CRR Enhancements

Jim Price, Lead Engineering Specialist,
Jim McClain, Sr. Market Design Specialist,
and Tom Cuccia, Sr. Stakeholder Engagement & Policy Specialist

CRR Enhancements Conference Call
Nov. 16, 2009
Meeting Objective

- To address refinements to the CRR Process

Issue categories:

- CRR-Related Credit Issues
  - Draft Final Proposal: CRR Credit Policy Enhancements
- Non-Credit Policy Issues
  - Straw Proposal: Revise load migration process, Revise modeling and treatment of trading hubs, Eliminate multi-point CRRs, Evaluate weighted least squares objective function, Refine tiers in monthly allocation
- Non-Credit Business Process Issues
  - Straw Proposal: Enable sale of CRRs in the CRR auctions
  - Process refinement: Tracking of Long Term CRRs, Developing “signature data” for the Priority Nomination Process
  - Future topic: Modeling approaches to reinforce CRR revenue adequacy
We are here for CRR-Related Credit Issues

1. Issue ID Paper
2. Straw Proposal
3. Final Draft Proposal

Board of Governors: December 2009

FERC
Implementation

Opportunities for Stakeholder Input
CAISO Stakeholder Process – CRR Enhancements – Non-Credit Issues

We are here for Non-Credit Issues

1. Issue ID Paper
2. Straw Proposal
3. Final Draft Proposal

Board of Governors: Early 2010

Opportunities for Stakeholder Input

FERC
Implementation
## CRR Non-Credit Related Issue Time Table

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity/Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 14</td>
<td>Publish Issue Paper</td>
</tr>
<tr>
<td>August 21</td>
<td>Stakeholder Conference call</td>
</tr>
<tr>
<td>August 28</td>
<td>Stakeholder Comments on Issue Paper</td>
</tr>
<tr>
<td>September 8</td>
<td>Stakeholder Meeting at CAISO</td>
</tr>
<tr>
<td>September 15</td>
<td>Stakeholder Comments following meeting</td>
</tr>
<tr>
<td>November 9</td>
<td>Straw Proposal on Non-Credit Issues</td>
</tr>
<tr>
<td>November 16</td>
<td>Stakeholder Conference call</td>
</tr>
<tr>
<td><strong>November 23</strong></td>
<td><strong>Stakeholder Comments on Straw Proposal</strong></td>
</tr>
<tr>
<td>December</td>
<td>Draft Final Proposal on Non-Credit Issues</td>
</tr>
<tr>
<td>December</td>
<td>Stakeholder Conference call</td>
</tr>
<tr>
<td>Early 2010</td>
<td>BOG Decision, FERC Filing</td>
</tr>
</tbody>
</table>
### Today’s Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 – 10:10</td>
<td>Intro &amp; Objective</td>
<td>Tom Cuccia</td>
</tr>
<tr>
<td>10:10 – 10:20</td>
<td>CRR-Related Credit Issues</td>
<td>Jim Price &amp; Shucheng Liu</td>
</tr>
<tr>
<td>10:20 – 11:00</td>
<td>Load migration process, Treatment of trading hubs, Weighted least squares objective function</td>
<td>Jim Price</td>
</tr>
<tr>
<td>11:00 – 11:45</td>
<td>Multi-point CRRs, Tiers in monthly allocation, Sale of CRRs in the CRR auctions, “Signature data”</td>
<td>Jim McClain</td>
</tr>
<tr>
<td>11:45 – 12:00</td>
<td>Questions, Next Steps</td>
<td>Jim Price &amp; Tom Cuccia</td>
</tr>
</tbody>
</table>
Proposed Enhancements for CRR Credit Policy

Jim Price, Ph.D., Lead Engineering Specialist, and Shucheng Liu, Ph.D., Principal Market Developer

CRR Enhancements Conference Call
November 16, 2009
Market operation experience and stakeholder feedback led ISO to consider three credit issues.

1. Implement CRR credit policy enhancements for required collateral for participation in CRR auctions
   - Summarized in next slide
   - To be presented to Board of Governors in December 2009

2. Define a process for re-selling CRRs of a defaulting CRR holder
   - To be considered in future

3. Establish the process for re-evaluation of holding credit requirements for extraordinary circumstances
   - Refined business process will be incorporated in BPM for CRRs through the BPM change management process.
Maximum credit exposure calculation is improved with the proposed method.

