRs will be acquired through upcoming allocations, auctions, SRS trades or load migration. Also, a new set of monthly auction prices will become available after each auction process.

Credit Margin and the daily auction prices are unique for each CRR definition regardless of its holder, for this reason the super-index H does not apply over such quantities.

Conceptually, the auction price should converge to the market value of CRRs. It may not, however, if the auction is uncompetitive. When the value of the CRRs in the auction is over- or under-valued, the auction price may not reflect the true credit risk for certain CRRs. The CAISO discussed with stakeholders alternative ways of utilizing historical price data to determine the appropriate credit requirement for holding short-term CRRs once that information becomes available. As per Tariff requirements, this credit enhancement will apply after one year of actual MRTU operation so that seasonal data becomes available. For a CRR, the inclusion of LMP data will yield the following credit requirement:

$$CR_{i,p}^H = - \sum_{m=1}^{M_{i,p}} \sum_{d=1}^{D_{i,m,p}} \min(\Psi_{i,d,m,p}, \lambda_{i,d,m,p}) MW_{i,d,m,p}^H + \frac{\sum_{m=1}^{M_{i,p}} \sum_{d=1}^{D_{i,m,p}} CM_{i,d,m,p}^{Daily} \times MW_{i,d,m,p}^H}{\sqrt{\sum_{m=1}^{M_{i,p}} D_{i,m,p}^H}}, \quad \forall i, p, H \quad (2)$$

where $\Psi_{i,d,m,p}$ stands for the historical expected value of the i -th CRR for TOU p in month m and day d based on historical Day Ahead congestion prices from actual MRTU operation.

The summation through all CRRs for both TOUs in each CRR holder's portfolio is the Total CRR value (TCV) or net credit requirement; *i.e.*,

$$TCV^H = \max\left(0, \sum_{i,p} CR_{i,p}^H\right), \quad \forall H \quad (3)$$

If this value is negative, then the CRR holder's portfolio is expected to have an associated net positive congestion revenue stream and then the credit requirement for its holder is set to zero. These credit requirement values that will be passed on to CAISO's Finance.

3. Extraordinary Events

Given the complexity to define a priori what events can be defined as extraordinary, CAISO will communicate to market participants when an event is deemed to be extraordinary. At this time CAISO plans to develop methodologies that would be used for outages of either transmission or generation facilities that can be systematically reflected into the market outcome, and which are the circumstances likely to cause value of CRRs to change. Thus, the discussion will refer only

to extraordinary events that lead to planned or forced outages of elements of the system. Rather than describing the event per se, the goal is to define the events by their impact they may have on the system. The values of obligation-type CRRs are bidirectional entitlements for their holders to receive a revenue stream (Option side → Premium) or to pay a (negative) revenue stream (Obligation side → Liability). Such values are based on the congestion component of LMPs from the Day-Ahead Market (DAM) only, and more precisely from the Integrated Forward Market (IFM) only. If an extraordinary event only affects the Real-Time Market (RTM), there will be no impact on CRR values and therefore there is no need to reevaluate CRR credit requirements. The congestion component reflects the value of scarce transmission. Therefore, congestion revenues will be affected by changes on congestion prices which depend on the system congestion in the IFM market. System congestion is primarily driven by the economical bids and the condition of the transmission system, such as de-rates and outages. This confines the definition of an extraordinary circumstance as any event that alters the congestion of the system beyond typical patterns. For instance, a major outage due to fires can lead to atypical flow reversal or could dramatically exacerbate congestion in some areas of the system, which will alter the usual congestion pattern. In contrast, flow reversal, such as that on Path 15 during winter time may not be considered a trigger for the reevaluation of credit as this flow reversal is a common occurrence due to seasonal patterns, and CRRs already accommodate seasonality. Neither may typical de-rates or outages on transmission elements due to scheduled or forced² outages be a trigger for reevaluation as they are very frequent occurrence. Their inclusion would otherwise lead to a continuous re-evaluation of credit requirements, defeating the purpose of having the current credit requirement functionality.

Although with less probability of occurrence, outages of major generation facilities may be considered as well. For instance, the outage of a major generation facility might require other generation units to meet the demand and could change the pattern of congestion or highly exacerbate it in some areas even though there is no direct impact in the transmission system. It is also important to define the horizon and duration of an event to trigger the reevaluation; this will depend on whether the event is expected or unexpected, such as a planned or forced outage.

Unexpected Events with Short Duration

Because the approach for reevaluation is based on expected values of congestion prices, as described in subsequent sections, at least one –simulated or actual– MRTU IFM outcome needs to be available, which already reflects such an event. Unexpected but time limited events that do not impact the IFM outcome will not trigger the re-evaluation of credit. Furthermore, as

² Outages that are submitted with less than 72 hours notice prior to the start of the outage are considered Forced Outages.

congestion revenues accrue on a monthly basis and credit requirements apply for CRRs valid over the subsequent 12 months, the unusual variation within a single day may not meaningfully distort the final cumulative result. For instance, if there is a sudden loss of Path 15 at 1400hrs on July 13th and it is expected to return to service by 2300hrs on the same day, by the time this forced outage happens, the IFM for Trade Date (TD) of July 13th was already run on July 12th, and indeed the IFM for TD of July 14th was already run by 1300hrs on July 13th. Hence, such an outage will not be reflected in either IFM for TD of July 13th or 14th, even though it was an extraordinary event and impacted system. This outage, however, will be accommodated in the RTM of July 13th. Consequently, such outage will not impact congestion revenues for those days, as CRRs are settled only on IFM congestion prices, which is the premise for reevaluating credit requirements.

