Business Practice Manual for Congestion Revenue Rights

Version 3029

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Approval History

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Revision History

Version	PRR	Date	Description
30	1520	10/20/2023	PRR 1520: 1. Update language for section 15: Process for Handling Disconnected PNodes for CRR Purposes
29	1487	12/08/2022	PRR 1487: 1. Add numerical examples for credit holding requirement calculation in Attachment H. 2. Update the description of $D_{i,m,p}$ in the credit holding requirement formula for clarity. 3. Format Attachment H. 4. Format Attachment K table. 5. Remove and update language on 30 day advance publication of allowable Source and Sink list 6. Remove language on Point-to-Point priority weights in the objective function calculation
28	1388	9/10/2021	PRR 1388: 1. Add language for Market User Interface data retention.
27	1240		PRR 1240: 1. Update language for forecast and historical load to include communication practices and deadlines for Market participants regarding resubmission. 2. Update available Source/Sink posting language to match current processes 3. Added clarifying language on how CRR options are handled in Attachment 'J'
26	1223	01/16/2020	PRR 1223:

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Version	PRR	Date	Description
			1. Update language in Attachment 'J' to reflect changes to data provided for CRR partial funding settlement validation due to CRR Transparency project
25	1217	11/22/2019	PRR 1217: 1. Language to clarify 24 hour outage rule 2. Added examples for SEQ, sink upper bound data 3. Updates related to CRR partial funding changes 4. Clarify sell offer credit requirements 5. Miscellaneous edits
24	1134	2/1/2019	PRR 1134: 1. Language to describe GCARM methodology in the CRR SFT
23	1105	10/26/2018	PRR 1105: 1. Move Settlement Rule language from the BPM for Market Operations to the BPM for Congestion Revenue Rights. 2. Add new attachment to describe the settlement changes associated with CRR 1B changes from full funding to partial funding 3. Update capacity release amount for annual CRR process from 75% to 65%
22	1083	10/23/2018	PRR 1083: 1. Added CRR 1A language for sell feature and Source sink limitations 2. Update to annual outage timeline 3. Provided language about how the Reliability Network Upgrade process will work with the CRR Merchant Transmission process
21	999	7-25-2017	PRR 999: General language cleanup and trading hub retirement process
20	934	8-25-2016	PRR 934: Add clarification to re-nomination of expiring long-term CRRs
19	908	8-4-2016	PRR 908: Add a section on adjustment of transmission constraints
18	774	11-1-2014	PRR 774: Add a section on modeling of the loop flow
17	773	8-28-2014	PRR 773:

Version	PRR	Date	Description
			Application of break-even methodology to internal transmission elements
16	692	12-20-2013	PRR 692: 1. Added language addressing new CRR Type – MT_TOR
15	679	10-10-2013	PRR 679: 1. Update old URLs.
14	634	12-3-2012	PRR 634: 1. Update language to reflect reference to circular schedule impact
13	595	11-8-2012	PRR 595: 1. Update Access to CRR Full Network Model 2. Update Load Migration & Adjustment to Load Data 3. Update CRR Load Metric & CRR Eligible Quantity 4. Update Annual Allocation of Seasonal and Long Term CRRs 5. Update Priority Nomination Process 6. Update Load Migration Reflected in Annual Allocation Process 7. Update Monthly CRR Eligible Quantity 8. Update criteria for adding new resources 9. Update SRS reporting requirements
12	569	08-15-2012	PRR 569: 1. Remove 'Converted Rights' and CVR. 2. Add more details on credit margin process in attachment G. 3. Clarification language for CRR holding credit requirement calculation in attachment H. 4. Updated CRR training section. 5. Added explanation of the ISO process for remapping retired pricing nodes locations at which CRRs are define.
11	548	06 – 10 - 2012	Updates to reflect name changes for TTC and OTC and changes from the CAISO to the ISO (PRR 548).
10	476	07-25-2011	Updates to reflect editorial corrections and the adjustments made based on the 2011 CRR enhancements process, such as: 1. PNP modification 2. Reconfiguration of annual CRRs due to topology changes

Version	PRR	Date	Description
			3. Auction clearing price clarification 4. Credit requirements for Load Migration 5. Clarification that only fully registered CRR Holders will receive Load Migration CRRs 6. Disconnected PNodes now mapped to CRR biddable PNodes 7. GMC charges 8. Addition of revenue adequacy break-even process for the annual CRR process and how monthly limits will be set
9	383	03-24-2011	Updates to attachment H to more clearly describe the process by which the credit requirement for an auction bid is calculated.
8	348	01-21-2011	Updates on convergence bidding
7	347	12-1-2010	Updates to broken links and Revision to reflect the following CRR enhancements: 1) Removal of multi-point CRR functionality 2) Implement Weighted Least Squares optimization for the CRR Allocation 3) Modify the methodology for allocating CRRs nominated at the Trading Hub 4) Credit and collateral updates 5) Load migration process 6) Annual and monthly allocation rule changes, including use of SLAPs, PNP signature data, and MEQ values 7) Removal of language related to CRR Year One activities 8) Clarification of the CRR “sale” process
6	153/154/ 155	2-23-2010	Revision to clarify business processes associated with: 1) OBAALSE Eligible Quantity (EQ) calculations. Moved original section 7.1.3 from the internal LSE section to section 12 for OBAALSEs. Language was modified to clarify the process for determining EQ values for OBAALSEs (PRR 155) 2) Process to reevaluate CRR Credit Requirements under Extraordinary Circumstances (PRR154) 3) The elimination of Pre-Auction bid path submission requirements (PRR154) 4) Clarification of PNP validation data preparation (PRR

Version	PRR	Date	Description
			155) 5) Disconnected PNodes (PRR153) 6) Clarification of Load Migration exclusion (PRR 155) 7) Clarification of using SRS to sell a CRR (PRR 155)
5	17	3-11-2009	Revision to account for policy enhancements associated with: 1) Monthly Process 2) Credit Calculation 3) 30-day Outage Rule 4) Access to CRR FNM 5) Timeline for finalizing market input data 6) IBAA Election 7) Bid Submission for Monthly and Annual Processes
4	17	9-5-2008	Revision to account for changes due to FERC March 31, 2008 Order and revision to account for policy enhancement associated with Stakeholder Discussion of CRR Year 2 Process and CRR Issues, Tariff Filing on May 30, 2008, and CRR White Paper issued on August 6, 2008. Changes are as follows: 1) OCALSE to OBAALSE 2) Historical Load for OBAALSE 3) Training 4) Source Verification process 5) Seller's Choice contracts 6) Eligible LSEs without Verifiable Load Forecast 7) Load Migration 8) Data Flow for Annual Allocation Process 9) Annual Outages 10) PNP for Years after CRR Year One 11) Calculating CRR Auction prices 12) Binding Constraints Clearing Prices in Auction 13) Monthly Outages and 30-day Rule 14) Forecast Load Methodology 15) Merchant Transmission CRRs 16) APNode Name Change 17) Calculation and Use of Congestion Revenue Rights Credit Margin Data
3	17	11-15-2007	Revision to account for policy enhancements associated with:

Version	PRR	Date	Description
			1) Miscellaneous tariff reference clean-up 2) Training 3) Seller's Choice contracts 4) Notification of allowable sources 5) ETC/CVR Waiver process 6) Forecast load process 7) Load migration 8) LT nomination process 9) Trading Hub surrogation 10)How multi-point CRRs are handled in the CRR Allocation 11)Process for reporting exceptions to 30 day outage rule
2	17	07-23-2007	Revision to account for changes due to FERC July 6, 2007 Order and stakeholder process dealing with Load Migration, Outages and forecast Load methodologies
1		06-07-2007	Revision after Stakeholder Discussion of CRR Issues and Tariff filing on May 7, 2007

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List of Exhibits:

1. Introduction

In this Introduction you will find the following information:

- The purpose of ISO BPMs
- What you can expect from this ISO BPM
- Other ISO BPMs or documents that provide related or additional information

1.1 Purpose of ISO Business Practice Manuals

The Business Practice Manuals (BPMs) developed by ISO are intended to contain implementation detail, consistent with and supported by the ISO Tariff, including: instructions, rules, procedures, examples, and guidelines for the administration, operation, planning, and accounting requirements of ISO and the Markets. Each Business Practice Manual is posted in the BPM Library at: http://bpmcm.caiso.com/Pages/BPMLibrary.aspx. Updates to all BPMs are managed in accordance with the change management procedures included in the **BPM for Change Management**.

1.2 Purpose of this Business Practice Manual

The purpose of this *BPM for Congestion Revenue Rights* is to provide detail to understand how the Congestion Revenue Rights (CRR) Allocation, Auction, and Secondary Registration System processes work. This BPM should be used in conjunction with the ISO Tariff and other training materials to provide Market Participants with the necessary information for understanding and participating in the CRR processes.

This BPM benefits readers who want answers to the following questions:

- What is a CRR?
- How are CRRs created?
- How are TORs and ETCs treated with respect to the allocation of CRRs?
- How are CRRs acquired through the allocation process?
- How are CRRs acquired through the auction process?

- How are trades of CRRs registered on the ISO Secondary Registration System?

Although this BPM is primarily focused on CRRs, certain other provisions related to CRRs are covered in other BPMs. Where appropriate, the reader is directed to these BPMs for additional information.

The provisions of this BPM are intended to be consistent with the ISO Tariff. If the provisions of this BPM nevertheless conflict with the ISO Tariff, the ISO is bound to operate in accordance with the ISO Tariff. Any provision of the ISO Tariff that may have been summarized or repeated in this BPM is only to aid understanding. Even though every effort will be made by ISO to update the information contained in this BPM and to notify Market Participants of changes, it is the responsibility of each Market Participant to ensure that he or she is using the most recent version of this BPM and to comply with all applicable provisions of the ISO Tariff.

A reference in this BPM to the ISO Tariff, a given agreement, any other BPM or instrument, is intended to refer to the ISO Tariff, that agreement, BPM or instrument as modified, amended, supplemented or restated.

The captions and headings in this BPM are intended solely to facilitate reference and not to have any bearing on the meaning of any of the terms and conditions of this BPM.

1.3 Purpose & Definition of CRRs

CRRs are financial instruments that enable holders of such instruments to manage variability in Congestion costs that occur under Congestion Management protocol that is based on locational marginal pricing. CRRs are acquired by qualified entities primarily, but not solely, for the purpose of offsetting costs associated with IFM Congestion costs that occur in the Day-Ahead Market. They can also be used for other legitimate activities, many of which will increase the liquidity of the CRR market. Only CRR Obligations can be acquired through the CRR Allocation and CRR Auction processes. CRR Options are not available through the CRR Allocation and CRR Auction processes and are only available for Merchant Transmission Facilities.

There are two types of CRRs: CRR Obligations and CRR Options:

- **CRR Obligation** – A CRR Obligation entitles its holder to receive a CRR Payment if the Congestion in a given Trading Hour is in the same direction as the CRR Obligation, and requires the CRR Holder to pay a CRR Charge if the Congestion in a given Trading Hour is in the opposite direction of the CRR. CRR Payments to CRR Holders of CRR Obligations are based on the per-MWh cost of Congestion, which equals the positive amounts of Marginal Cost of Congestion (MCC) at the CRR Sink minus the MCC at the CRR Source multiplied by the MW quantity of the CRR. CRR Charges for CRR Obligations associated with Congestion in the

opposite direction are based on the negative amounts of the difference in MCC between the CRR Sink and CRR Source.

- **CRR Option** – A CRR Option entitles its Holder to a CRR Payment if the Congestion is in the same direction as the CRR Option, but requires no CRR Charge if the Congestion is in the opposite direction of the CRR (See ISO Tariff § 36.2.2). CRR Payments to CRR Holders of CRR Options are based on the per-MWh cost of Congestion, which equals the positive amounts of Marginal Cost of Congestion (MCC) at the CRR Sink minus the MCC at the CRR Source multiplied by the MW quantity of the CRR. There are no CRR Charges associated with Congestion in the opposite direction of CRR Options.

All CRRs held by CRR Holders are settled with revenue collected in the IFM Congestion Fund. (See ISO Tariff § 11.2.4.4) In the hourly settlement of CRRs, through the IFM Congestion Fund. With the change from full funding to partial funding, as described in Attachment J of this BPM all CRRs, both obligations and options, can be adjusted due to revenue shortfalls from the Day Ahead Market congestion rents. In the allocation of the Monthly CRR Congestion Fund there is an exemption for Measured Demand that is associated with TOR or ETC schedules as outlined in section 11.2.4.4.3 of the ISO Tariff.

CRR Obligations can be acquired as Point-to-Point (PTP) CRRs. A PTP CRR is a CRR Obligation defined from a single CRR Source to a single CRR Sink (See ISO Tariff § 36.2.3).

The Settlement calculations for buying and holding CRR Obligations and Options are described in ISO Tariff § 11.2.4, CRR Settlements. As part of the Convergence Bidding and circular scheduling processes there can be implications to the Settlement of CRRs. For more information related to how the Settlement of CRRs could be impacted by Convergence Bidding and circular scheduling please refer to the BPM for Market Operations.

There are four terms for CRRs (See ISO Tariff § 36.3.2):

Monthly CRR – A CRR acquired for one calendar month. Monthly CRRs are made available on a TOU basis.

Seasonal CRR – A CRR acquired through the annual CRR Allocation or CRR Auction process that has a term of one season and either on or off peak. For the purpose of the CRR processes, a season is defined as follows: season 1 is January through March, season 2 is April through June, season 3 is July through September and season 4 is October through December.

Long Term CRR – One of the tiers in the annual allocation process is the Tier LT. Long Term CRRs have a term of 10 years and are allocated on a seasonal/TOU basis.

Merchant Transmission CRR – The Merchant Transmission CRR has a term of 30 years or the pre-specified intended life of the facility, whichever is less. The acquisition of the Merchant Transmission CRR is performed through a separate process that is described in section 14 of this BPM.

1.4 Overview of Processes for Creation & Acquisition of CRRs

The following processes exist for the creation and acquisition of CRRs:

- CRRs are created by ISO through the CRR Allocation and CRR Auction processes and through the allocation of Merchant Transmission CRRs (See ISO Tariff § 36.11).
- Only internal LSEs and Qualified Out-of-Balancing Authority Area Load Serving Entities (Qualified OBAALSEs) that meet the requirements specified in Section 3.3 of this BPM can participate in the CRR Allocation (See ISO Tariff § 36.8).
- After the annual (including the Long Term CRR Allocation process) and monthly CRR Allocation processes there will be an annual and monthly CRR Auction for any entity interested in acquiring CRRs that are qualified as either a Candidate CRR Holder or are CRR Holders already. (See ISO Tariff § 36.13). The annual auction will not include the auction of Long Term CRRs.
- There is a separate process that allocates CRRs to Project Sponsors of Merchant Transmission Facilities that is discussed in more detail in section 14 of this BPM and in ISO Tariff § 36.11.
- Parties may also acquire CRRs from CRR Holders through the Secondary Registration System (SRS) through which CRRs are traded bilaterally.
- Transferees must also qualify as Candidate CRR Holders (go through registration and meet requirements as listed in Section 3 of this BPM) prior to acquiring CRRs.

1.5 References

The definition of acronyms and words beginning with capitalized letters are given in the *BPM for Definitions & Acronyms*.

Additional information that specifically pertains to CRRs is contained in the following documents:

- CRR Market User Interface (this document is made available to all attendees of the MUI training class)
- BPM for Candidate CRR Holder Registration

- BPM for the Full Network Model
- BPM for Settlements and Billing
- BPM for Market Operations
- BPM for Market Instruments
- BPM for Credit Management
- BPM for Definitions and Acronyms
- ISO Credit Policy & Procedures Guide
- ISO Tariff

2. CRR Communication

In this section you will find the following information:

- Who to call if there is a CRR-related issue
- How to contact the ISO CRR team for CRR Allocation and Auction and Secondary Registration System related activity
- The requirements for digital certificates

2.1 Contact for CRR Related Issues

Any questions or concerns regarding CRRs or the CRR system should be forwarded to the ISO Help Desk. They will determine the appropriate group to address the issue. The ISO Help Desk can be contacted by calling 1-888-889-0450.

Technical and proprietary questions and/or issues should be sent to crrdata@caiso.com.

2.2 System Requirements

The ISO CRR system is a secure web-based software system operated by ISO that is accessed via a secure web-browser. The CRR system can be accessed via the ISO portal with a digital certificate using Internet Explorer version 11, Chrome or Firefox.

2.3 Digital Certificates

All CRR users wanting to access the CRR system must complete the CRR registration process as described in the BPM for Candidate CRR Holder Registration, which can be found at: https://bpm.caiso.com/bpm/bpm/list (See ISO Tariff §§ 4.10 and 36.5). As part of the CRR registration process an Application Access Request/Change Form (AARF) will need to be completed, which will allow access to the CRR system via the ISO portal. Prior to the ISO issuing the digital certificate the Candidate CRR Holder must have completed all of the necessary steps for registration. This form can be found at:

http://www.caiso.com/pubinfo/info-security/certs/index.html

This completed form is sent to certrequest@caiso.com. If the entity requesting a digital certificate is not a registered entity with ISO, then an authorized representative must contact Client Relations at 916-608-1246 or visit the ISO Website below to register and qualify as a Candidate CRR Holder entity that can transact business with ISO.

http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx

Consistent with ISO Tariff § 36.5, it is not a requirement that a CRR Holder or Candidate CRR Holder be a Scheduling Coordinator but it must be registered with the ISO.

3. Registration & Qualification of Candidate CRR Holders

In this section you will find the following information:

- How to begin the CRR system registration process
- What financial information must be provided
- What are the creditworthiness requirements

This section does not address how Candidate CRR Holders or CRR Holders further qualify for CRR Allocation: this topic is covered in Section 5 of this BPM.

3.1 Registration Requirements

Prior to being given access to the CRR system, all entities requesting access must complete the registration and qualification process with ISO, regardless of whether they wish to acquire CRRs by CRR Allocation, CRR Auction, or the Secondary Registration System (See ISO Tariff §§ 4.10 and 36.5). If the entity is already a certified Scheduling Coordinator (SC) it may have already completed part of the registration process. Any entity wishing to qualify as a Candidate CRR Holder and to access the CRR system must first complete the CRR registration application form and the information sheet for the CRR Entity Agreement, which are contained in the BPM for Candidate CRR Holder Registration located at:

http://bpmcm.caiso.com/Pages/BPMLibrary.aspx. The BPM for Candidate CRR Holder Registration describes the registration process, which includes submission of financial information, Business Associate ID (BAID) assignment and completion of the CRR Holder Affiliate information. All of the necessary registration forms can be found at the above URL.