- The enhancements apply to the calculation of pre-auction credit requirement regarding:
  - Calculate maximum credit exposure of a CRR bid using the same MW value for the total credit requirement
  - Reduce pre-auction credit requirement for a negative-valued CRR bid, by excluding negative bid, but not the credit margin, in calculation
  - Use auction winning value to meet holding credit requirement for the CRR

- Benefits:
  - Improved efficiency of collateral usage
  - Reduced pre-auction credit requirement for some bids
  - No additional financial risk
Comparison of existing and proposed methods for pre-auction credit requirement calculation:

- **Existing method**

  \[
  \text{Pre - Auction Credit Requirement} = \max\left(\$500,000, \sum_{i} (\max(BidPrice_{i}, MW_{i}) + Credit\ Margin_{i} \times MW_{i})\right)
  \]

- **Proposed method**

  \[
  \text{Pre - Auction Credit Requirement} = \max\left(\$500,000, \sum_{i} \max(0, BidPrice_{i}, MW_{i}) + Credit\ Margin_{i} \times MW_{i}\right)
  \]

  where
  
  \[
  MW_{i} = \text{is the maximum MW value of the bid for } CRR_{i}
  \]
  
  \[
  MW_{i} = \text{the MW value within the range of the bid curve for } CRR_{i}, \text{ i.e., } 0 \leq MW_{i} \leq MW_{i}
  \]
  
  \[
  BidPrice_{i} = \text{the bid price ($/MW) corresponding to } MW_{i} \text{ on the bid curve for } CRR_{i}
  \]

  Minimum credit requirement in monthly auction is reduced from $500,000 to $100,000
Non-Credit Policy and Business Process Issues

Jim Price, Lead Engineering Specialist

and

Jim McClain, Senior Market Design Specialist

CRR Enhancements Conference Call
November 16, 2009

<table>
<thead>
<tr>
<th>Non-Credit Policy Issues</th>
<th>Non-Credit Business Process Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process for adjusting CRR holdings to reflect load migration</td>
<td>Sale of CRRs in the CRR auction</td>
</tr>
<tr>
<td>Method for handling trading hubs in the CRR release</td>
<td>Modeling to reinforce CRR revenue adequacy through transmission outage consideration (future)</td>
</tr>
<tr>
<td>Weighted least squares objective function</td>
<td>Tracking of long-term CRRs in the CRR system (process refinement)</td>
</tr>
<tr>
<td>Elimination of multi-point CRRs</td>
<td>Process for “signature data” in PNP (process refinement)</td>
</tr>
<tr>
<td>Refinement of tiers in monthly CRR allocation</td>
<td></td>
</tr>
</tbody>
</table>
**Issue:** Current process for transferring CRRs due to load migration between Load Serving Entities (LSEs) requires the ISO to handle data on retail end-use customers.

- Not otherwise the type of data for which the ISO is responsible for handling and processing.
- Data are confidential to entities who are not direct ISO market participants.

**Objective:** Revise process to avoid ISO handling of confidential retail end-use customer data.
Issue Paper Identified Initial Potential Solution

- **Alternative identified in Issue Paper:**
  - Initial processing of end-use customer data by utility distribution companies (UDCs), followed by re-allocation by ISO.

- **Stakeholder comments on Issue Paper:**
  - Current process, including roles & responsibilities, resulted from significant discussions between ISO and stakeholders. Potential revisions need adequate justification & discussion.
  - UDCs should provide load migration data and not be subject to disputes associated with ISO responsibilities.
  - ISO processing of data maintains quality control & independence.

- **Straw Proposal narrows the issue as it was described in Issue Paper**
Process in Straw Proposal Will Ensure Issues Are Addressed

- Established process consists of discrete steps:
  - Before accounting for load transfers between LSEs, UDCs calculate average demand per customer, by customer class. Then:
    1. UDCs send customer-specific load migration data to ISO. Using these data, the ISO (a) counts the customers per customer class that transferred between LSEs, then (b) calculates the net load migration between each pair of LSEs by multiplying the number of customers by the average demand, which was provided by UDCs.
    2. The ISO converts net migration from MW to percentages of LSE’s total demand, and calculates the appropriate transfers of CRRs between LSEs.