An unexpected event with duration across multiple days becomes an expected event in the IFM of the next trading days.

Expected Events

Planned outages will not be included in a Full Network Model (FNM) version used in the IFM until the outage is approved by the CAISO. Regarding the timing of changes to the FNM, all known approved transmission line outages or generator outages are updated in the FNM before the DAM opens. Generally, CAISO may make changes, under certain conditions, that result in an impact to the DAM due to a change in outage conditions after it opens. For further details please refer to the BPMs of both Outages and Market Operations.

For the case of expected events, such as scheduled maintenance of a significant transmission facility, CRR team will rely on outage information. CAISO will look ahead by generating IFM prices with the inclusion of the event and determine the change of credit requirement under such conditions, if any. A caution note on planned events is that they may be still subject to subsequent changes. It is important to note that certain planned events will be already accounted for in the monthly release of CRRs under the umbrella of the 30-day rule. This rule allows the CAISO to know the outages at least 30 days prior to the start of the calendar month for which the outage will occur so that this can be reflected in the network model used in the monthly process to release CRRs. The purpose of this procedure is to ensure revenue adequacy by controlling the transmission capacity released through CRRs, which is not in direct correlation to credit risk. Therefore, if an outage reported under the 30-day rule is classified also as an extraordinary event, it may also trigger the reevaluation of credit requirements³.

³ There may be a natural inclination to tie the outages of facilities that are considered under the 30-day rule with the classification of an extraordinary event. The 30-day rule defines the system facilities that may have an impact on

Another caution note on this approach is on the set of IFM prices to be used. At a minimum, one outcome of the IFM will be needed for reference. In the case of events lasting several days, the cumulative set of prices will be used to reflect more accurately the actual impact. Given the timeframe of an unexpected event, there may not be enough time to run simulations and generate multiple sets of IFM prices. For expected events, in contrast, there may be enough time to run several scenarios. Although the event can be unique, more than one set of daily prices (using different sets of IFM bids) may be needed to have a more statistically meaningful sample of prices, as it may happen that the market adjust on its own after some days when market participants change their bidding strategies under the new system conditions. This may be time consuming given all the work to setup and run IFMs. There is also the issue of determining what set of bids (historical bids used in previous days) would be more appropriate for use in simulations.

4. Reevaluation of Credit Requirements

With IFM congestion prices readily available reflecting the extraordinary event, from either actual operation or simulated scenarios depending on the horizon and nature of the event, expected CRR values ($\overline{\Psi}_{i,d,m,p}$) are determined based on the probability distribution of the congestion prices for the source-to-sink definition of each CRR. The expected value is calculated as the simple average of the source-to-sink differential of IFM congestion prices for each CRR.

Such expected values will be used to compute the credit requirements for each CRR holder. Notice that the expected value for all CRRs will be only valid/used for the period of days, Δ , in which the extraordinary event occurs. For any other day outside this period, the original auction price or expected values will still be used, following the standard computation of the CRR system. This can be hard coded in the manual computation of the reevaluation process as follows:

$$\overline{CR}_{i,p}^H = - \sum_{m=1}^{M_{i,p}} \sum_{d=1}^{D_{i,m,p}} \Omega_{i,d,m,p} MW_{i,d,m,p}^H + \frac{\sum_{m=1}^{M_{i,p}} \sum_{d=1}^{D_{i,m,p}} CM_{i,d,m,p}^{Daily} \times MW_{i,d,m,p}^H}{\sqrt{\sum_{m=1}^{M_{i,p}} D_{i,m,p}^H}} \quad (4)$$

congestion revenues. However, the premise of the outages under the 30-day rule is for revenue adequacy while the scope of the approach under extraordinary events is for changes in credit risk profiles.

where

$$\Omega_{i,d,m,p} = \begin{cases} \bar{\Psi}_{i,d,m,p} & \text{if } d \in \Delta \\ \lambda_{i,d,m,p} \text{ or } \Psi_{i,d,m,p} & \text{if } d \notin \Delta \end{cases} \quad (5)$$

This computation is equivalent to re-evaluating the credit requirement for the period of time in which the extra-ordinary event occurs.

When the credit requirements exceed the current posted collateral there may be a need to call for more collateral; if the reevaluation actually decreases the credit requirement, then the current credit requirement remains valid. The credit requirements for each CRR holder that will be passed on to Finance will be defined as:

$$TCV^H = \max(0, \sum_{i,p} CR_{i,p}^H, \sum_{i,p} \overline{CR}_{i,p}^H), \quad \forall H \quad (6)$$

where CR^H is the most current system-based credit requirement as defined in either Expression 1 (within the first year of MRTU operation) or Expression 2 (afterwards), and \overline{CR}^H is the most recent re-evaluation of credit requirements due to extraordinary circumstances as defined in Expression 4.

It is important to mention that this process is exclusively for a reevaluation of CRR credit requirements; it is not for ensuring revenue adequacy for CRRs. This process is to ensure CAISO correctly quantifies credit requirements so that participants have enough collateral to honor their CRR liabilities; thus, this process will only impact, in some instances, the amount of collateral CRR holders will need to post and will not alter the CRR holdings of participants on their own. In this context, there is a possibility that based on this reevaluation process, CAISO may make a request for additional collateral and if CRR holders cannot fulfill this requirement, CAISO will follow the standard process described in Section 12 of the MRTU Tariff.

Finally, given the inherent uncertainty on the data to compute credit requirements under extraordinary circumstances, the monitoring of congestion revenues for each CRR holder will be a companion measurement as it is the best indication of the evolution over time of the financial position of CRR holders.