3.2 Financial Information

As part of the registration process, each entity that intends to hold CRRs through the CRR Allocation, CRR Auction, or the Secondary Registration System must provide financial information that helps demonstrate its ability to accommodate the financial responsibility associated with holding CRRs.

All CRR Holders and Candidate CRR Holders must comply fully with all creditworthiness requirements as provided in ISO Tariff § 12 and the BPM for Credit Management.

3.2.1 Credit Requirements for CRR Auctions

To establish available credit for participating in any CRR Auction, each Candidate CRR Holder must provide security in a form consistent with ISO Tariff § 12 and the BPM for Credit Management. .

3.2.2 Credit Requirements for Holding CRRs

Market participants must maintain sufficient collateral to hold their allocated and awarded CRRs. The collateral associated with CRR ownership is comprised of four components:

- Collateral related to transactions for past Trading Days
- Collateral related to future Trading Days
- Collateral related to completion of SRS trades
- Collateral related to bidding in a CRR Auction

See Attachment H and the BPM for Credit Management for further details related to CRR credit.

3.3 Confirmation & Verification of Specific LSE Status for CRR Allocation Eligibility

As stated in ISO Tariff § 36.8, CRRs will be allocated to Load Serving Entities (LSEs) serving Load internal to the ISO Balancing Authority Area and to Qualified OBAALSE. Any entity that wishes to participate in the CRR Allocation process must provide information that demonstrates that it has an obligation to serve Load (See ISO Tariff § 36.8.2). For entities serving Load internal to the ISO Balancing Authority Area, examples of the information that could be submitted include Settlement Quality Meter Data or documents filed with the California Energy Commission. Qualified OBAALSEs should follow the rules outlined in Section 12 of this BPM for their legitimate need showing and any other requirements that apply specifically to OBAALSEs (See ISO Tariff § 36.9).

3.4 Training Requirements

CRR Holders and Candidate CRR Holders must attend an ISO CRR training class at least once prior to participating in the CRR Allocations, CRR Auctions or Secondary Registration System (See ISO Tariff § 36.5.2). Unless granted a waiver by the ISO, Candidate CRR Holders and CRR Holders shall at all times have in their employment a person, or have obtained the services of a third party or consultant, that has attended the ISO's CRR training class. Such requests for waiver will be considered by the ISO on a case-by-case basis. Additionally, Candidate CRR

Holders and CRR Holders are obligated to notify the ISO as soon as practicable if they no longer either: (1) employ a person who has attended an ISO CRR training class; or (2) retain the services of a consultant or third party who has attended an ISO CRR training class. The training class will be given by the ISO on the operation of the CRR Market User Interface (MUI) as well as CRR basics and CRR Allocation, CRR Auction and SRS rules. Since digital certificates are issued to specific individuals on behalf of the entity they work for, initially it is the individual or individuals attending the training that will be issued the digital certificate. For purposes of issuing digital certificates, it is the intent that once an employee, third party contractor or consultant has been trained at the ISO that this training would then be passed on to other employees, third party contractors or consultants of the company, who would then be eligible to receive a digital certificate to access the CRR system. ISO can update training requirements annually or on an as-needed basis. If an employee, third party contractor or consultant leaves a company, the ISO should be notified so that this certificate can be revoked.

3.5 Access to CRR Full Network Model

Market Participants and non-Market Participants may request access to the CRR FNM by meeting the criteria and following the process set forth in Tariff Section 6.5.1.4. In order to gain access to the CRR FNM, each Market Participant and non-Market Participant will need to execute a Non-Disclosure Agreement with the ISO and may be required to provide other information as described in that tariff provision. Upon receiving the supporting documentation for the request, the ISO will notify the requesting party whether the requirements in Tariff Section 6.5.1.4 have been met. If access is approved, each Market Participant and non-Market Participant will access the CRR FNM data via the CRR FNM SharePoint site on the Market Participant Portal (MPP) at https://portal.caiso.com/crrfnm/default.aspx . To establish this access, each Market Participant and non-Market Participant will need to establish a User Access Administrator (UAA) and the UAA will need to submit a User Application Access Request Form (AARF) for each authorized individual to gain access to the CRR FNM SharePoint site. The estimated time to for receiving a digital certificate is approximately ten (10) Business Days. Additional information can be obtained at: http://www.caiso.com/pubinfo/info-security/certs/index.html

4. CRR Allocation & CRR Auction Timeline

In this section you will find the following information:

- The calendar of annual events related to CRR Allocations and CRR Auctions

4.1 Yearly Calendar of Allocations & Auctions

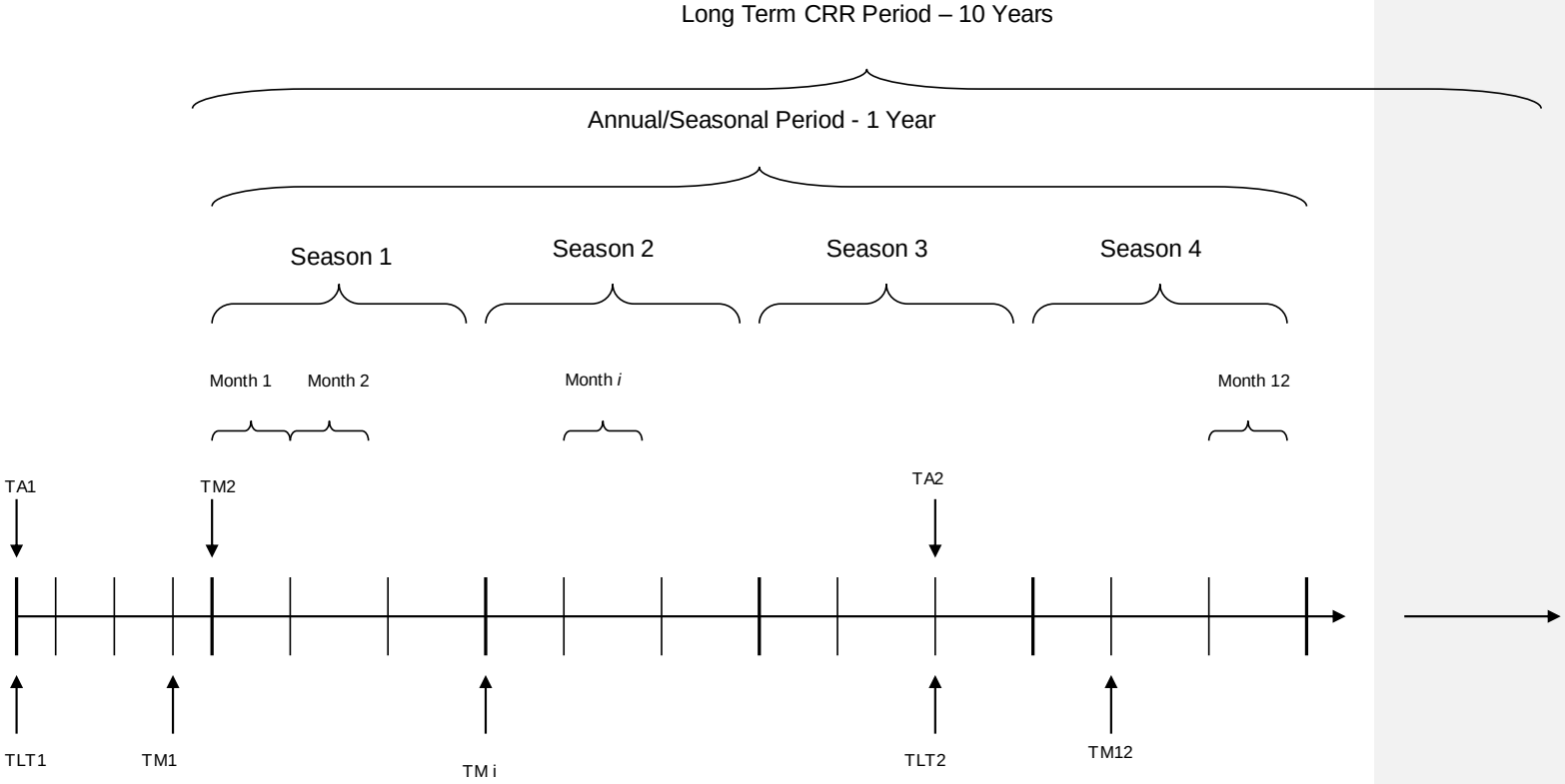
ISO conducts an annual CRR Allocation and CRR Auction once a year. The annual CRR Allocation and CRR Auction release Seasonal CRRs for four seasonal periods and two time-of-use periods, on peak and off peak. These seasonal/TOU periods coincide with the calendar quarters (season 1 – January through March, season 2 – April through June, season 3 – July through September, and season 4 – October through December). The time-of-use periods are described in Attachment A of this BPM. Part of the annual CRR Allocation process includes the release of Long Term CRRs (i.e. Tier LT), which if an entity chooses to participate in, provides the ability to obtain allocated CRRs for a period of ten years. The Long Term CRRs are also allocated based on the four seasonal and two time-of-use periods mentioned above. As required by §§ 36.8.2.2 and 36.13 of the ISO Tariff, ISO will also conduct monthly CRR Allocations and CRR Auctions twelve times a year in advance of each month. Within each annual and monthly CRR Allocation and CRR Auction process, ISO performs distinct processes for each on-peak and off-peak period.

Each CRR Allocation process is based on nominations submitted to ISO by LSEs or Qualified OBAALSES eligible to receive CRRs. A general timeline of the CRR Allocation and CRR Auction processes is given below. The ISO will post the specific timelines each year no later than June 30 of each year.

4.2 Allocation & Auction Timeline

The annual and monthly CRR Allocation and CRR Auction timeline is illustrated in Exhibit 4-1.

Exhibit 4-1: Annual, Long Term and Monthly CRR Allocation & Auction Timeline



The timeline is comprised of repeated steps starting with the annual process and month 1 for the monthly process:

- **TA1 & TLT1** – Approximately four months before the start of the each applicable CRR year, the annual CRR Allocation/Auction process begins, which produces on-peak and off-peak, Seasonal CRRs for seasons 1, 2, 3, and 4. During Tier LT of the annual allocation process Long Term CRRs will be allocated for the duration of 10 years.
- **TM1** – Approximately six weeks before the start of the first month (month 1), the monthly process begins, which produces on and off-peak Monthly CRRs for month 1.
- **TM2** – Approximately six weeks before the start of the second month (month 2), the monthly process begins, which produces on and off-peak Monthly CRRs for month 2.
- **TMi** – Approximately six weeks before the start of the i^{th} month (month i), the monthly process begins, which produces on-peak and off-peak Monthly CRRs for month i.
- **TM12** – Approximately six weeks before the start of the 12th month (month 12), the monthly process begins, which produces on-peak and off-peak Monthly CRRs for month 12.
- **TA2 & TLT2** – Approximately four months before the start of the second year, the annual CRR Allocation/Auction process begins, which produces on-peak and off-peak Seasonal CRRs for seasons 1, 2, 3, and 4. Tier LT2 and all subsequent Long Term CRR allocation processes will be run after the completion of the Priority Nomination Tier.
- The Merchant Transmission CRR Allocation process will be performed on an as-needed basis during the respective month in which the Merchant Transmission Facility is put into operation.

4.3 Key Steps Performed in the CRR Allocation & Auction Processes

This section is intended to provide the readers of this BPM with an overview of the key steps that are completed as part of the CRR Allocation and Auction processes. The details of these steps are provided in the body of this BPM.

1) ISO prepares network model, constraints, Aggregated Pricing Node (APNode) mapping, and contingencies (please refer to Attachment B of this BPM for more details).

2) Candidate CRR Holders register for the CRR Allocation and/or CRR Auction (please refer to section 3 of this BPM for more details).

3) ISO performs verification data collection process for entities participating in the CRR Allocation (please refer to section 7 of this BPM for more details).

4) ISO prepares data from steps 1 and 3 above and loads it into the CRR system.

5) ISO announces dates of CRR Allocation and Auction markets (please refer to section 4 of this BPM for more details).

6) Nominations that reflect the rights under Transmission Ownership Rights (TOR) and Existing Transmission Contracts (ETC) nominations are created by the ISO. Refer to Attachment B, section 4, of this BPM for more information on this process. The TOR and ETC nominations will be made available under a NDA, prior to the running of the first tier of the annual CRR Allocation (See ISO Tariff § 6.5.1.1.1). The directions and forms for completing the NDA can be found at: http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx

7) ISO inputs Transmission Ownership Rights (TOR) nominations and Existing Transmission Contracts (ETC) and runs the Simultaneous Feasibility Test (SFT).

8) Annual CRR Allocation process begins with the simultaneous running of Seasons 1 through 4 (please refer to section 8 of this BPM for more details):

- Open historical load data submittal window for four seasons.

- During the open and close submittal window, allocation participants are able to submit their historical load via the CRR Market User Interface (MUI) by season, LAP, and hour (the CRR system will convert each hour to the appropriate time of use).[1] The data requirements for the load data are described in detail during the required CRR Training Class. In the class, Market Participants learn that "Final Load" is the MW value that will actually be used by the CRR software system to calculate the load metric which is then reduced by any Existing Contract Rights (ETCs) and Transmission Ownership Rights (TORs) the Load Serving Entity may have to arrive at the eligible quantity of CRRs an LSE may request in the allocation. This value is the Adjusted Load Metric. "Preliminary Load", which is used by Metered Subsystems that choose net settlement, represents the load located within the MSS bubble. When submitting the load data through the MUI the type of load labeled as

[1] This does not apply to TORs since entities holding these do not receive CRRs or to external load serving entities who submit historical usage at Scheduling Points.

"Generation" is also used by the MSS choosing net settlement and represents the amount of generation located within the MSS bubble. The difference between the hourly Preliminary Load values and the hourly Generation values equal the "Final Load" previously discussed. "Pump Load" may be used by LSEs having non-conforming load such as pump load.

- Close historical load data submittal window.
- The CRR system and ISO staff determine the Seasonal CRR Eligible Quantity for each allocation participant by LAP and time of use period within each of the four seasons.

9) The annual allocation process consists of four tiers for each of the four seasons (See ISO Tariff §§ 36.8.3.1 and 36.8.3.5). For the CRR annual process, Tier LT is run after tier 1 (Priority Nomination Tier), since the results of the PNP are used to generate the signature data to be used for Tier LT. ISO posts the timeline for each of the processes prior to the beginning of the annual CRR Allocation. The steps below are run for each of the tiers in the annual CRR Allocation process, including Tier LT (please refer to section 8 of this BPM for more details):

    - ISO determines the Seasonal CRR Eligible Quantity for each tier for all four seasons and two time-of-use periods, by sink location, and provides this information to allocation participants.
    - ISO creates the current tier's markets (four seasons, on and off peak) and attaches the respective CRR FNM and commercial information to those markets. The specific commercial information to be released is noted in ISO Tariff section 6.5.1.1.1 and requires a Non Disclosure Agreement (NDA) to be signed before getting access to this data. If a NDA has been executed then allocation participants will be able to download the CRR FNM, associated commercial data and Fixed CRRs from previous allocation markets. Please refer to the ISO Tariff § 6.5.1.3.1 for a description of the Public Market Information to be published on an annual basis and Tariff section 6.5.1.3.2 for a description of the Public Market Information to be published on a monthly basis.
    - ISO opens the submission window for the current tier's allocation process for all four seasons.
    - ISO closes the submission window for the current tier's allocation process for all four seasons.
    - ISO runs the SFT for all four seasons/TOUs, reviews and posts results.

- ISO sends a message, via the MUI, that the allocation processes are complete.
- Allocation participants can download general allocation results as well as their specific individual results.

10) The annual CRR Auction begins once the annual CRR Allocation process is completed (please refer to section 9 of this BPM for more details)

- Interested Candidate CRR Holders or CRR Holders will provide the necessary creditworthiness requirements to the ISO according to the CRR Auction timeline that will be provided
- ISO will provide residual value information on the Scheduling Point/Transmission Interfaces after Tier 2 of the annual CRR Allocation
- ISO creates the annual CRR Auction markets (four seasons on and off peak) and attaches the respective CRR FNM and commercial information to those markets. The specific commercial information to be released is noted in ISO Tariff section 6.5.1.1.1 and requires a Non Disclosure Agreement (NDA) to be signed before getting access to this data. If a NDA has been executed then auction participants will be able to download the CRR FNM and associated commercial data for the current auction market.
- ISO opens the bid submission window for the annual CRR Auction markets for all four seasons.
- ISO closes the bid submission window for the annual CRR Auction process for all four seasons.
- ISO runs the SFT for all four seasons and two TOUs, reviews and posts results.
- ISO sends a message, via the MUI, that the auction process is complete.
- CRR Auction participants can download general auction results as well as their specific individual results.

11) The monthly CRR Allocation and CRR Auction will follow a similar process as described above for the annual CRR Allocation and CRR Auction (See sections 10 and 11 of this BPM and ISO Tariff §§ 36.8.3.2, 36.8.3.6, and 36.13).

4.4 Integrated Balancing Authority Area (IBAA) Election

Consistent with Section 36.14 of the ISO Tariff, participants can manage the impact on CRRs affected by the implementation of a new IBAA and IBAA changes. In the event that there is a need to implement an IBAA change other than on January 1 of any given year, the ISO will incorporate the IBAA change into the FNM for the monthly CRR Allocation and CRR Auction process for the first month in which the IBAA change will take effect if feasible.

4.4.1 Modifications to CRR Settlement of Previously-Released CRRs to Reflect IBAA Changes

To the extent an IBAA change, including the establishment of a new IBAA or a change to an existing IBAA, modifies the pricing for Settlement purposes of IFM scheduled transactions between the ISO Balancing Authority Area and the IBAA, the CRR Holder of Previously-Released CRRs whose CRR Source or CRR Sink is affected by an IBAA change may make a one-time election either to:

(a) modify the Settlement of the affected CRR Source or CRR Sink to conform to the revised IFM pricing associated with the IBAA change, or

(b) retain the original CRR Source or CRR Sink specification of the Previously-Released CRR.