- Straw Proposal does not change the fundamental process
Straw Proposal divides Step 1 to align with UDC vs. ISO roles:

a) As retail distribution companies, UDCs will count the retail customers per customer class that transferred between LSEs, and send the count of customers to ISO.

b) Using these data, the ISO will then calculate the net wholesale-level load migration between each pair of LSEs (i.e., the wholesale market participants) by multiplying the number of customers by the average demand, which was provided by UDCs.

Step 2 is unchanged. The ISO converts net migration from MW to percentages of LSE’s total demand, and calculates the appropriate transfers of CRRs between LSEs.
Process in Straw Proposal Will Ensure Consistency of Business Processes

- ISO will ensure consistency of business processes as roles of ISO and UDCs change.
  - Consistency includes documentation of business process in CRR BPM.
  - UDC reporting of number of customers ensures consistency with UDCs’ calculation of average demand for customer classes.
  - ISO assisted UDCs in existing process, including prototype computer software, and will continue to assist as needed.

- Solution needs to address both ISO and stakeholder concerns.
  - Straw Proposal is an alternative between extremes of ISO receiving confidential retail data and UDCs independently processing migration data.
Topic: Revise Modeling and Treatment of Trading Hubs in CRR Allocation

- **Issue:** Current CRR allocation process results in holdings of many small CRRs, due to disaggregation of a nominated Trading Hub CRR into separate CRRs for each constituent PNode of the Trading Hub.

- **Objective:** Streamline allocation process by revising approach for allocating and tracking CRRs having a Trading Hub source or sink.
Straw Proposal Adapts an Alternative Proposed in a Stakeholder Comment.

- **Description:**
  1. Disaggregate Trading Hub nominations to constituent PNodes.
  2. Conduct Simultaneous Feasibility Test (SFT) to award constituent PNodes using current methodology, and award rebundled Trading Hub CRR as percentage of nomination.
  3. CRR awards also include counterflow CRRs to relieve any binding constraints, as the difference between SFT results and the PNodes’ shares of awarded Trading Hub CRRs.
  4. Eligibility for subsequent tiers is reduced by Hub Nomination less the counterflow CRRs.

- Trading Hub CRRs eligible for renewal in Priority Nomination Process. (Counterflow CRRs not renewable)

- ISO’s Straw Proposal will facilitate implementation by retaining existing SFT and adding post-processing.
### Example 1 Illustrates Simple Case Using Straw Proposal

#### Nomination & Current Method:
- LSE nominates CRR of 100 MW with Trading Hub as source and Default LAP as sink. CRR source disaggregates:
  - 20 MW @ PNode P1, 50 @ P2, 15 @ P3, 10 @ P4, 5 @ P5
- Binding constraint reduces CRR from P1 to 0 MW. [Assumption is no constraint to Default LAP.]
- Current method awards total 80 MW at P2 to P5, tracks 4 CRRs, and reduces LSE’s eligibility for Tier 2 by 80 MW.

#### Awards with Straw Proposal:
- Straw Proposal method awards 100 MW CRR with Trading Hub as source and Default LAP as sink. CRR source is re-aggregated:
  - 20 MW @ PNode P1, 50 @ P2, 15 @ P3, 10 @ P4, 5 @ P5
- LSE also receives 20 MW counterflow CRR from DLAP to P1.
- Method awards 100 MW from Trading Hub, tracks 2 CRRs, and reduces LSE’s eligibility for Tier 2 by 80 MW.
- If DLAP constrained @ 90% of nomination, LSE gets 90 MW Hub CRR and 18 MW counterflow CRR.
Implementation Isn’t Always So Simple (Example 2)

- Implementation adds a nuance: awarded CRRs are truncated to 0.001 MW.

<table>
<thead>
<tr>
<th>Source</th>
<th>Disaggregated Nomination</th>
<th>Allocated from SFT</th>
<th>Truncated Nomination</th>
<th>Truncated Result from SFT</th>
<th>Counterflow Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>.002</td>
<td>0</td>
<td>.002</td>
<td>0</td>
<td>.002</td>
</tr>
<tr>
<td>P2</td>
<td>.005</td>
<td>.005</td>
<td>.005</td>
<td>.005</td>
<td>0</td>
</tr>
<tr>
<td>P3</td>
<td>.0015</td>
<td>.0015</td>
<td>.001</td>
<td>.001</td>
<td>0</td>
</tr>
<tr>
<td>P4</td>
<td>.001</td>
<td>.001</td>
<td>.001</td>
<td>.001</td>
<td>0</td>
</tr>
<tr>
<td>P5</td>
<td>.0005</td>
<td>.0005</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>.01</td>
<td>.008</td>
<td>.009</td>
<td>.007</td>
<td>.002</td>
</tr>
</tbody>
</table>

Example assumes only P1 is affected by congestion, but truncation limits small awards. LSE requested 0.01 MW Hub CRR.

LSE receives 0.009 MW Hub CRR + 0.002 MW counterflow CRR.
Impact Is Not Limited to Small CRRs (Example 3)

Modify Example 1: SFT limits awards to DLAP by 1/11 of nomination, and limits P5’s CRR to 0.01% of disaggregated nomination.

<table>
<thead>
<tr>
<th>Source</th>
<th>Disaggregated Nomination</th>
<th>Allocated from SFT</th>
<th>Adjusted Nomination</th>
<th>Truncated Result from SFT</th>
<th>Counterflow Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>20</td>
<td>18.1818</td>
<td>18.181</td>
<td>18.181</td>
<td>0</td>
</tr>
<tr>
<td>P2</td>
<td>50</td>
<td>45.4546</td>
<td>45.454</td>
<td>45.454</td>
<td>0</td>
</tr>
<tr>
<td>P3</td>
<td>15</td>
<td>13.6364</td>
<td>13.636</td>
<td>13.636</td>
<td>0</td>
</tr>
<tr>
<td>P4</td>
<td>10</td>
<td>9.0909</td>
<td>9.090</td>
<td>9.090</td>
<td>0</td>
</tr>
<tr>
<td>P5</td>
<td>5</td>
<td>.0005</td>
<td>4.545</td>
<td>0</td>
<td>4.545</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>86.3641</td>
<td>90.906</td>
<td>86.361</td>
<td>4.545</td>
</tr>
</tbody>
</table>

Congestion to DLAP limits P1 to P4 at 90.909% of nomination, and limits P5. “Adjusted Nomination” is 90.909% of disaggregated nomination, then truncation limits nomination to 90.906 MW.

LSE receives 90.906 MW Hub CRR + 4.545 MW counterflow CRR.
**Topic:** Implement Weighted Least Squares Objective Function

- **Issue:** Current CRR allocation software does not equitably distribute the reduction from CRR allocation requests among participants. Software now uses the most effective nominated CRR to mitigate congestion in the simultaneous feasibility test, to maximize release of CRRs.

- **Objective:** Balance equity with maximum CRR release.

- **Proposal** remains under consideration:
  - Implement weighted least squares (WLS) CRR optimization algorithm to balance equity with maximum CRR release.
WLS Balances Award Reductions Among CRR Nominations

- Examples in Straw Proposal compare details of proposal and existing method. To compare highlights, assume:
  - Two resources as in Section 4.2.4, Table 3: CRR1 nominates 100 MW with shift factor (SF) on binding constraint = 0.5. CRR2 nominates 50 MW with SF on binding constraint = 0.2.
  - Equal weights, to balance reductions of awards. (Final weights to be established in BPM.)

- “Max CRR” objective function maximizes CRR awards.
  - Most effective reduction is reduced to relieve constraint.

- WLS objective function finds least squares of award reductions.
  - As math in Section 4.2.4 shows, the reductions are balanced using shift factors: 17.24 MW reduction for CRR1, 6.9 for CRR2.
Stakeholder Comments Generally Support Implementing WLS

- Multiple comments support WLS objective function.
- Coordinate WLS with changes to monthly allocation tiers, elimination of multi-point CRR, and revision of Trading Hub CRRs.
  - Examples in Straw Proposal show distribution of constraint management among nominations.
  - Retaining Tier 2 in monthly allocation allows opportunity to nominate alternative sources.
- Issue: At some point, ISO will consider Auction Revenue Rights and other auction enhancements, and needs to be sure interim benefits of WLS justify its implementation cost.
**Topic:** Elimination of Multi-Point CRRs

- **Issue:** To implement new enhancements to the CRR system it is necessary to build in dual functionality for PTP and MPT CRRs. This adds complexity and cost to the enhancements and to the maintenance of the CRR system.
  - Only .7% of 2009 CRR nominations were awarded using the MPT function and the majority of awards were for priority 1.