The CRR Holder of such a CRR must make the one-time election prior to the first CRR Allocation and CRR Auction process that incorporates the IBAA change in the CRR FNM, in accordance with the process further described below. If the IBAA change is implemented to coincide with the beginning of a calendar year and is coordinated with the annual CRR Allocation and CRR Auction process for that year, as described in Tariff Section 36.14.1, the provisions discussed herein apply only to Previously-Released CRRs that are Long Term CRRs and Previously-Released CRRs that are Seasonal CRRs obtained through the CRR Allocation and are eligible for PNP nomination. In the event that the IBAA change is implemented in the ISO Markets other than on January 1, then these provisions apply also to any Previously-Released CRRs that are Seasonal CRRs effective for the remainder of the year in which the IBAA change is implemented.

4.4.2 Process for Election

Any time a new IBAA is adopted or the definition of an existing IBAA is changed, the ISO will send out a market notice to notify CRR Holders whether there is a possibility of an election. The ISO will also contact the parties that are affected CRR Holders to the best of its knowledge via email to solicit whether the affected CRR Holder intends to make such an election for those

CRRs that are impacted by the IBAA change. CRR Holders that believe their CRRs are affected by any given IBAA change or the adoption of a new IBAA may contact ISO personnel at crrdata@caiso.com.

Once the ISO receives notification that the parties are considering an election, the ISO will forward an email that will contain a spreadsheet entitled IBAA Election which enable the holders to elect to reconfigure or retain the definitions of the Previously Released CRRs. The CRR Holder must complete the spreadsheet and send it to crrdata@caiso.com. The subject line should include the text “IBAA Election”.

The results of the IBAA election on current CRR holdings will be posted on the ISO website.

5. Eligibility for Participation in the CRR Allocation Process

In this section you will find the following information:

- How entities of various types become eligible to participate in the CRR Allocation process

The following entities are eligible for participation in the CRR Allocation process:

- Internal LSEs that meet the requirements specified in section 5.1 of this BPM (See ISO Tariff § 36.8.2).
- OBAALSEs that meet the requirements specified in section 5.2 of this BPM (See ISO Tariff § 36.9).
- Project Sponsors of Merchant Transmission Facilities may also be allocated CRRs and those are accounted for in the allocation process as further described in section 14 of this BPM (See ISO Tariff § 36.11).

5.1 Qualification Process for Internal LSEs

In order to be eligible to participate in the CRR Allocation as an internal LSE, the entity must be able to provide supporting documentation that reflects the Location of the Load for which they are responsible for as a Load Serving Entity. This qualification process will be linked with the sink verification process as described in section 7 of this BPM. An LSE is eligible to request CRRs for that amount of Load that is subject to Congestion Charges for the use of the ISO Controlled Grid as determined in ISO Tariff §§ 36.8.2.1 and 36.8.2.2. Therefore, Load that is served by TORs or ETCs does not qualify for the CRR Allocation.

5.2 Qualification Process for OBAALSEs

An OBAALSE's eligibility for the allocation of CRRs is also measured by the quantity of Load that it serves that is exposed to Congestions Charges for the use of the ISO Controlled Grid as determined in ISO Tariff § 36.9.3. Similar to internal LSEs, any Load that an OBAALSE has the obligation to serve that is covered under TORs or ETCs would not qualify for the CRR Allocation. Further details on this qualification process are in section 12 of this BPM.

5.3 Qualification Process for Project Sponsors of Merchant Transmission Facilities

To qualify for participation in the CRR Allocation process for Merchant Transmission Facilities, the Project Sponsor must demonstrate that they will not recover the cost of the transmission investment through ISO's Access Charge or other regulatory cost recovery mechanism in accordance with ISO Tariff § 24.7.3 (See also ISO Tariff § 36.11). For a discussion on the Merchant Transmission CRR allocation process, refer to Section 14 of this BPM and ISO Tariff § 36.11.

6. Timeline for Finalizing Market Input Data

The market input data includes sink MW validation data (including historical and forecasted load data), market upper bound validation data, and TOR/ETC data. Such data shall need to be finalized at least two (2) business days before the start of the next market setup. Any new data submitted or data changes submitted within less than two business days from the scheduled start date of the following market setup will not be accepted. This requirement is to ensure that ISO has enough lead time (i.e. 2 business days) to perform data validation and quality check, and to correct any invalid data.

In the case of TOR/ETC data, this data is originally submitted to the CRR team via the TRTC process. This data contributes to the TOR market, and Tier 1 allocation, and thus late data submission and data changes will also not be accepted.

7. Allowable CRR Sources and Sinks and Eligible Quantity Calculation for Internal LSEs

In this section you will find the following information:

- Information on allowable sources for the CRR Allocation
- How historical and forecasted Demand for CRR Sink verification is determined
- How Seasonal and Monthly CRR Load Metrics are calculated
- Information related to the load migration process

7.1 Permissible CRR Sources for the CRR Allocation

Pursuant to § 36.8.4 of the ISO Tariff, the following sources may be used when submitting CRR nominations in the CRR Allocation process:

- Generating Unit PNodes
- Trading Hubs
- Scheduling Points
- Points of Delivery associated with ETCs

7.1.1 Generating Unit PNodes

Before a generating unit PNode can be added to the list of available biddable PNodes in the CRR process it must have been officially classified as having met the Commercial Operation Date (COD). Once the COD notice is received the new resource will be added to the beginning of the next available CRR process, depending on the timing of receipt of the COD notification. If a resource achieves COD after the CRR process (monthly or annual) has begun it will be made available at the start of the next available monthly CRR process. If a new resource should become energized after the release of the annual or monthly source/sink biddable list the ISO will attempt to incorporate this new resource into the allocation process if the timing permits and only if the PNode associated with the new resource exists in the version of the FNM that is being used for the respective allocation process.

7.1.2 Scheduling Point Residual Set Aside

For the annual CRR Allocation process for import CRRs, the calculation of the residual value set aside takes place after tier 2 of the CRR Allocation process. After tier 2 of the annual CRR Allocation the ISO will calculate and set aside for the annual CRR Auction 50% of the residual

capacity at the Scheduling Points. The residual value set aside calculation will take into consideration any Long Term CRRs that are valid for the respective season and time-of-use period (See ISO Tariff § 36.8.4.2.2).

For the monthly CRR Allocation processes for import CRRs, the calculation of the residual value set aside takes place after tier 1. After tier 1 of the monthly CRR Allocation the ISO will calculate and set aside for the monthly CRR Auction 50% of the residual capacity at the Scheduling Points. The residual value set aside calculation will take into consideration any annual allocated or auctioned CRRs and Long Term CRRs that are valid for the respective month and time-of-use period as well as the results of tier 1 of the monthly CRR Allocation.

7.1.3 ETC Points of Delivery

For Existing Transmission Contracts (ETCs) that end at a Point of Delivery that differs from where the load is located then those LSEs can use these end points as verified CRR Sources in the verified tiers provided that the Candidate CRR Holder holds an Energy contract that can be delivered utilizing the ETC transmission service. The VSQ associated with these locations will be based on the hourly MWh of Energy specified in the contract for delivery at the Location averaged over all hours of the relevant TOU period.

7.2 CRR Sink Verification for Allocation Process

CRR Sink verification for the CRR Allocation process is conducted every year and month before the annual and monthly CRR Allocation processes commence.

7.2.1 Market User Interface used for Submittal of Sink Verification Data

In the verification process, the CRR MUI is used to submit load data, which is used in a process to derive the sink MW for each entity on a season and time of use basis. The process for the calculation of the sink MW value is discussed below.

7.2.2 LSEs

For CRR Sink verification purposes, the historical period for the annual/seasonal verification is the prior year (See ISO Tariff § 36.8.2.1). The following sinks may be used when submitting CRR nominations in the CRR Allocation process (See ISO Tariff § 36.8.2):

- Default Load Aggregation Points (LAP)
- Sub-LAPs if within the LSE's Default LAP (in the annual tier 2 or 3 and monthly tier 1 or 2)[2]
- Metered Subsystem (MSS) LAP for a MSS Operator that chooses net settlement
- Scheduling Points for external LSEs
- Custom LAP for loads that are Pumped-Storage Hydro Units and Participating Load

The ISO will make available, prior to the beginning of the CRR Allocation process, a list of allowable sources and sinks to be used in the allocation. The ISO will post the list of allowable sources and sinks to be used in the allocation at approximately the same time as the CAISO releases each CRR FNM.

For tier one of the annual CRR Allocation process, LSEs, as well as MSS Operators choosing gross settlement, are limited to the Default LAPs (PGE, SCE, and SDGE) as CRR Sinks. LSEs must demonstrate that they serve Demand in the LAP or LAPs they intend to use as CRR Sinks. LSE's sink verification can be based upon Settlement Quality Meter Data submitted to the ISO or information filed with the CPUC reflecting where the LSE's load is located.[3] MSS Operators choosing gross settlement may use their filed MSS agreement as a means of verification.

For MSS Operators that choose the net settlement option, a specific MSS LAP is created by ISO as a CRR Sink and is used by the MSS Operator when nominating CRRs. These MSS Operators can verify their CRR Sink Location using their filed MSS agreement. The MSS election of gross or net is made on an annual basis, at least 60 days prior to the deadline for the annual CRR Allocation process. Once the election is made it is valid for each of the monthly allocations within that annual term. If the MSS Operator does not notify ISO of their election then the default is gross settlement (ISO Tariff § 4.9.13).

In tier 2 or 3 of the annual CRR Allocation and in tier 1 or 2 of the monthly CRR Allocation, Sub-LAPs are eligible CRR Sinks provided that the Sub-LAP is within the nominating LSE's LAP (See ISO Tariff §§ 36.8.3.1 and 36.8.3.2). Sub-LAPS are validated to make sure they are within the nominating LSE's verified LAP. There is no specific Sub-LAP MW limit; although the total of

[2] This information is made available prior to each allocation and auction process and the source and sink list being used. In this spreadsheet which can be found on the following web page: http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx there is a column for Resource Type "SUBLAP" which displays all sub-laps.

[3] Data submitted to the CPUC or CEC can be used to verify the sink MW values for the historical period as long as it is in the hourly/TOU format required by the CRR MUI. For an entity that is submitting historical load data to the CAISO for CRR Allocation they will need to have accurate and verifiable data. Any information filed with the CPUC or CEC showing proof of the entity being a LSE would suffice for the sink verification.

all Sub-LAP and Default LAP nominations cannot exceed the total sink limitation. For example, if an LSE has a total tier 3 nomination limit of 100MW at the SCE Default LAP they could nominate CRRs from the SCE Default LAP for 50MW and a combination of 50MW from any of the Sub-LAPs within the SCE Default LAP. The LSE could also choose to nominate a total of 100MW from any combination of the Sub-LAPs within the SCE Default LAP. If this LSE only had verified Load within the SCE Default LAP area it could not request any nominations from the PG&E or SDG&E Default LAPs or Sub-LAPs.

7.3 Historical/Forecasted Demand

To determine the CRR eligible quantities for the annual and monthly CRR Allocation processes, Candidate CRR Holders and CRR Holders must submit their historical and forecasted Demand data through the CRR MUI.

7.3.1 Historical Demand Period & Calculation of Seasonal CRR Load Metric

This section describes data requested by the ISO that is used to calculate the Seasonal and Monthly CRR Load Metric Values (See ISO Tariff § 36.8.2.1).

For the historical Demand reference period, ISO generally uses a calendar year and standard quarter terms (Q1/Jan-Mar, Q2/Apr-Jun, Q3/Jul-Sep, and Q4/Oct-Dec). The reference period includes the most recent period when the full calendar year of historical Demand data is available. For example, the CRR Allocation process for the calendar year 2009 actually begins in July of 2008 and the most recent historical Demand reference period that contains a full year's worth of data is January 2007 through December 2007, the previous full calendar year.

When the historical Demand data is submitted through the CRR MUI, it is grouped into the four seasons, two time-of-use (TOU) periods, and the individual LAPs within which the LSE serves Load. The CRR system then derives Load duration curves for each season, TOU, and LAP. The LSE's Seasonal CRR Load Metric for each season and time of use period is the MW level of Demand that is exceeded only in 0.5% of the hours based on the LSE's historical Demand data.

Due to the unique nature of the Load served by the State Water Project (SWP) the ISO has given the SWP the option of using either five-year average historical Load data or the prior year's historical Load, for purposes of calculating its respective Adjusted Load Metric.

Timeline for Resubmission of Annual Historical Load Data

Within two business days of the annual historical load window's closure the CRR team will perform a validation of the submitted load. If the Historical load data fails to pass validation the CRR team will send the Market Participant a message through the private messages in the CRR portal. After receiving a message from the CRR team, the participant must contact the CRR team so that differences in load data can be resolved. Any load resubmissions must be completed two business days prior to the issuing of the Seasonal Eligible Quantity.

7.3.1.1 Increasing CRR Load Metric by Waiver of ETC Rights

An LSE or OBAALSE that holds ETC rights may execute a waiver of its ETC rights or a portion thereof and receive a commensurate increase in its CRR Allocation eligibility in accordance with the following provisions:

1. To qualify for an increase in CRR eligibility, the ETC rights being waived must provide for delivery to the location of the LSE's Load or, in the case of an OBAALSE, to the Scheduling Point on the ISO Controlled Grid at which the OBAALSE exports Energy to serve its Load. The CRR Allocation process only allocates CRRs whose CRR Sink is the LSE's Load location or the OBAALSE's Scheduling Point of export from the ISO Controlled Grid. Therefore the only ETC MW amounts that are relevant for purposes of calculating an entity's ALM are the MW amounts of rights that provide for Energy delivery to the LSE's Load location or the OBAALSE's Scheduling Point of export from the ISO Controlled Grid.

2. The waiver provides a recalculation of the entity's CRR Allocation eligibility. The entity's ALM is calculated by subtracting the MW amount of its maximum ETC entitlement from its Load Metric.

3. As described further below, the waiver must be executed prior to the calculation of the Seasonal CRR Eligible Quantity for Tier 1 of the ISO's annual CRR Allocation process. This timing is necessary because the ISO must calculate ALMs for all participating LSEs and OBAALSEs prior to opening the Tier 1 nomination period.

4. The waiver is permanent, except as noted later in this paragraph. Once a rights holder waives a MW quantity of an ETC and receives a commensurate increase in its ALM for CRR Allocation eligibility, the rights holder cannot reclaim the ETC benefits associated with the waived MW in a subsequent CRR Allocation process. This provision is necessary (1) to ensure that the rights holder cannot receive both CRR coverage and the benefits of ETC coverage (the perfect hedge Settlement treatment and the scheduling priority) for the same MW of Load that it serves, and (2) to protect the value

of the CRRs allocated to other entities, specifically the ability to renew those rights in the Priority Nomination Process (PNP) and the revenue adequacy of those rights, either or both of which could be diminished if waived ETC MW amounts could be subsequently reclaimed by the rights holder. The exception mentioned above would apply in the event of a major change to the ISO's market design that substantially changes the Congestion Management rules and procedures, including elimination of the use of Locational Marginal Pricing and CRRs from the ISO Tariff. In that event, provided the ETC has not yet expired, the Existing Rights holder may revoke its waiver and reclaim the full ETC entitlement that is applicable under the contract at the time the ISO's market change takes effect.

5. The waiver will be reflected in the Transmission Rights and Transmission Curtailment (TRTC) Instructions as submitted by the Participating Transmission Owner for the associated ETC, so that the remaining ETC MW are treated appropriately with respect to scheduling and Settlement in the ISO's market processes. The waiver will apply to both the perfect hedge Settlement treatment and the scheduling priority of the waived MW of the ETC. In addition, the forecasted usages will be updated accordingly.

6. The waiver must be executed in a legally binding manner, as described in the next section.

Procedure for Executing a Waiver of ETC Entitlement

Holders of ETC that desire to waive such rights in accordance with the provisions above must execute and submit to the ISO a waiver. Prior to submitting such a Waiver, the holder of such rights must obtain a letter of agreement from its applicable Participating Transmission Owner (PTO) to reflect the reduced MW eligible quantities under the ETC in the TRTC instructions, or the applicable PTO must submit revised TRTC Instructions to the ISO reflecting the reduced amounts. TRTC Instructions reflecting reduced amounts pursuant to such waivers must clearly refer to the applicable waiver and attach a copy (electronic or hard copy) of the waiver submitted and accepted by the ISO. Such waivers and TRTC Instructions must be submitted to the ISO no later than 60 days before the date on which the ISO is set to release CRR FNM for the applicable annual CRR Allocation, which is announced in its CRR timeline posted on the ISO Website in advance of the applicable annual CRR Allocation.

7.3.2 Forecast Load Methodology & Calculation of Monthly CRR Load Metric

7.3.2.1 Forecast Load Methodology

For the monthly CRR Allocation process, each LSE submits its forecasted Demand data to ISO through the CRR MUI. This forecasted Demand data should be consistent with the 60-days ahead non-coincident peak forecast for that month, as submitted to the CEC and adjusted for any load migration.

The ISO will select load forecasts submitted by three or fewer randomly-selected LSEs each month and will follow the process outlined in the sub-sections below to confirm consistency between the Load data submitted for CRR purposes and the CEC data submitted for Resource Adequacy purposes. As part of the data validation process the ISO will validate all LSE's forecasted Load data against the available CEC data.

For those LSEs that have CRR eligible load but do not have load forecast data that can be verified against the forecast the LSE provides to the CEC for Resource Adequacy purposes, the ISO will use up to five years of previous historical load of the same month.

The LSEs serving loads without verifiable load forecasts will submit their historical load data using the same procedures and timeline already in place for the monthly process.

7.3.2.2 Calculation of Monthly CRR Load Metric

As each subsequent monthly CRR Allocation period is opened, the LSE's submitted monthly Demand forecast is used to calculate two Load duration curves (one on-peak and one off-peak for the applicable month) to form the basis for monthly CRR Allocations for each eligible CRR Sink location at which the LSE serves Load. For each time-of-use period and eligible CRR Sink location, the Monthly CRR Load Metric is the MW level of Demand that is exceeded only 0.5% of the hours based on the LSE's submitted Demand forecast (See ISO Tariff § 36.8.2.2). For each eligible CRR Sink location, prior to separating the submitted hourly Load data into on-peak and off-peak hours and prior to calculating the Monthly CRR Load Metric, the ISO performs the consistency adjustments described in the following sub-sections to the combined on-peak and off-peak Load data.

7.3.2.2.1 OBAALSE Monthly CRR Load Metric

As directed in Tariff section 36.9.3, the Monthly CRR Eligible Quantities are determined in the same manner as the Seasonal CRR Eligible Quantities. For the Monthly CRR Eligible Quantities the OBAALSE will need to submit the same two data sets as was done for the annual process except that the data will only be for the period covered by the monthly CRR period

applicable for the monthly CRR process. If the monthly CRR process is for the month of May, then the OBAALSE will submit the historical data associated with May of the prior year.

7.3.2.2.2 Eligible LSEs Without Verifiable Load Forecast

For eligible LSEs that cannot provide a load forecast data which the ISO would be able to validate against comparable data provided to the CEC for resource adequacy purposes, the ISO will use up to five years of previous historical load of the same month.

For each time-of-use period and eligible sink location, a load metric for each of the five relevant months will be computed. The CRR Load Metric is the MW level of demand that is exceeded only 0.5% of the hours based on the LSE's historical load of each relevant month. Then the five load metrics will be averaged. The average based on five years of data provides a more stable load metric.

7.3.2.2.3 Resource Adequacy Adjustment for Monthly Load Forecast

Except in the case of non-conforming Load as described in the next section, the ISO may confirm forecasted Demand data that is submitted to the ISO against the Load forecast data submitted to the CEC for Resource Adequacy purposes, and make adjustments in the following way:

ISO will collect the LSE's 60-days ahead non-coincident peak forecast as submitted to the CEC.

From the hourly Demand data submitted through the CRR MUI, by CRR Sink, the ISO will identify the LSE's peak value.

ISO will put both data sets noted above into the same level of granularity, for comparison purposes. If both sets are at the CRR Sink level then the comparison will be done at the CRR Sink level, if the CEC data is at the UDC/IOU service territory level then the CRR MUI submitted data will be aggregated to that level.

A ratio will then be calculated by taking the non-coincident peak value submitted to the CEC and dividing this by the peak Demand value submitted through the CRR MUI for the same month.

This ratio will then be used to multiply each hourly value submitted through the CRR MUI to arrive at the adjusted forecasted Load values.

The hourly adjusted Load values will then be divided into the on-peak and off-peak hours, and for each TOU period the adjusted Demand value that occurs at the 0.5% exceedance level will be the Monthly CRR Load Metric used for that TOU period for that month.

LSE's that fall outside a five percent tolerance will be required to re-submit their adjusted forecast to the CRR MUI so an adjusted load metric can be calculated. The five percent tolerance accounts for load growth/shrinkage forecast errors but not load migration which is already reflected in the 60-day ahead non-coincident peak values.

Please note that the CPUC RA process only applies to customers in the IOU service areas, so publicly owned utilities are not covered by the CPUC RA requirements although some of these entities do provide forecast data to the CEC.

7.3.2.2.4 Consistency of Monthly Load Forecast with Data Submitted to the CEC for Non-Conforming Loads

For those LSEs with non-conforming loads, the ISO may confirm forecasted Demand data that is submitted to the ISO against the CEC Load forecast, and make adjustments in the following way:

LSE provides its hourly data for the system peak hours to both the CEC and ISO for RA purposes.

LSE provides its hourly data for each eligible CRR Sink through the CRR MUI, as required by the ISO Tariff.

ISO will put both data sets noted above into the same level of geographic granularity, for comparison purposes. If both sets are at the CRR Sink level then the comparison can be done at the CRR Sink level without any aggregation. If the two sets of data are at different levels of geographic granularity, then the ISO will aggregate the more granular data set to achieve accurate comparability.

ISO will then perform a consistency check by comparing the corresponding hourly values for the two data sets. For example, if the RA data covers the system peak hours of HE-15 to HE-17, the ISO will calculate the LSE's total submitted RA demand over these hours and the LSE's total submitted CRR demand (as submitted through the CRR MUI) for the same hours, and then will calculate the ratio of the total submitted RA demand for those hours divided by the total submitted CRR demand for those hours. LSEs will then be required to re-submit their adjusted forecast to the CRR MUI so an adjusted load metric can be calculated.

7.3.2.2.5 Timeline for Resubmission of Monthly Historical and Forecast Load Data

Within two business days of the forecast load window's closure the CRR team will perform a validation of the submitted load. If either the Historical or Forecast Load data fails to pass validation the CRR team will send the Market Participant a message through the private

messages in the CRR portal. After receiving a message from the CRR team, the participant must either contact the CEC to have an updated non-coincident peak forecast sent to the CRR team for validation, or submit a new historical/forecast load that meets the validation requirements. Any load resubmissions must be completed two business days prior to the issuing of the Monthly Eligible Quantity.

7.4 Load Migration & Adjustments to Load Data

During the annual CRR Allocation process when an LSE submits its historical Demand, if Load has migrated to or from the LSE prior to submitting this historical Demand data, then there will be an adjustment made to reflect this migrated Load in the LSE's Seasonal CRR Load Metric (See ISO Tariff § 36.8.5). The ISO will implement the Load Migration adjustments as described in the ISO Tariff Section 36.8.5 and will make monthly adjustments due to Load migration, as noted in the sections below.

As discussed in Section 36.8.5 of the ISO Tariff, Load Migration from an LSE's portfolio reduces the Priority Nomination Process (PNP) Eligible Quantities for that LSE and has a corresponding increase for the Load receiving LSE. The reduction in PNP Eligible Quantities is applied as a constant percentage to all CRRs allocated to that LSE in the prior annual CRR Allocation.

An LSE to which the ISO allocates new CRRs to reflect load migration must be a registered candidate CRR holder or a CRR holder and meet all requirements applicable to such entities. If the load gaining LSE is not a CRR holder or a candidate CRR holder at the time the load migration process takes place, then the load migration CRRs will not be transferred to that load gaining LSE and will not be financially settled, instead, it will be transferred from the load losing LSE to the ISO and will be absorbed within the CRR balancing account for the duration of the term of the load migration CRRs. In addition, the LSEs affected by the load migration will not be eligible to nominate the transferred CRRs in subsequent Priority Nomination Tier (ISO Tariff § 36.8.5.4).When the load migration takes place, the ISO will evaluate and adjust the credit requirements for both the load losing LSE and the load gaining LSE prior to the transfer. If additional financial security is required from either the load losing LSE or the load gaining LSE, the ISO Finance team will notify the LSE to provide enough collateral to cover the transfer.

During the time period prior to the next annual CRR Allocation the migrated Load is reflected in the monthly forecasted Demand data that will be submitted by the LSE acquiring the migrated Load. The monthly forecasted Demand data will account for any Load migration for the monthly CRR Allocation and; therefore, will not be adjusted through this process.

7.4.1 Data Requirements to track Load Migration

To transfer Seasonal and Long-Term CRRs to account for load migration the ISO must receive data regarding the movement of customers between LSEs from the Utility Distribution Company (UDC) or other entity that provides distribution service to the customer to provide information on migration of customers between LSEs directly to the ISO, as part of the Direct Access enrollment process.

UDCs will provide the data organized in five different files as described below:

1. **Direct Access Service Request (DASR) Summary Records:**

This file will have the information about the net positive number of end-use customers per customer class transferring from one LSE to another LSE. If there is no transfer of customers between two LSEs in any of the customer classes, then such records should not be included in this file. The data in this file would be in the comma-separated-values (CSV) format. Please refer to section 8 for the naming convention of this file. This file would have the following fields:

Field name	Description
Record ID	This field should allow ISO to uniquely identify each DASR transaction summary record related to the transfer of a customer class from one LSE to another. This field would be in alphanumeric format and shall be unique just for each file. For example, if file for Nov 2011, has Res2011, then no other records for that file should have it as its record ID but a file for any other month (Oct, Dec, etc.) can have Res2011 as its record ID. Maximum length on this field shall be 30.
Customer Class	This field identifies the class of the customer as defined in section 6 of this document.
Old LSE	This field identifies the load-losing LSE by means of its unique nine-digit Dun & Bradstreet (DUNS) number. If a DUNS number contains leading zeros, they should also be included.
New LSE	This field identifies the load-gaining LSE by means of its unique nine-digit Dun & Bradstreet (DUNS) number. If a DUNS number contains leading zeros, they should also be included.
Number of Customers	This field identifies the number of customers transferring from Old LSE to the New LSE in numeric format. For instance, for a file being submitted for

Transferring	January 2011 CRR monthly process, the number of customers will include the customers completing transfer between Dec 1 and Dec 31, 2010 (inclusive) plus customers which completed transfers before Dec1, 2010 but were never reported in previous DASR summary records. This field shall always be greater than zero.
Effective start date	This field identifies the effective date for the CRR transfer, which is the first day of the CRR process month. This field would be in the MM/DD/YYYY format. For any submission, this date would be the first day of the subsequent calendar month for which the DASR summary file is being submitted to ISO. For instance, for a DASR summary file being submitted for the January 2011 CRR monthly process on Dec 20, 2010, this date would be 01/01/2011.
Time stamp	This field is a timestamp to identify when the individual DASR Summary records is created. This will allow ISO to identify the sequence of transactions and what transactions should be considered in each tracking period. This field would be in the MM/DD/YYYY format.

a. DASR Summary Records Example

Record ID	Customer Class	OLD LSE	NEW LSE	Number of Customers	Effective Date	Timestamp
Res01012011	Residential	123456789	987654321	250	01/01/2011	12/21/2010
Large15201012011	Large15_2	987654321	123456789	350	01/01/2011	12/21/2010

If a UDC missed submitting the DASR transfer summary for any previous month's load migration, those numbers shall be included in the month for which the load migration data submission deadline is still open. For example,

- UDC XYZ under-reported the number of transfers from LSE_A to LSE_B in the Residential customer class for Oct 2010 by 500.

- There are 10,000 residential customers transferring from LSE_A to LSE_B effective of Nov 1, 2010.
- The number of customers transferring from LSE_A to LSE_B effective 11/01/2010 shall be adjusted by 500 to 10,500

2. DASR Transaction Records

Starting with the January 2011 monthly process, this file shall only be submitted upon request by ISO. This file will have the information related to each transaction record (one transaction stands for one customer moving between LSEs). This kind of file will have the following fields

Field name	Description
Record ID	This field should allow ISO to uniquely identify each DASR transaction related to the movement of a customer. This is needed to filter multiple transactions that may exist for the same DASR record
Service Delivery Point (SDP)	The SDP is the end point of the UDCs' electric distribution network, to which energy is delivered by the UDC to an end-use customer and will be used as unique identifier of a customer. ISO does not expect the name or address or any other customer-level information.
Customer Class	This field identifies the class of the customer
Old LSE	This field identifies the load-losing LSE by means of its nine-digit Dun & Bradstreet (DUNS) number. If a DUNS number contains leading zeros, they should also be included.
New LSE	This field identifies the load-gaining LSE by means of its DUNS number. If a DUNS number contains leading zeros, they should also be included.
Effective start date	This field will define a specific start date for the switch of the customer.
Time stamp	This field is a timestamp to identify when the individual DASR is created. This will allow ISO to identify the sequence of transactions and what transactions should be considered in each tracking period.
Status	This field will be used to identify any transaction that is cancelled. ISO will focus on field value "cancel" or "cancelled" regardless of any other field value.

3. Billing Data

Starting with the January 2011 monthly process, this file shall only be submitted upon request by ISO. For each customer that migrates and is reported in the above file (DASR transaction records), ISO will receive an associated file with the customer billing data of the last 12 months. Depending on the nature of the customer, hourly (or finer) intervals may not be available. In this case, ISO also expects to receive the same kind of billing data that is provided to the customer-gaining Energy Service Provider (ESP) when a customer is switched, such as aggregated data in a monthly basis.

When a customer switches LSEs, UDCs send the billing data to the LSE gaining the customer. ISO expects to receive the same files for its internal load migration process. Regardless of the specific format, ISO will receive the following information from UDCs related to billing data

Field name	Description
Customer/transaction ID	This field should allow the billing data to be associated with the specific DASR record reported in File 1.
Data type	This field will identify the kind of billing data for the corresponding record. This field may be needed as different kinds of data (i.e., 15- or 30-minute versus monthly data) may be provided in the same file.
Meter ID	The meter ID (or similar field) identifies the data coming from different meters in case a customer has more than one meter.
Date	Date stamp to identify the year, month and day (if applicable) of the last 12 month billing history data.
Interval meter data	One column or row for each time interval of each day of the last 12 months. Interval meter data (in KWs or MWs) in the same granularity that is already provided to the load-gaining LSE, such as hourly, 30-minute or 15-minute intervals, or data in an aggregated basis, such as monthly, if applicable.

ISO will receive one file containing the billing data of all customers. In case that more than one meter exists for the same customer, ISO expects to receive the data in the same fashion and

extent provided to the customer-gaining ESP through DASR when the customer switches. In this case, each set of interval meter data will be identified with its corresponding Meter ID.

4. Customer Rates

Once a year, each UDC will provide the average consumption in retail customer classes. Each UDC will provide the information of customer rates using the following format and structure:

Field name	Type	Description
UDC	Character	Name of the corresponding UDC, namely PGAE, SDGE or SCE
Customer Class	Character	This field identifies the corresponding customer classes for which a KW/customer rate is computed.
TOU	Character	Time of use, ON or OFF
Season	Character	This field identifies the season in which the KW/customer rates were based on. Each season will be named as SN1, SN2, SN3 or SN4 for season 1, 2, 3 and 4, respectively.
KW per customer rate	Numeric	Customer rate for each of the customer classes. Values should be in given in KWs.
Year	Date	This field will identify the year that was used as the basis to compute the KW/customer rates. For the process to be run in August 2008, UDCs will submit rates based on data from 2007.

a. Customer Rates Example

File name: SDGE_custrates_200808.csv

UDC	Customer Class	TOU	Season	KW per customer	Year
SDGE	Residential	ON	SN1	5.352	2007
SDGE	Residential	OFF	SN1	5.123	2007
SDGE	Residential	ON	SN2	5.4	2007
SDGE	Residential	OFF	SN2	5.381	2007
SDGE	Residential	ON	SN3	6.215	2007
SDGE	Residential	OFF	SN3	6.015	2007

SDGE	Residential	ON	SN4	5.012	2007
SDGE	Residential	OFF	SN4	4.987	2007
SDGE	Small_com	ON	SN1	15.213	2007
SDGE	Small_com	OFF	SN1	12.123	2007
SDGE	Small_com	ON	SN2	15.222	2007
SDGE	Small_com	OFF	SN2	12.456	2007
SDGE	Small_com	ON	SN3	17.541	2007
SDGE	Small_com	OFF	SN3	15.145	2007
SDGE	Small_com	ON	SN4	14.547	2007
SDGE	Small_com	OFF	SN4	13.285	2007
:	:	:	:		
:	:	:	:		
SDGE	Large80_UP	ON	SN1	105000.123	2007
SDGE	Large80_UP	OFF	SN1	106000.789	2007
SDGE	Large80_UP	ON	SN2	0	2007
SDGE	Large80_UP	OFF	SN2	0	2007
SDGE	Large80_UP	ON	SN3	105648.125	2007
SDGE	Large80_UP	OFF	SN3	104451.125	2007
SDGE	Large80_UP	ON	SN4	105147.563	2007
SDGE	Large80_UP	OFF	SN4	104978.478	2007

Each UDC file will contain 168 records: (21 customer classes)*(four seasons)*(two time of use). If a UDC has no customers in a specific customer class, the value for the corresponding KW/customer rate should be set to zero. No missing or null entries are expected.

In order for UDCs to compute the corresponding KW/customer rates, the following process should be followed:

a) For each season and time of use, ISO will derive a descending load duration curve to determine the hour and its corresponding MW load value at the 99.5 percentile. ISO will use the historical load profile of each Load Aggregation Point (LAP) from the most recent calendar year

b) For each UDC, season and TOU, ISO will average out the corresponding MW load values of the first N hours of the load duration curve to match as close as possible the MW load value of the 99.5%.
c) ISO will provide to UDCs these specific sets of N hours that need to be used to compute the KW/customer rates.
d) For each of the N hours specified by ISO of each season and time of use of 2007, each UDC will sum up the loads of all customers in each customer class (the 20 customer classes defined by ISO). The resulting value is the net KW level of load in each customer class for each hour.
e) Each UDC will count the number of customers that were used to determine the net load in step c. This is the number of customers that existed around the same time reference used in Step d.
f) At this point, there is a load level and a number of customers for each season, time of use and customer class by each UDC. The corresponding KW/customer rates will be computed by dividing the load level by its corresponding number of customers.
g) For each season, TOU and customer class, each UDC will average out the set of KW/customer rates computed for the corresponding set of N hours. These are the values to be provided to ISO. KW/customer rates should have a granularity of 0.001 KW.

5. Number of Customers

Each UDC will provide the current number of customers for each LSE in its territory at the beginning of each month. Each UDC will provide the information of number of customers using the following format and structure:

Field name	Type	Description
UDC	Character	Name of the UDC territory where the number of customers for an LSE are being counted
LSE	Character	This field will have the DUNS number that identifies each LSE. If a DUNS number contains leading zeros, they should also be included.
Customer class	Character	Its fields will have the definition of the corresponding customer class.

Number of customers	Numeric	This field will have the corresponding number of customers of each LSE in the corresponding customer class as of the last day of each month. For instance, for the load migration process to be run around the 21st of August, the number of customers will be counted as of July 31.
Date stamp	Date	This field identifies the date stamp in which the number of customers is defined. For instance, for the number of customers to be submitted on July 15, the number of customers should be counted as of the last day of June, 2008 and the date stamp should be July 1, 2008. For the update to be given on August 15, the number of customers should be counted as of the last day of July, 2008, and hence the date stamp should be August 1, 2008. The time stamp will be the same for all records submitted in the same file.