- **Objective:** Ease the cost and implementation of the sell feature, WLS and all future functionality.
Elimination of Multi-Point CRRs without elimination of monthly tiers

- Based on comments received the CAISO proposes moving forward with removing the MPT function while retaining both tiers of the monthly process, with modifications that are discussed later in this presentation.

- In order to ease the cost and implementation of the various enhancements that are being discussed the MPT function would be removed.
Topic: Refinement of Tiers in Monthly Allocation

- **Issue:** Current monthly CRR process has two allocation tiers plus the auction. CRR participants have asked for a decrease to the monthly process but the current calendar does not have any slack.

- **Objective:** Look at reducing the amount of time required by CRR participants as well as the CAISO to perform the monthly CRR Allocation.
Stakeholders were not supportive of single tier Monthly CRR Allocation

- Following the comments received the CAISO is proposing to retain both tiers of the monthly allocation process but modify some of the rules.

- The rules to be modified include:
  - Allow Sub-LAPs in both tiers of the monthly allocation
  - Allow 100% of monthly eligible quantity, less previously awarded CRRs for the same period, be available starting with tier 1
**Topic: Sell Feature in Auction**

- **Issue:** CRRs cannot be sold directly into the auction. In order to liquidate a position CRR Holders must either buy counter-flows or attempt to sell in the SRS.

- **Objective:** Provide a mechanism by which CRRs acquired in the auction or allocation can be sold directly into the auction.
Stakeholders generally supported Sell Feature in Auction but requested more details

- All comments received were in general support of this issue. In the current straw proposal on non-credit issues we have provided some details that were requested by stakeholders.
  - Allocated CRRs could be sold but the LSE would be required to fulfill the same requirements as if it had been traded through the SRS
  - Negative valued CRR sales, meaning the CRR Holder would pay to “sell” these CRRs would require collateral.
  - As the final rules are determined through this stakeholder process the CAISO will ensure they are implemented accordingly in the CRR system
**Topic:** Modeling Approaches to Improve Revenue Adequacy

- **Issue:** Initial months of the new market reflected the impact that outages had on CRR revenue adequacy. Based on this initial history the CAISO would like to discuss ways to improve the modeling of scheduled outages and accounting for un-scheduled outages.

- **Objective:** The CAISO was going to discuss this issue once we had gathered one year of data but this process provides a good forum for discussing options.
Hold off on discussion of modeling approaches to improve revenue adequacy until data is available

- Stakeholders requested more data on which to base discussions
- When the CAISO has gathered more operational data, at least 12 months, we will re-visit this issue with stakeholders.
**Topic:** Tracking of Long Term CRRs

- **Issue:** Current software provides for a single seasonal release of CRRs. When the LT SFT is run, for each season and TOU, the awarded CRRs are actually for nine years in addition to the one year annual awards, for a total of ten years but the awarded CRRs are only visible for a single year. CRR participants have requested the CAISO provide a solution to this issue. This is mainly an administrative issue that we have a solution for until such time as we can start working on the multi-period function (not to be confused with multi-point CRRs).

- **Objective:** To have all years of the LT CRR visible in the CRR system. The CRR vendor is working on a replication feature that can be used to create the additional years of CRRs. This function should be available later this year.
The CAISO has previously described the current software limitation that provides for a single seasonal release of CRRs.

The ability to replicate these awarded CRRs for the entire LT period is an administrative issue associated with the limitation in the CRR system to easily replicate the LT CRRs.

After explaining the issue and hearing no further questions or concerns the CAISO will be implementing this process within the next couple of months.
Current CAISO tariff section 36.8.3.5.1 describes the process by which signature data is determined for use in the PNP.

A technical bulletin was also posted on this process, which can be found at: http://www.caiso.com/2425/2425f3d85a760.pdf

During the PNP process a concern was raised that the signature data should exclude any portion of the PNP awards that were extended for LT CRRs.

A stakeholder submitted a suggestion that this forum could be used to discuss possible modifications to this language.