The following table is an illustration:

File name: PGAE_200808_nbrcust.csv

UDC	LSE	Customer Class	Number of customers	Date Stamp
PGAE	001111111	Residential	45878	08/01/2008
PGAE	022222222	Residential	4516	08/01/2008
PGAE	333333333	Residential	48751	08/01/2008
PGAE	444444444	Residential	15463	08/01/2008
PGAE	555555555	Residential	1646	08/01/2008
PGAE	666666666	Residential	13654	08/01/2008
PGAE	777777777	Residential	1579794	08/01/2008
PGAE	001111111	Small_com	45646	08/01/2008
PGAE	022222222	Small_com	464	08/01/2008
PGAE	333333333	Small_com	798	08/01/2008
PGAE	444444444	Small_com	8796	08/01/2008
PGAE	555555555	Small_com	464	08/01/2008

PGAE	666666666	Small_com	49898	08/01/2008
PGAE	777777777	Small_com	105	08/01/2008
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
PGAE	001111111	Large70_80	3	08/01/2008
PGAE	022222222	Large70_80	1	08/01/2008
PGAE	333333333	Large70_80	0	08/01/2008
PGAE	444444444	Large70_80	0	08/01/2008
PGAE	555555555	Large70_80	7	08/01/2008
PGAE	666666666	Large70_80	14	08/01/2008
PGAE	777777777	Large70_80	1	08/01/2008
PGAE	001111111	Large80_UP	0	08/01/2008
PGAE	022222222	Large80_UP	0	08/01/2008
PGAE	333333333	Large80_UP	0	08/01/2008
PGAE	444444444	Large80_UP	0	08/01/2008
PGAE	555555555	Large80_UP	0	08/01/2008
PGAE	666666666	Large80_UP	0	08/01/2008
PGAE	777777777	Large80_UP	0	08/01/2008

If an ESP has no customers in a customer class, a value of zero is expected. Traffic lights will be counted in the Commercial I (small commercial) class.

The data related to the migration of customers are available through the DASR process that already exists when end-use customers in the UDCs' areas switch LSEs. UDCs will do the necessary adjustments to the data to accommodate the customer classes described in this section. The full DASR process is an interactive exchange between LSEs and the UDCs, in which LSEs request the switch of customers to their service, or return customers to default bundled service. Once the switch of a customer between LSEs is confirmed, the customer's billing history is exchanged. The ISO will use the UDCs Service Delivery Point identifier as the

definition of what constitutes a customer. This is typically the level at which metering of the customer takes place and is consistent with the level at which the DASR process occur. The ISO has defined a process with each of the UDCs, in whose areas Direct Access transfers occur, the logistical details of the information exchange. Transfers of customers between LSEs may also occur through other mechanisms (e.g., changes in UDC boundaries or an LSE that has gone or is going out of business and the load transfers have already been contemplated for), but such changes should be far less frequent than standard transfers of Direct Access customers. These other types of changes would be handled through administrative mechanisms, with the associated transfers of CRRs performed following the same principles that are described herein. For this purpose, the involved parties should contact the ISO before the migration process is run to define the specifics of the mechanism that will be used to quantify the amount of load transfer.

Each UDC is required to provide to the ISO the customer level data described above pursuant to the process also described herein. In doing so the UDCs are responsible for obtaining any authorization(s) from the California Public Utility Commission (CPUC) that may be required for the purposes of transferring confidential customer data to the ISO. The ISO will work with the UDCs and the CPUC to establish any procedures necessary to effectuate such transfers, including the adoption of a Protective Order or a Non-Disclosure Agreement for each utility as determined to be appropriate by the UDCs, CPUC and the ISO.

Once the confidential customer level data is successfully submitted to the ISO and the ISO has successfully received the data in the format requested as specified herein, the ISO will issue an electronic notice of receipt to the UDC representative that submitted the confidential customer data.

7.4.2 Definition of Customer Classes

For end-use customers of any size, the UDCs will determine a standard number of kW per customer in each customer class based on an average of N peak hours (determined by ISO) for the Default LAP in which the UDC is located. The customer classes listed below are average ranges and each UDC will calculate the values to be used, based on actual data usage associated with each class. The following classes are used in the process to reflect load migration:

MW Tier	Class Type	Label
MW<1	Residential	Residential

MW Tier	Class Type	Label
MW <0.02	Commercial I	Small_com
0.02<= MW <0.5	Commercial II	Med_com
MW<1	Lighting	Lighting
0.5 <=MW <1	Industrial	Industrial
MW<1	Agricultural	Agricultural
1<= MW <1.5	Large	Large1_15
1.5<=MW<2	Large	Large15_2
2<=MW<3	Large	Large2_3
3 <=MW< 5	Large	Large3_5
5<=MW<8	Large	Large5_8
8<=MW<13	Large	Large8_13
13<=MW<18	Large	Large13_18
18<=MW<24	Large	Large18_24
24<=MW<30	Large	Large24_30
30<=MW<40	Large	Large30_40
40<=MW<50	Large	Large40_50
50<=MW<60	Large	Large50_60
60<=MW<70	Large	Large60_70
70<=MW<80	Large	Large70_80
80<=MW	Large	Large80_UP

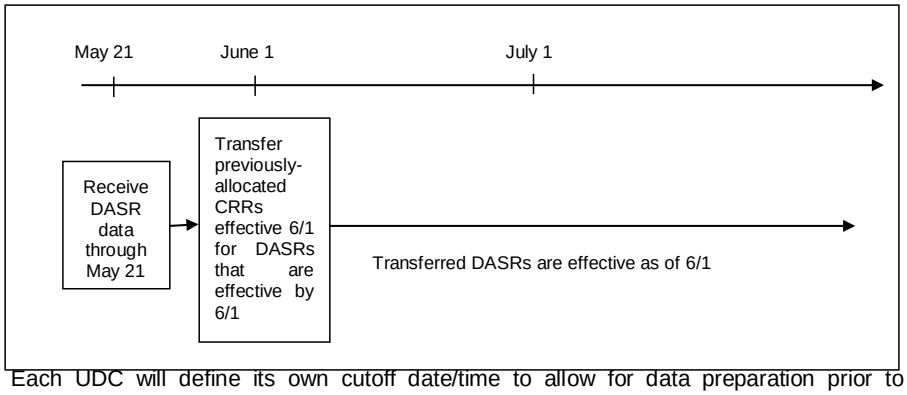
The label of each class is a ISO's recommendation to identify each customer class in the five files previously described. A customer should be put into the corresponding class based on the

customer's peak load over the prior last 12 months. Also, traffic lights will be included into the Commercial I (small commercial) class.

7.4.3 Timeline for Submission

ISO process to reflect load migration will start approximately on the 21st of each month for the next monthly CRR allocation and auction. CRR transfers will be made effective on the first of the month for load migration that is effective by the first of the same month. This step will be performed prior to determining each LSE's eligibility for monthly CRR Allocation. ISO will release the specific calendar for submission deadlines of data for load migration well in advance of starting any process to account for load migration. This is because ISO will need to consider the dates of the specific months when the load migration process will be run. This calendar will also accommodate the submission deadlines to avoid non-business days.

This process is illustrated in the following diagram, using CRR transfers effective on June 1 as an example:



Each UDC will define its own cutoff date/time to allow for data preparation prior to data submission to ISO; for example, 12 PM on the 19th of each calendar month. It is therefore understood that each UDC will have its own respective monthly data cycle within the CRR Monthly Load Migration cycle and that each UDC's data cycle will start where the previous cycle completed, thus not discarding any transactions.

For the active CRR processing month, each UDC will have the capability to continuously submit data files as long as the submission is earlier than the deadline of the active month. If two of the same file types were submitted within an active CRR month and the most current file does not

contain 100% of the older file's records, all records not contained in the most current file will be lost and thus not processed.

7.4.4 Naming Convention

In order to allow an efficient implementation of the process, UDCs must follow a naming convention for all files submitted to ISO. This convention is identified below:

File	Name	Example
DASR Summary records	UDCname_yearmonth_dasrsummary.csv	PGAE_201101_dasrsummary.csv
DASR records	UDCname_yearmonth_dasr.csv	PGAE_200808_dasr.csv
Billing data	UDCname_yearmonth_billing.csv	SDGE_200808_billing.csv
No. of Customers	UDCname_yearmonth_nbrcust.csv	SCE_200808_nbrcust.csv
KW/customer rates	UDCname_year_custrates.csv	PGAE_2008_custrates.csv
Zip containing all files to be submitted	UDCname_yearmonth.zip	SDGE_200808.zip

The year and month in the file name should refer to the date of the process in which the data is going to be used. For instance, if the submission of data is to be used for the process run on the 21 of April, 2010, then the name should contain the string 201004. The date should not refer to the date when the data is submitted. For the files to be submitted on July 15, 2008 and August15, 2008, the corresponding dates to be used in both are 2008 for the year and 08 (to stand for August).

An active month ends on the submission deadline and a file submitted between the deadline and the last calendar day will have the subsequent month identifier. For instance, if the deadline for submission was April 21 and if a file is submitted on April 22, 2010, the name should contain the string 201005 because its content will used for the process of May, 2010.

If a UDC resubmits the same monthly ZIP file within the same active CRR month (for instance, there was corrupted data and the UDC needs to resubmit the files or wants to send an update), the process will overlay in its entirety any existing data from previous submission.

Also, if a UDC wants to update 1 of the files previously submitted, it will need to resubmit **all** files again.

Because there is a limitation of 2 Gig for file sizes to be uploaded through SFTP, the UDC submitted ZIP files will need to be versioned. Additionally, if a UDC has a data file that would exceed the upload size limit, the data would need to be split across multiple CSV files. The way the files are accommodated in zip versions is up to UDCs. Take for instance the following illustration:

UDC	Zip File	Contains	CSV File Size	ZIP File Total Size
UDC_A	UDC_A _200808_**1**.zip	UDC_A _200808_billing_**1**.csv	1.5 GB	
				1.5 GB
	UDC_A _200808_**2**.zip	UDC_A _200808_billing_**2**.csv	900 MB	
				900 MB
	UDC_A _200808_**3**.zip	UDC_A _200808_dasr.csv	100 KB	
		UDC_A _200808_nbrcust.csv	250 KB	
		UDC_A _200808_custrates.csv	50 KB	
				400 KB

Scenario - UDC_A's July 2008 ZIP file exceeds the SFTP server upload size limit.

- After researching, UDC_A has determined that the size of July's 'billing' file is the cause of non-acceptance of file. UDC_A decides that splitting the 'billing' file into two will allow a successful upload. When splitting of a same type of file, each resulting CSV file must be versioned.
- UDC_A further decides that the combined size of the remaining three CSV files is small enough to be wrapped in one ZIP file. Since none of the three remaining files were split, no CSV file versioning is required.
- In addition, since multiple ZIP files are being submitted for the same active month, UDC_A must also versions each ZIP file.

7.4.5 File Format

All original data files must be in the CSV format. Each UDC must upload all CSV files wrapped in a compressed (.zip) file. ISO will unzip each file to extract the CSV file. If a disclaimer is included in the billing data, there will be an identifier to determine where the disclaimer ends if the disclaimer is at the top of the file. If the disclaimer is at the end of a file, there will be an identifier to determine where the disclaimer begins. No disclaimers are to be inserted into the actual data. ISO would accept a record with its content as "~~~9999~~~" (three consecutive ~ symbols followed by the number 9999 followed by three consecutive ~ symbols; without the quotes) as the valid identifier for the beginning or end of the actual data.

7.4.6 Transfer Protocol

The submission of data files from each UDC to ISO will be through a secure FTP server.

7.4.7 Definition of time of use.

Since CRRs are on a seasonal basis, different values that are going to be provided by UDCs will need to refer to the time of use: ON or OFF. Please refer to the CRR page on CAISO.com (http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx) for the corresponding TOU definition for individual calendar years.

7.4.8 Calculation of Required CRR Transfers

The net load gained by an LSE-2 from other LSE-1 will be tracked separately from the net load lost by LSE-2 to a different LSE-3 during the same month, using the formulas described below. This avoids needing to attribute load transfers between LSE-1 and LSE-3 when there were actually no transfers directly between these LSEs. For transfers of CRRs due to Load Migration the load gaining LSE will only acquire CRRs from the load losing LSE from the sink location at which the load migration has taken place. This will typically be at the default LAP location. If there are custom sink locations at which load migration does not take place then those CRRs sinking at the custom sink location will not be part of the Load Migration transfer. An example of this would be CRRs allocated to LSEs scheduling pump load which would only transfer should the resource be scheduled by another LSE.

The general method of calculation treats the set of Seasonal and Long Term CRRs that resulted from each annual allocation process as a separate portfolio, and adjusts the portfolio as follows:

Step 1:

Base of allocated CRRs held the by load-losing LSE =

(CRRs originally allocated to the load-losing LSE through ISO allocation processes)

+ (New CRRs allocated to the load-losing LSE through previous months' load migration transfers)

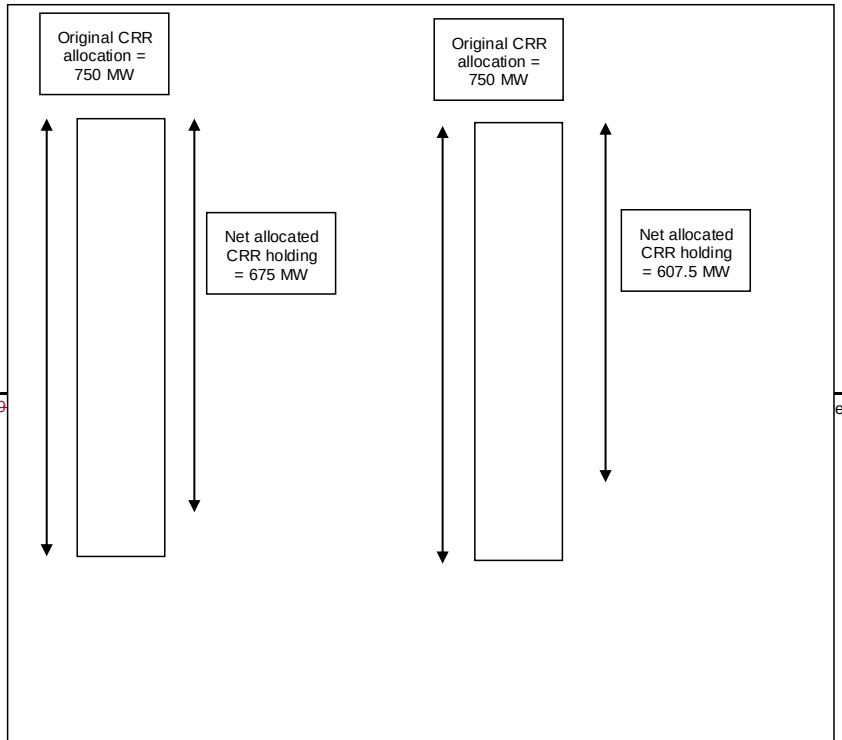
- (Counter flow CRRs assigned to the load-losing LSE through previous months' load migration transfers)

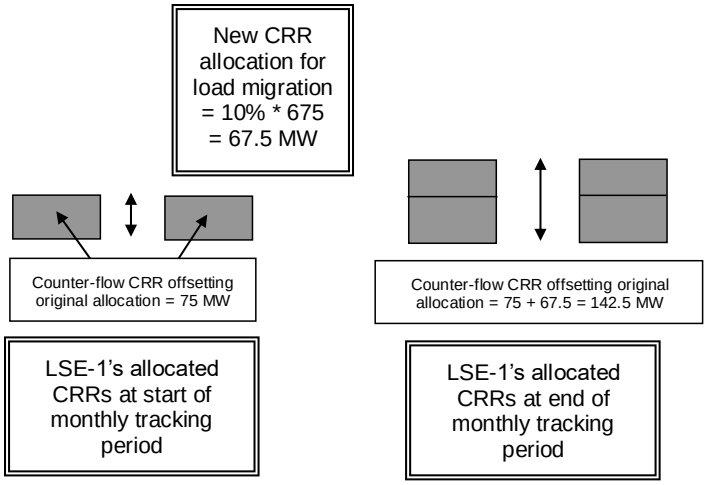
An LSE may have CRRs in different UDC territories, but only those sinking at a UDC's location where the migrated load is place will be considered in the corresponding transfer. In other words, an LSE losing load only in UDC1 would only lose CRRs in UDC1. Conversely, an LSE gaining load in UDC 1 would only gain CRRs sinking in UDC 1.

The calculation of (Base of allocated CRRs held by the load-losing LSE) is computed for each source to sink combination in the load-losing LSE's portfolio of allocated CRRs, by season and TOU. Only CRRs with the same path can be netted. An important point is that the resulting number for computing the subsequent CRR transfer is the total allocated CRR value for each source to sink combination, including netting of counter flow CRRs, and that CRR transfers are not computed for each of the individual allocated CRRs that are combined to get the total.

Example: LSE was allocated 750 MW of CRRs from PNode A to LAP-1 in the original annual CRR Allocation process. LSE-1 previously lost 10% of its load, and thus was awarded 75 MW of counter flow CRRs from LAP-1 to PNode A. It has not gained load from other LSEs.

Its net holding of allocated CRRs is 750 – 75 = 675 MW. It is now losing another 10% of its load, and this time its transfer to load-gaining LSEs will be 10% * 675 MW = 67.5 MW (not 75 MW of its original allocation and 7.5 MW of the counter flow CRR). Its net holding of allocated CRRs at the end of the monthly tracking period is 675 – 67.5 = 607.5 MW.





Step 2:

Within each process to reflect load migration, the net number of customers being transferred between each pair of LSEs in each customer class is counted for each LSE as the algebraic sum of number of customers lost and gained to each other LSE. The corresponding load transfer between each pair of LSEs, for each customer class, TOU and season is:

(*Net number of customers migrated between two LSEs)*(Average MW/customer).*

Although the number of customers that migrates in each class between each pair of LSEs is constant in the whole process, the load transfer will be different for each season and TOU because a different MW/customer rate is applicable to each TOU and season.

Afterwards, the LSEs' net load transfer is calculated as the algebraic sum of load lost and load gained to each other LSE. If the net load transfer represents a gain of load, then no further computation is carried out for such an LSE because the CRRs to be gained by this LSE will be defined by the load-losing counter-part.

Example: Some LSEs are switching customers in several customer classes. The following table calculates the load transfer between each pair of LSEs during a monthly tracking period in each customer class. Consider the information refers to the same sink, TOU and season. The average kW per customer for each season and TOU will be supplied by the UDCs and the ISO

would count the net number of customers being transferred between each pair of LSEs in each customer class and then compute the corresponding load transfer.

Customer Class	Net number of customer transferred	MW/customer rate	Load Migration (MW)	Old LSE	New LSE
Residential	200	.005	1	1	2
Residential	600	.005	3	1	3
Small Commercial	500	0.010	5	2	4
Small Commercial	450	0.010	4.5	4	3
Medium Commercial	5	0.2	1	1	2
Medium Commercial	35	0.2	7	2	3
Agricultural	5	0.8	4	3	1
Industrial	4	0.85	3.4	3	2
Large8_13	1	8	8	1	3

The tracking of the net load transfer by pair of LSEs is summarized in the following matrix (lost load is positive and gained load is negative, the load-losing LSEs are given in rows and the load-gaining LSEs are given in columns):

	LSE1	LSE2	LSE3	LSE4
LSE1	----------	1+1=2	3+8-4=7	0
LSE2	-1-1=-2	----------	7-3.4=3.6	5=5
LSE3	-3-8+4=-7	-7+3.4=-3.6	----------	-4.5=-4.5
LSE4	0	-5=-5	4.5=4.5	----------

Hence, the net load transfer per load-losing LSE is:

Load-losing LSE	Quantity	Load-gaining LSE
LSE1 loses	2 MW	to LSE2
	7 MW	to LSE3
LSE2 loses	3.6 MW	to LSE3
	5 MW	to LSE4
LSE4 loses	4.5 MW	to LSE3

Likewise, the load-losing LSEs' current load for each LSE, customer class, TOU and season, is:

(Current number of customers in the corresponding class for the load-losing LSE)(Average MW/customer).*

The LSEs' net current load is the sum of the load from all its customer classes. For each process, UDCs will provide to the ISO the LSEs' number of customers in each customer class existing as of the end of the previous month.

Step 3:

Percentage of CRRs to transfer from the load-losing LSE to load-gaining LSE =

(Load-losing LSE's net load transferred to the load-gaining LSE during the month)

/ (Load-losing LSE's net current load)

The Percentage of CRRs to transfer from the load-losing LSE to the load-gaining LSE is in general different for each season and TOU because the MW/customer rates used in the computation are defined by season and TOU as well. The term (Load-losing LSE's net current load) is based on all customers from all classes who are served by the load-losing LSE at the time of the previous monthly CRR allocation, regardless of whether these were new or pre-existing customers.[4]

[4] New customers who were not previously served by any LSE, and closing of customer accounts that are not transfers to other LSEs, are tracked through updates to the number of customers who are served, and are not tracked as load migration between LSEs. Instances where a customer moves within a UDC service area are the closing of one account and the opening of another account, and are not tracked as load migration between LSEs.

Step 4:

CRRs allocated to load-gaining LSE =

(Base of allocated CRRs held by load-losing LSE)

* (Percentage of CRRs to transfer from the load-losing LSE to the load-gaining LSE)

This calculation has been illustrated in the example for Step 1.

Step 5:

Counter flow CRRs allocated to the load-losing LSE =

-1 * (CRRs allocated to the load-gaining LSE)

(i.e., equal amount of MW in the opposite direction)

8. Annual CRR Allocation

In this section you will find the following information:

- An overview of the annual CRR Allocation process flow
- How the Seasonal Available CRR Capacity is determined
- How an LSE's Seasonal CRR Eligible Quantity is calculated
- How the four tier allocation process is conducted, consisting of the allocation of Seasonal and Long Term CRRs
- A description of the Priority Nomination Process

8.1 CRR Load Metric & CRR Eligible Quantity

LSEs submit through the MUI, historical Demand data to ISO for the prior year, for each LAP within which the LSE serves Load. The CRR system uses this data to calculate the CRR Load Metric[5] for each LSE, season, LAP, and time-of-use period. The CRR Load Metric represents the level of load for a season that is expected to be equaled or exceeded only 0.5% of the time or near the peak (See ISO Tariff § 36.8.2.1). For determination of OBAALSE's eligible quantity please refer to section 12.2.4 of this BPM. In the event that the LSE has lost or gained net Demand through Load migration during the course of the prior year, the Seasonal CRR Load Metric is adjusted to reflect the loss or gain as described in Sections 8.5 and 10.6 of this BPM.

The quantity of CRR nominations an LSE or Qualified OBAALSE can request for each season, LAP, and time-of-use period is determined by the Seasonal CRR Eligible Quantity. ISO calculates an LSE's Seasonal CRR Eligible Quantity by adjusting from that LSE's or Qualified OBAALSE's Seasonal CRR Load Metric based on load migration and subtracting the quantity of Demand served by its TORs and ETCs. ISO works with each LSE or Qualified OBAALSE on an individual basis to determine the quantity of TORs and/or ETCs to be subtracted from its Seasonal CRR Load Metric to derive the Adjusted Load Metric. This value is then scaled down to 75% to arrive at the Seasonal CRR Eligible Quantity.

For MSS Operators that elect net Settlement, their CRR Eligible Quantities reflect their net Demand (See ISO Tariff § 4.9.13.1). These MSS Operators submit hourly historical net

[5] The term CRR Load Metric will be used in general to refer to a Load metric calculated for a season or a month by load location and TOU.

Demand data and net Demand forecast data from which ISO constructs net Load duration curves to determine their Seasonal and Monthly CRR Eligible Quantities respectively.

In the Priority Nomination Process, there are three basic pieces of data that are considered when validating a nomination; sink upper bound, source upper bound and signature validation. This data is contained within two validation data files that are made available through the CRR MUI. One of the files is called "Signature Validation Data" and the other is called "Source and Sink Upper Bound Validation Data". Both of these files are accessible through the CRR MUI Downloads screen.

In Tier 2 and Tier 3, there are two basic pieces of data that are considered when validating a nomination; sink upper bound, source upper bound. This data is contained within one validation data file that is made available through the CRR MUI. The file is called "Source and Sink Upper Bound Validation Data". This file is accessible through the CRR MUI Downloads screen.

8.2 Annual Allocation of Seasonal and Long Term CRRs

In this section, we describe the general process used to allocate Seasonal and Long Term CRRs as shown in Exhibit 8-1.

Only Candidate CRR Holders or CRR Holders that are also LSEs or Qualified OBAALSEs can participate and obtain CRRs through the CRR Allocation process (See ISO Tariff § 36.8).[6] The Seasonal CRR Eligible Quantity is the starting point for calculating a LSE's nomination limits for each season of the annual allocation process.

LSEs or OBAALSEs may make CRR nominations in the Priority Nomination Process (Tier 1) up to the lesser of (1) its Seasonal CRR Eligibility Quantity multiplied by two-thirds; minus the quantity of Long Term CRRs for each season, time of use period and CRR Sink for that year; and minus the net MW amount of load migration CRRs valid for each season, time of use period and CRR sink for that year or (2) the total quantity of Seasonal CRRs allocated to that LSE or OBAALSE in the previous annual CRR Allocation, plus the net quantity of load migration CRRs associated with the immediately preceding Seasonal CRR Allocations for the corresponding season, time of use, and CRR sink location; minus the quantity of Long Term CRRs allocated in the immediately preceding Season CRR Allocation for each season, time of use period and CRR sink; and minus the net MW amount of load migration CRRs valid for each season, time of use period and CRR sink for that year.

[6] For the sake of convenience, in this document such entities are referred to as Allocation Eligible Entities.

If the nominations pass the validation process (i.e. nominations include only allowable CRR Sources and CRR Sinks and don't exceed the associated MW values), they are included in the CRR market where they undergo an SFT with other CRR nominations in the same CRR market (see Attachment B – Simultaneous Feasibility Test). Cleared CRRs are then provided back to Allocation Eligible Entities via the CRR MUI. The ISO then calculates and provides back to Allocation Eligible Entities the new eligible quantities for tier 2, based upon up to two-thirds of its Seasonal CRR Eligible Quantity less the CRRs that cleared in tier 1, Long Term CRRs previously allocated to it that are valid for the CRR team currently being allocated, and the net MW amount of long-term Load Migrations CRRs assigned to the LSE that are valid for the term currently being allocated. Allocation Eligible Entities (AEEs) repeat the same process in tier 2 as they followed in tier 1. For tier 2, the CRR Source Location and MW verification is not enforced and is considered an open source tier.

In Tier LT Allocation Eligible Entities or Qualified OBAALSEs may nominate any of the Seasonal CRRs allocated in the Priority Nomination Process (PNP). In addition, the total quantity of Seasonal CRRs that can be nominated as Long Term CRRs cannot exceed 50% for of the Allocation Eligible Entity's Adjusted Load Metric, with the exception for OBAALSEs as noted below.

For OBAALSEs, the quantity of Seasonal CRRs that it can nominate as Long Term CRRs is up to 50% of its Adjusted Load Metric for each season, time-of-use period, and Scheduling Point. A Qualified OBAALSE must demonstrate that all of its nominated Long Term CRRs are supported by a combination of long-term procurement arrangements of 10 years or greater and ownership of generation resources. Such a demonstration must be accompanied by a written sworn declaration by an executive employee authorized to represent the Qualified OBAALSE attesting to the accuracy of the data demonstration.

For OBAALSEs the long-term procurement is future looking, as with the annual showing of need, so the term of the long-term contract will start at least on the first day of the beginning of the season for which the PNP CRRs were awarded and are being requested in Tier LT and end at the earliest of the last day of the season for which the PNP CRRs were awarded and are being requested in Tier LT plus nine years. For example, if the PNP period on which the Tier LT nominations were being based was for the year 2010 and the season 2 (April 2010 through June 2010) PNP awards were being requested in Tier LT then the long term contracts must at least cover the period April 1, 2010 through June 30, 2019.

For tier 3, the eligible quantity is calculated as 100% of the Seasonal CRR Eligible Quantity less the CRRs that cleared in tier 1 and tier 2, the Long Term CRRs previously allocated to that eligible entity that are valid for the CRR term currently being allocated, and the net MW amount of long-term Load Migrations CRRs assigned to the LSE that are valid for the term currently

being allocated. For tier 3, the CRR Source Location and MW verification is not enforced and is considered an open source tier. However, the CRR Sink Location and MW value verifications are preserved with the exception that for tiers 2 or 3 Allocation Eligible Entities may request Sub-LAPs as the sink as long as the Sub-LAP is contained in the Default LAP that the Allocation Eligible Entity is eligible to request from.

8.2.1 Priority Nomination Process

The Priority Nomination Process (PNP) provides a means for AEEs that participated in the CRR Allocation in a given year to re-acquire in the immediately subsequent years the CRRs that were allocated to them in the immediately previous year (See ISO Tariff § 36.8.3.5.1). The PNP is used in tier 1 for each of the annual CRR Allocations. The SFT for tier 1 of all annual CRR Allocations only includes those CRRs previously allocated to AEEs during the previous annual CRR Allocation, subject to the limitations as noted in ISO Tariff § 36.8.3.5.1. Tiers 2 and 3 are non-source verified tiers, meaning that AEEs can request from any source, up to the limit of their eligible quantity for that tier.

Pursuant to Tariff section 36.8.3.5.1 the LSE participating in the PNP may make nominations up to the lesser of the following two values:

1. Its Seasonal CRR Eligible Quantity (SEQ) multiplied by two-thirds; minus the quantity of Long Term CRRs for each season, time of use period and CRR Sink for that year; and minus the net MW amount of load migration CRRs valid for each season, time of use period and CRR sink for that year; or
2. The total quantity of Seasonal CRRs allocated to that LSE in the previous annual CRR Allocation; plus the net quantity of load migration CRRs associated with the immediately preceding Season CRR Allocations for the corresponding season, time of use, and CRR sink location; minus the quantity of Long Term CRRs allocated in the immediately preceding Season CRR Allocation for each season, time of use period and CRR Sink; and minus the net MW amount of load migration CRRs valid for each season, time of use period and CRR sink for that year.

For purposes of calculating item 2 above, any seasonal allocation awards utilizing a Sub-LAP sink were counted as sinking at the relevant Default LAP.

As part of the normal process for determining each LSE's Seasonal CRR Eligible Quantity, as described in Tariff section 36.8.2.1 the ISO will adjust the LSE's Seasonal CRR Load Metric to reflect gains or losses due to Load Migration. This is accomplished by taking the net Load Migration adjustment, as a percentage, for the load losing LSE and multiplying this percentage by the load losing LSE's Seasonal CRR Load Metric to derive the MW amount that was transferred due to Load Migration. The Load Migration adjustment will reflect Load Migration through the most recently completed monthly Load Migration process prior to starting the annual CRR process. This will typically be the monthly Load Migration process done for July. The net

Load Migration adjustment for each LSE is reflected in the Load Migration column of the two spreadsheets provided by the ISO. The Load Migration column will show a negative value for a load-losing LSE or a positive value for a load gaining LSE. The Load Migration adjustment affects both the total quantity of CRRs an LSE may nominate in the PNP and the LSE's signature validation data set noted above.

As part of the PNP the LSE will also receive signature validation data. The signature pair data used for the PNP is prepared to include CRR source/sink pairs acquired through the Long Term CRR Allocation. Consistent with Tariff Section 36.8.3.5.1 and Appendix A, which defines the Priority Nomination Process, the CRR team will adjust these amounts to exclude any awarded Long Term CRRs in the PNP signature pair data. This section describes the signature data (source/sink pairs) that the nominating LSE may use in the PNP. An LSE nomination of any particular source/sink in the PNP may not exceed the MW quantity of CRRs having that source/sink pair that the LSE was allocated in the previous annual CRR Allocation, reduced by the MW quantity of those Long-Term CRRs with the same source/sink that were awarded in the prior year's Long-Term CRR allocation, for the same season and time of use period. This definition states that the PNP is "for CRR Holders to re-nominate (1) Seasonal CRRs they were allocated in the prior year, (2) *Long Term CRRs that are expiring* and (3) Existing Transmission Contracts that are expiring." Because there are no Long Term CRRs that will be expiring until 2017, the PNP signature data (until 2017) can only include Seasonal CRRs allocated in the prior year and any expiring ETCs.

The signature source/sink pairs are also adjusted for load migration. Load migration CRRs that were effective during the previous year for which the annual CRR process is being performed (i.e. for the annual allocation for 2010 load migration CRRs for 2009 will be included) will be added to the signature data as a valid source/sink pair so that they can be nominated by the receiving LSEs in the PNP. The signature source/sink pairs that had matching load migration source/sink pairs will then be adjusted for load migration. For example, assume that the signature source/sink pair data is being prepared for the PNP of the 2010 season 1 on-peak period. The starting point for this data is the prior year's seasonal awards for season 1 on-peak adjusted for any long term CRRs acquired through Load Migration that were valid for the period for which the seasonal nominations will be made. If an LSE was awarded 10MW of CRRs from A to B in the 2009 season 1 on-peak period and subsequently received, through Load Migration, long term CRRs that are valid for 2010, season 1, on-peak for 2MW from A to B then the signature source/sink pair data would reflect 8MW from A to B. The PNP data to be used for nominating CRRs for 2010, season 1 on-peak is comprised of those seasonal CRRs awarded in the prior year (10MW A to B in this example) but if the LSE already holds the same CRRs, acquired through Load Migration, then the signature source/sink pair is reduced by those same CRR source/sink pairs.

During the process of developing the signature data pairs, if an LSE had acquired a CRR in the prior seasonal CRR Allocation with a source that was retired after the CRR was awarded, this source will be removed from the signature pair data. The sink data reflecting the total quantity of CRRs the LSE may nominate in the PNP will not be adjusted. Therefore, this sink data still reflects the total awards. CRRs awarded in a tier where the LSE could request a Sub-LAP sink will not be made available in the PNP since PNP CRR nominations can only be made at the Default LAP.

8.2.2 Long Term Nomination Process

There are two basic pieces of data that are considered when validating a Tier LT nomination; sink upper bound, and signature validation. This data is contained within two validation data files that are made available through the CRR MUI.

The two basic sets of data to be used to validate Tier LT nominations are:

Sink Upper Bound – The sink upper bound is set at 50% of ALM. This number sets the absolute maximum number of MWs that can be nominated at a sink.

Signature Validation – Within the Signature Validation data there are three components; source upper bound, sink upper bound and source/sink signature validation data. These three sets of data are all based on what was awarded in tier 1 of the annual allocation process.

1. Source/Sink Signature Validation Data - Any Tier LT nomination submitted has to be a source/sink pair that was awarded in tier 1of the annual allocation process.

2. Source Upper Bound - Taking the set of signature validation data from the step above the CRR system sums up all similar sources, by season and time-of-use (TOU) and creates a second set of source upper bound data.

3. Sink Upper Bound - Taking the set of signature validation data from the step above the CRR system sums up all similar sinks, by season and TOU and creates a second set of sink upper bound data.

The data described above is used together to set the limits by which an entity can submit Tier LT nominations and is contained within the two files that were made available.

Example Tier LT Limits – Season 1 On Peak

LSE1	Adjusted Load Metric LAP1	200MW
LSE1	Adjusted Load Metric LAP2	400MW
LT Election		Up to 50% of ALM

Tier 1 Cleared CRRs – Path signature data

Source1 to LAP1	60MW
Source2 to LAP1	35MW
Source2 to LAP2	40MW
Source3 to LAP2	75MW

Sink Upper Bound – Based on 50% of ALM

LAP1	100MW = (0.5 * 200)
LAP2	200MW = (0.5 * 400)

Source Upper Bound - From cleared T1 CRRs

Source1	60MW
Source2	75MW
Source3	75MW

Sink Upper Bound – From cleared T1 CRRs

LAP1	95MW
LAP2	115MW

In this example the sink limitation will be based on the lesser of 50% of the ALM, by LAP, or the total sink CRRs cleared in the PNP. In this example the total sink CRR cleared in the PNP are less so the limitation would be 95MW for LAP1 and 115MW for LAP2. The LSE can request from any source/sink pair that cleared in the PNP. The CRR system will take the lower value from the set of data described above.

8.2.2.1 Re-Nomination of Expiring Long-Term CRRs

Pursuant to tariff section 36.8.3.5.5 LSEs have two alternatives for renewal of expiring long-term CRRs.

Alternative #1: Elect to nominate all expiring LT rights as long-term CRRs in Tier LT one year prior to the year of expiration. Since Tier LT is for the nine year period one year beyond the current annual process this election would be the first opportunity to re-nominate the expiring LT CRRs. For example, the first LT market was for the period 2009-2017 so the annual process that is being run to award CRRs for 2017, which is run in the summer of 2016, would include the LT market for the period 2018-2026 and this would be the Tier LT one year prior to the year of expiration. If the LSE chooses this alternative then all of the expiring LT CRRs would be added to the signature data to be used for the Tier LT process. Continuing the example of the first LT market, an entity that was allocated three separate LT CRRs for the 2009-2017 period that chose alternative #1 would need to choose alternative #1 as to all three LT CRRs awarded for that period. The signature data is created in the same manner as the PNP and LT processes that are run each year. The LSE is limited to the exact same LT CRRs as they were previously awarded in regards to the source, sink, season and TOU with the awarded MW amount, netted for load migration LT CRRs, being an upper limit on the re-nomination amount. For example, if an LSE was awarded a LT CRR that is expiring from Source A to Sink B for season 1 on peak for 10MW the LSE can elect to re-nominate a CRR from Source A to Sink B in the season 1 LT market for the on peak time-of-use for any amount from zero to 10MW. If the LSE does not want to re-nominate a specific CRR it would not submit a zero nomination amount but would just not submit a nomination. The LSE has flexibility into which CRRs it elects to re-nominate as long as it does not violate any of the signature data validation rules or any other applicable quantity limitations as noted in Tariff section 36. As with all CRR markets there is no guarantee that the nominated amount will clear since all nominations must pass the Simultaneous Feasibility Test (SFT) in order to be awarded. If the re-nominated CRR does not clear the SFT 100% there is no subsequent re-nomination available in the following year's PNP. In addition, if the LSE elects to only re-nominate a portion of the expiring LT CRRs it cannot then elect to take the un-nominated CRRs into the following PNP process.

Alternative #2: Elect to nominate the expiring LT rights in the PNP process that is being run for the year after the LT CRRs have expired. For example, the first LT market expired at the end of 2017 so the PNP process for which the expiring LT CRRs could be nominated would be the 2018 PNP that is run in the summer of 2017. Similar to alternative #1, the LSE is limited to the exact same LT CRRs as they were previously

awarded in regards to the source, sink, season and TOU with the awarded MW amount, netted for load migration LT CRRs, being an upper limit on the re-nomination amount. For example, if an LSE was awarded a LT CRR that is expiring from Source A to Sink B for season 1 on peak for 10MW the LSE can elect to re-nominate a CRR from Source A to Sink B in the season 1 PNP market for the on peak time-of-use for any amount from zero to 10MW. As noted above the LSE is not obligated to re-nominate the entire set of expiring LT CRRs and can pick and choose which ones to re-nominate as long as it does not violate any of the signature data validation rules or any other applicable quantity limitations as noted in Tariff section 36. Any CRRs clearing the SFT of the PNP are then made available for extension as a LT CRR in the subsequent Tier LT that is run after the PNP. Choosing this alternative allows the LSE to either continue re-nominating the cleared CRRs in each subsequent PNP on a yearly basis or taking the CRRs awarded through the PNP and nominating them into the Tier LT process.

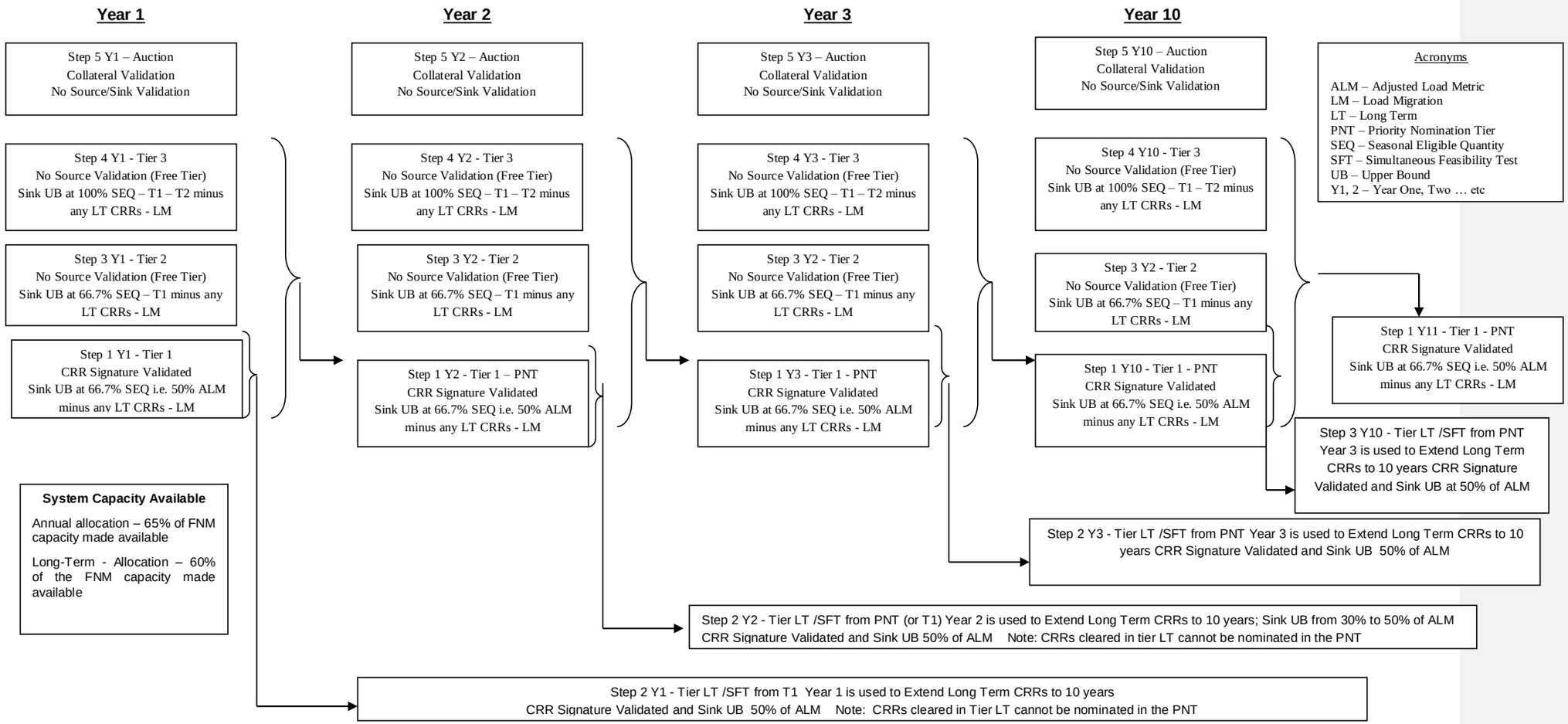
Regardless of which alternative is selected it is important to note that the capacity associated with the expiring LT CRRs is only available to the holders of the expiring LT CRRs until the running of the annual tier 2 allocation for the period after the LT CRRs have expired.

LSEs that hold expiring LT CRRs will need to provide the re-nomination of expiring long-term CRR alternative election form to crrdata@caiso.com by the date listed on the annual CRR allocation and auction timeline as posted on the CRR webpage at: http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx under the heading “Current Processes” for the respective annual process year. The alternative election form will be posted to the same location as the annual allocation and auction timeline document. If the alternative election form is not received by the cutoff date then the election will be reflected as alternative #2, which is to participate in the PNP.

8.2.3 Timeline For Finalizing Market Input Data

The market input data needs to be finalized at least two (2) business days before the start of the next setup. For more details, please see Section 6 of this BPM.

Exhibit 8-1: Congestion Revenue Rights Data Flow for the Annual Allocation Process Across Years



As shown graphically in Exhibit 8-1, when ISO starts the annual CRR Allocation process, it runs the Priority Nomination Process (tier 1) for each of the four seasons and two TOU periods simultaneously, runs the nominations through the SFT, and makes this information available to the Allocation Eligible Entities (AEEs) prior to opening tier LT for the nomination process. Since the cleared awards from the PNP are used as the signature data for tier LT, tiers 2 and 3 are run after tier LT. ISO then opens tier LT for all four season/TOU combinations, runs the nominations through the SFT, and makes the results available to the AEEs prior to running tiers 2 and 3 of the annual allocation.

ISO publishes a detailed timeline for the annual and monthly CRR Allocation and CRR Auction processes 45-60 days prior to beginning the calendar year for which the annual and monthly CRR Allocation and CRR Auction processes will be held for. So around late October or early November each year a new CRR calendar is posted for the upcoming year. For example, around late October of 2019 we will post the monthly schedule for the 2020 monthly allocation and auction processes as well as the 2021 annual allocation and auction process that will start in the summer of 2020.

8.2.4 Treatment of CRR Source Nominations at Trading Hubs

When Trading Hubs are nominated as CRR Sources the CRR system will disaggregate the Trading Hub nominations into individual Point-to-Point CRRs from all of the Generating Unit PNodes making up the Trading Hub, based on the Trading Hub allocation factors (See ISO Tariff §§ 36.8.3.1.2 and 36.8.4.1) for the relevant period for which the Trading Hub nomination is being requested. Prior to the start of the annual allocation process the ISO will determine the allocation factors for each Trading Hub and these same allocation factors will be used for the annual (including Tier LT) and monthly allocation processes. After the SFT has been run using the disaggregated CRRs a post process will be done to re-aggregate these disaggregated CRRs back into a Trading Hub CRR with any necessary counter-flow CRRs needed to maintain feasibility. The process that will be followed to do this is as follows:

1. All allocation Trading Hub nominations would be disaggregated to its constituent PNodes and the SFT would be conducted,

2. The percentage of allocated MW amount is computed from the nominated MW amount, relative to the disaggregated nomination in step 1, and its MW amount cleared from the SFT. Note that both nominated and cleared MW amounts are truncated to 0.001 MW granularities before the computation of the allocation percentage.

3. A rebundled Trading Hub CRR allocated MW amount would be computed using the highest percentage and the trading hub nomination that cleared,7

4. The CRR award would consist of the rebundled Trading Hub CRR and counter-flow CRRs that are needed to relieve any binding constraints that would be caused by awarding the rebundled Trading Hub CRR., The counter flow MW amounts are calculated as the difference between the PNodes' MW amounts cleared from the SFT and the product of the highest allocation percentage and the PNodes' disaggregated nomination,8

5. The rebundled MW amount of the Trading Hub CRR may have to be adjusted in order to have net MW of the Trading Hub and counter flow PNodes equal to the total SFT result. This will typically be limited to an increment of .001MW.

6. The Seasonal Eligible Quantity (SEQ) for subsequent tiers would be reduced by the rebundled Trading Hub award minus the counter-flow amounts.

7. Counter-flow CRRs awarded through this process will be assigned a CRR Type of 'LSE-THCNT' so that LSEs will be able to distinguish between the TH awarded CRRs and the system generated counter-flow CRRs.

2.2.1 Examples

Example #1

- Nomination is for 100MW from TH1 to DLAP
- Trading Hub (TH1) is comprised of five PNodes with the following allocation factors;
  - PNode1 20%
  - PNode2 50%
  - PNode3 15%
  - PNode4 10%
  - PNode5 5%
- Nominated MW amounts of Pnodes sent to the CRR SFT
  - PNode1 20 MW

7 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.

8 The re-aggregation will be performed as a post-process, between the 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 counter-flow 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 counter-flow 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.

  - PNode 2 50 MW
  - PNode 3 15 MW
  - PNode 4 10 MW
  - PNode 5 5 MW
- SFT results are:
  - PNode1 20 MW 100% cleared
  - PNode2 45 MW 90% cleared
  - PNode3 15 MW 100% cleared
  - PNode4 10 MW 100% cleared
  - PNode5 5 MW 100% cleared
  - Total 95 MW
- CRR Awards are:
  - TH1 to DLAP 100 MW
  - DLAP to PNode2 5 MW

Example #2

- Nomination is for 100MW from TH1 to DLAP
- Trading Hub (TH1) is comprised of five PNodes with the following allocation factors;
  - PNode1 20%
  - PNode2 50%
  - PNode3 15%
  - PNode4 10%
  - PNode5 5%
- Nominated MW amounts of Pnodes sent to the CRR engine
  - PNode1 20 MW
  - PNode 2 50 MW
  - PNode 3 15 MW
  - PNode 4 10 MW
  - PNode 5 5 MW
- SFT results are:
  - PNode1 16 MW 80% cleared
  - PNode2 33 MW 73.3% cleared
  - PNode3 12 MW 80% cleared
  - PNode4 6 MW 60% cleared
  - PNode5 4 MW 80% cleared
  - Total 71 MW
- CRR Awards are:
  - TH1 to DLAP 80 MW
  - DLAP to PNode2 7 MW
  - DLAP to PNode4 2 MW

Example #3

A third example to demonstrate the rounding/truncation process:

- Nomination is for 0.1 MW from TH1 to DLAP

- Trading Hub (TH1) is comprised of five PNodes with the following allocation factors;
  - PNode1 20%
  - PNode2 50%
  - PNode3 15%
  - PNode4 8%
  - PNode5 7%
- Nominated MW amounts of Pnodes sent to the CRR engine
  - PNode1 0.02 MW
  - PNode 2 0.05 MW
  - PNode 3 0.015 MW
  - PNode 4 0.008 MW
  - PNode 5 0.007 MW
- SFT results are:
  - PNode1 0.001 MW 5% cleared
  - PNode2 0.003 MW 6% cleared
  - PNode3 0.005 MW 33.33333333 % cleared
  - PNode4 0.001 MW 12.5% cleared
  - PNode5 0.001 MW 14.285714% cleared
  - Total 0.011 MW
- CRR Awards are:
  - TH1 to DLAP 0.031 MW (adjust TH value to have total MW amount of TH and counter-flow PNodes equal to 0.011MW)
  - DLAP to PNode1 [(.3333333333 * .02) - .001] = .0056666666 truncated value = 0.005
  - DLAP to PNode2 [(.3333333333 * .05) - .003] = .0136666666 truncated value = 0.013
  - DLAP to PNode4 [(.3333333333 * .008) - .001] = .0016666666 truncated value = 0.001
  - DLAP to PNode5 [(.3333333333 * .007) - .001] = .0013333333 truncated value = 0.001

Example #4

- Nomination is for 0.01 MW from TH1 to DLAP
- Same Trading Hub (TH1) definition as the third example
- Nominated MW amounts of Pnodes sent to the CRR engine
  - PNode1 0.002 MW
  - PNode 2 0.005 MW
  - PNode 3 0.0015 MW (truncated value = 0.001)
  - PNode 4 0.0008 MW (truncated value = 0)
  - PNode 5 0.0007 MW (truncated value = 0)
- SFT results are:
  - PNode1 0.001 MW 50% cleared
  - PNode2 0.003 MW 60% cleared
  - PNode3 0.001 MW 100% cleared
  - PNode4 0 MW excluded
  - PNode5 0 MW excluded
  - Total 0.005 MW
- CRR Awards are:

- TH1 to DLAP 0.008 MW (adjust TH value to have total MW amount of TH and PNodes equal to 0.005 MW)
- DLAP to PNode1 0.001 MW
- DLAP to PNode2 0.002 MW

8.3 Available CRR Capacity

ISO makes available 65% of Seasonal Available CRR Capacity for the annual CRR Allocation and CRR Auction processes, 60% of the Seasonal Available CRR Capacity in Tier LT, and 100% of Monthly Available CRR Capacity for the monthly CRR Allocation and CRR Auction processes (See ISO Tariff § 36.4.1). The percentages noted above are also applied to the Operating Transfer Capability values to be used for each of the Scheduling Points.

An additional adjustment to the available capacity at Scheduling Points is determined in accordance with ISO Tariff § 36.8.4.2, for the purposes of the CRR Allocation and CRR Auction of CRRs that have a CRR Source identified at a Scheduling Point.

In the annual or monthly CRR Allocation and CRR Auction processes, the ISO will account for any Merchant Transmission CRRs (see Section 14 of this BPM) as Fixed CRRs on the DC CRR FNM that is used in the SFT for the CRR Allocation and CRR Auction (see Attachment B).

For the purpose of the annual CRR Allocation and CRR Auction, ISO assumes all transmission facilities, within the ISO Controlled Grid, are in service unless ISO is aware of a major outage that is scheduled for a long portion of one or more of the seasons in the annual process. If the outage is deemed to be significant then the ISO may choose to reduce the operating limit of the facility or to take the facility completely out of service.

8.4 Incorporation of Transmission Outages in the Annual Process

For the purpose of the annual CRR Allocation and CRR Auction, the ISO assumes that all lines are in-service unless a scheduled outage of a significant facility is known in time to reflect that outage in the FNM for the annual process. Pursuant to tariff section 9.3.6.1 Operators shall provide the CAISO with their CRR Transmission Maintenance Outages plan by July 1 of each year, for Outages they plan to take in the following year.

8.5 Load Migration Reflected in Annual Allocation Process

An AEE that loses or gains net Demand through Load migration in any year has its Seasonal CRR Eligible Quantities in the next annual CRR Allocation reduced or increased in proportion to the net Demand lost or gained (See ISO Tariff § 36.8.3.5.1). In general, the adjustment to the Seasonal Eligible Quantities is obtained by adjusting the Seasonal CRR Load Metric that each AEE submits via the CRR System MUI. The following detail the steps that will be performed:

1. Each AEE submit their historical hourly load data via the CRR System MUI.

2. Each submission is verified against ISO metered data.

3. The CRR team will download each load duration curve for each Season from the CRR system.

4. The ISO Load Migration Process will calculate a table of "percentage of net loss" from one AEE to another.

5. For each load loosing AEE remove that % of load and add it to the load gaining AEE for each hour.

6. Modify the AEE's Load Metric by subtracting/adding that percentage, the Seasonal CRR Load Metric is the starting point for calculating the Seasonal Eligibility Quantity.

7. The Seasonal CRR Load Metric and the modified Seasonal Eligibility Quantity would be supplied back to each AEE via the MUI private message system.

8. Each AEE would send a confirmation email to crrdata@caiso.com.

In addition, an AEE who loses Demand through Load migration in any year has its PNP eligible quantities reduced in proportion to the gross amount of Demand lost through Load migration. This reduction in PNP eligible quantities is applied as a constant percentage to all CRRs that were allocated to that AEE in the prior annual CRR Allocation.

There is also an increase in an AEE's PNP eligible quantities due to an increase in Demand from Load migration. The Demand-gaining AEE may choose to nominate the CRRs transferred into its portfolio from the Load migration process as defined in section 8.2.1 of this BPM as part of the PNP.

9. Annual CRR Auction

In this section you will find the following information:

- How bids are submitted for the annual CRR Auction
- What creditworthiness requirements apply to the submission of bids
- What is the impact of holding CRRs on collateral requirements
- How to effect a CRR "sale" through the auction

9.1 Annual Auction Overview

The annual CRR Auction process takes place after the four-tiered annual CRR Allocation process. Any Candidate CRR Holder or CRR Holder may participate in the CRR Auction subject to the creditworthiness requirements under the ISO Tariff (See ISO Tariff §§ 36.5, 36.13.3, and 12). Candidate CRR Holders or CRR Holders interested in the annual CRR Auction may submit bids, once the market is opened, via the CRR MUI to the extent that they do not exceed their Aggregate Credit Limit. The minimum credit requirement to participate in an annual CRR Auction may be supported from a Candidate CRR Holder's Aggregate Credit Limit (see the ISO BPM for Credit Management). For additional details on the CRR Auction bids credit exposure calculation see Attachment H of this BPM.

Any Market Participant (MP) wishing to participate in the CRR Auction must complete the registration process in advance of any CRR market in which they want to participate. The complete registration process is detailed in the BPM for Candidate CRR Holder Registration, which can be found at: http://bpmcm.caiso.com/Pages/BPMLibrary.aspx. Once an entity has successfully registered and fulfilled all the requirements, they become a Candidate CRR Holder. An entity that is already a CRR Holder is not required to go through the registration process again to participate in the CRR Auction, but is still subject to the creditworthiness requirements in ISO Tariff § 12. For collateral purposes, the Candidate CRR Holder or CRR Holder works with its Client Representative to determine its Aggregate Credit Limit and posts additional collateral with ISO if desired.

Once the bid submittal period is over, ISO runs the SFT and optimization (see Attachment B) and returns results to the CRR Holders via the CRR MUI. ISO publishes a detailed timeline for the annual CRR Allocation and CRR Auction processes 30 days prior to the beginning of the CRR Allocation and Auction process.

9.2 CRR Source & Sink Location for the Auction Process

Allowable CRR Source and Sink combinations in the CRR Auction process are as noted in the exhibit below (See ISO Tariff § 36.13.5).

Exhibit 9-1: Allowable CRR Auction Source & Sink Combinations

		SINK LOCATIONS			
		LAP	**GEN**	**TH**	**SP**
SOURCE LOCATIONS	**GEN**	X		X	X
	TH	X			X
	SP	X		X	

LAP	Includes DLAPs, Sub-LAPs, MSS LAPs, CLAPs (for Participating Load)
GEN	Generator PNode and APNode locations
TH	The three trading hub locations
SP	Scheduling Points associated with interfaces/Ties

9.3 CRR Bids Submission

9.3.1 CRR Buy Bid Submission

Bids to purchase CRRs via the CRR Auction must be submitted as described below. Once submitted to ISO, CRR bids may not be withdrawn after the submission window has closed. The ISO will notify auction participants when the open and close dates are for each auction market. Candidate CRR Holders or CRR Holders may bid for Point-to-Point CRRs.

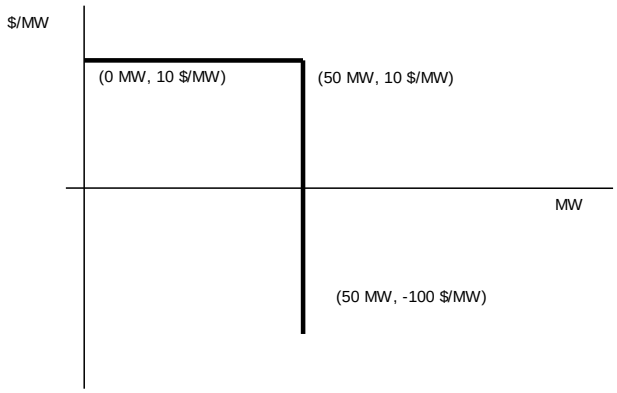
Each bid to buy a Point-to-Point CRR must specify the following information:

- The associated season and time-of-use period
- The associated CRR Source and CRR Sink
- A monotonically non-increasing piecewise linear bid curve in quantities (denominated in thousandths of MW) and prices ($/MW)

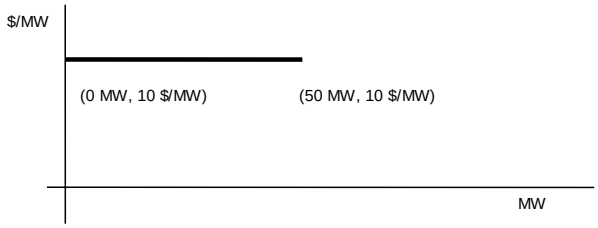
In general, any bid point (quantity, price) is allowed, as long as the first MW quantity is zero. However, when the last bid point of any bid curve leads to having a vertical bid segment, such a point is not further considered downstream in the CRR application as it has no meaning in the

optimization engine. Under this scenario, the bid is not rejected, there is no error message displayed to the participant, and the bid curve is processed without the last bid point.

As an illustration, let us consider an example in which a market participant submits a two-segment bid as shown in the following graph. The last bid point leads to a vertical segment and, therefore, is ignored.



In this case, both the pre-auction credit requirements and the auction clearing processes will use the equivalent one-segment bid shown below.

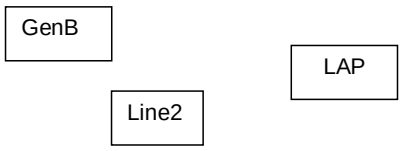


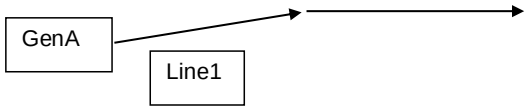
9.3.2 CRR Sell Bid Submission

If an entity is interested in removing a CRR from its portfolio there are two mechanisms by which this can be performed; the Secondary Registration System (please refer to section 13 of this BPM for more information on the SRS), or by offering to sell the CRR in the auction process. To sell a CRR in the auction the holder of the CRR must offer it for sale during an auction period for which the CRR is active. For example, if a CRR was acquired in the 2019 annual process for season 2, then that CRR could only be offered for sale in the 2019 monthly auctions for April, May and June of 2019. The MW of the first bid point must be zero and the maximum MW offered for sale must be less than or equal to the available MW of the CRR. If a CRR has been offered for sale in the SRS a CRR sell bid cannot be submitted in the auction until the SRS offer is expired.

The high level concept of the sell offer is that the "selling" entity is offering the capacity that the particular CRR is taking up, not specifically that exact source/sink combination. When offering a CRR for sale the purchaser does not have to buy the exact CRR source/sink combination that is being offered, although that is a possible result of the running of the SFT. It is possible that the buying entity needs a certain portion of the capacity being offered for sale that is needed for flows from a different source/sink combination in order for its respective bid to clear the SFT.

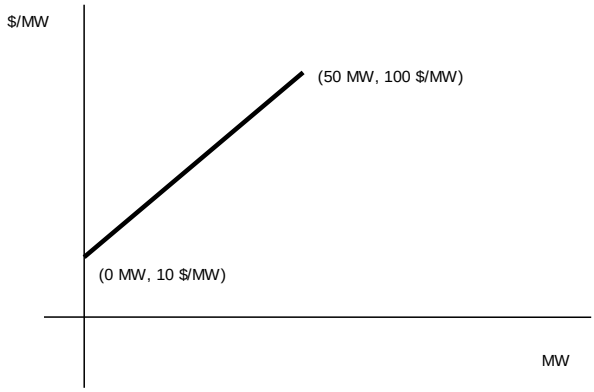
The following example further describes the concept. Assume that entity #1 holds a CRR from GenA to LAP for 10MW and is offering this CRR for sale in an auction market. This CRR flows over two lines, Line1 and Line2 (see diagram below). If entity #2 goes into this auction and offers to buy from GenB to LAP for 10MW, which has flows only across Line2, and is willing to pay what entity #1 wants to be paid then the result would be that entity #1 would be paid by entity #2 to give up their CRR and would no longer hold the CRR from GenA to LAP for 10MW and entity #2 would end up with a CRR from GenB to LAP for 10MW.





Each bid to sell a CRR must specify the following information:

- The CRR ID that is being offered for sale
- The associated CRR Source and CRR Sink will be populated by the system
- A monotonically non-decreasing piecewise linear bid curve in quantities (denominated in thousandths of MW) and prices ($/MW), a slope bid curve example is shown below, but participants can also submit step bid curves also, similar in concept to buy offers. The maximum MW value in the bid curve cannot exceed the awarded CRR value.



Similar to buy bids collateral requirements for sell offers are determined by the type of bid curve submitted by the selling entity with the main difference being that credit margin data is not included in the calculation since if the sell offer is accepted the selling party will no longer hold those CRRs. For a sell offer with a positive bid curve, the seller is wanting to be paid to sell this CRR so no credit requirement is needed. For a sell offer with a negative bid curve, the seller is willing to pay someone to get rid of this CRR there will be a credit requirement.

Entities that acquire seasonal CRRs in the annual allocation or auction process can offer for sale those CRRs in the monthly auctions for the same period that the CRR is valid for. For example, if an entity acquired a season 1 CRR in the annual allocation process they can offer for sale the respective monthly periods in the January, February or March monthly auctions. When a seasonal CRR is sold in one of the monthly processes the CRR system splits the CRR into the respective periods for which it is valid and for the respective MW amounts but retains the original CRR ID. As an example, let's assume an entity acquired CRR ID 1234 which is for 100 MW for 2020 season 1 on peak. When the January 2020 monthly auction is held they sell 50 MW of CRR 1234. When this is done the CRR system will then reflect the following:

CRR 1234	1/1/2020 through 1/31/2020	50 MW
CRR 1234	2/1/2020 through 3/31/2020	100 MW

If the seller had sold the entire 100 MW in the January auction then the CRR system would reflect the following:

CRR 1234	2/1/2020 through 3/31/2020	100 MW

CRRs acquired through the allocation process can also be sold through the auction but since these CRRs were awarded to LSEs based on load serving obligation it is important to note that allocated CRRs will always be associated with the LSE that was awarded those CRRs through the allocation process. Therefore, sold allocation CRRs do not impact eligible quantity calculations and do not reduce the load migration calculations. For purposes of eligible quantity (SEQ and MEQ) and load migration calculations the original awarded CRR values are used.

10. Monthly CRR Allocation

In this section you will find the following information:

- The time line for the monthly Allocation process
- How the Monthly Available CRR Capacity is calculated
- How is an AEE's Monthly CRR Eligible Quantity determined

10.1 Monthly CRR Load Metric & CRR Eligible Quantity

The monthly CRR Allocation process is similar to the annual CRR Allocation process. Each month ISO uses the AEE's monthly Demand Forecast submitted through the CRR MUI to calculate two load duration curves (one on-peak and one off-peak load duration curve for the applicable month) to form the basis for monthly allocations for each LAP in which the AEE serves Demand or the applicable Scheduling Point for a Qualified OBAALSE. The Monthly CRR Load Metric is the MW level of Load that is exceeded only in 0.5% of the hours based on the AEE's submitted Demand Forecast or the Qualified OBAALSE's historical Real-Time Interchange Export Schedules. ISO calculates an AEE's Monthly CRR Eligible Quantity by subtracting from that AEE's Monthly CRR Load Metric the quantity of Load served by TORs, ETCs (See ISO Tariff § 36.8.2.2). The ISO then takes the Monthly CRR Eligible Quantity and reduces it by any Seasonal CRRs allocated in the annual CRR Allocation and any holdings of Long Term CRRs allocated in prior years that are valid for the month and time of use of the CRRs being nominated (See ISO Tariff §§ 36.8.3.2 and 36.8.3.6).

The Monthly CRR Eligible Quantity is the starting point for calculating an AEE's nomination limit. In tier 1, AEEs may submit nomination requests up to 100% of the difference between their Monthly CRR Eligible Quantity and the quantity of Seasonal and Long Term CRRs they were allocated for the respective month (See ISO Tariff §§ 36.8.3.2.1. and 36.8.3.6.1.). For tier 2 they may submit nomination requests to fill in where nominations were not adequately covered in tier 1. (See ISO Tariff §§ 36.8.3.2.2. and 36.8.3.6.2.). The Monthly CRR Eligible Quantity is also adjusted downward for transmission rights (TOR and ETC) as in the annual process (See ISO Tariff § 36.8.2.2).

In tiers 1 and 2 CRR nomination submittals are verified for the CRR Sink Location and MW values when nominations are submitted via the MUI and targeted to an allocation market.

10.1.1 Monthly CRR Eligible Quantity

See the example below on how the Monthly CRR Eligible Quantity is calculated for a month. To illustrate how Tier LT results can impact the Monthly CRR Eligible Quantity calculation we will assume the values cleared for the final 2011 season 2/on peak results are as listed below for a total of 355MW cleared in the 2011 season2/on peak allocation:

Gen1 150MW

SP1 55MW

TH1 65MW

Gen2 65MW

SP2 20MW

In this example assume the following:

- The monthly process is for April 2011.
- In all monthly processes there is CRR Sink verification
- The forecasted load generated a Monthly CRR Load Metric of 520MW.
- The Tier LT allocation process that was done in 2010 awarded Long Term CRRs for 2011 through 2019. Since the monthly allocation process that is being assumed in this example is for April 2011, the cleared Tier LT CRRs will reduce the Monthly CRR Eligible Quantity. In Tier LT this AEE had 50MW of CRRs allocated for season 2/on

peak for the next nine years. These awarded Long Term CRRs will be used to reduce the Monthly CRR Eligible Quantity.

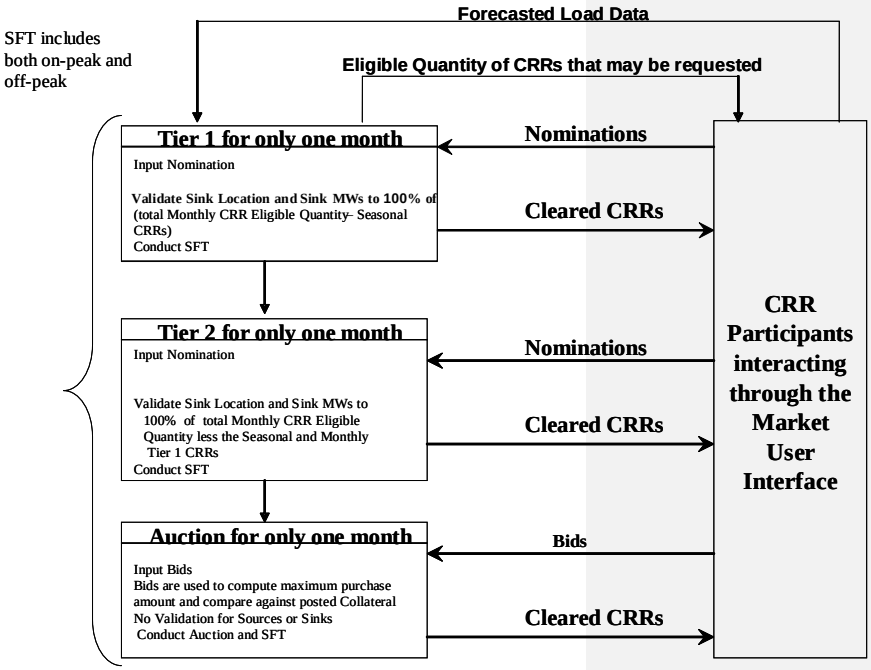
- This AEE does not have any Load served by TORs or ETC.

From the above information the first step would be to start with the Monthly CRR Load Metric of 520MW, remove the cleared seasonal CRRs from season 2/on peak of 355MW and also subtract the cleared Long Term CRRs for season 2/on peak of 50MW. This leaves the AEE with a Tier 1 Eligible Nomination Quantity of 115MW. All of the 115MW can be nominated in tier 1 of the monthly CRR Allocation process for April 2011.

10.2 Timing of Tiers

Exhibit 10-1 below presents the process for the monthly CRR Allocation and CRR Auction. ISO publishes a detailed timeline for the monthly CRR Allocation and CRR Auction processes 30 days prior to opening a market.

Exhibit 10-1: Monthly CRR Allocation and CRR Auction Process



FNM Capacity Restored to 100 Percent

10.3 Incorporation of Transmission Outages

For the purpose of the monthly CRR Allocation and CRR Auction, ISO works with Outage Coordination Operations Engineering to review proposed Outages to determine which Outages

should be reflected in the network model[9]. The modeling of these Outages for the monthly allocation can have a significant impact on ISO being able to maintain revenue adequacy for the CRR Holders.

It is possible for Outages modeled in the monthly allocation to render previously awarded CRRs infeasible. When this occurs, a special feature in the CRR system called "soft limits" functionality can be activated. This functionality will increase the limits on any constraints that are overloaded as a result of the transmission outages such that all the previously awarded CRRs will be feasible. The act of changing operating limits like this is a factor that could contribute to but does not necessarily mean a possible revenue inadequate condition (See ISO Tariff §§ 36.4.2).

10.3.1 Monthly Outage Methodology for outages that may have a significant effect on CRR Revenue Adequacy

As provided in Section 9.3.6.3.2 of the ISO Tariff and Section 4.2.1 of the BPM for Outages, Outages that may have a significant effect upon CRR revenue adequacy must be submitted for ISO approval at least 30 days in advance of the first day of the month the Outage is proposed to be scheduled. If the 30th day falls on a non ISO business day, then the Planned Outage Request is due on or before the last business day; 30 days prior to the month the outage is to begin. Outages that may have a significant effect upon CRR revenue adequacy include only Transmission facilities of the ISO Controlled Grid where:

1. The equipment or any part of the equipment[10] is rated above 200 kV (except for ISO-approved exceptions), or
2. The equipment is part of any defined flow limit as described in a ISO operating procedure (except for ISO-approved exceptions), or
3. The equipment was out of service in the last three years and for which the ISO determined a special flow limit was needed for real-time operation.

The ISO provides updates on the revenue adequacy of the issued CRRs on a monthly basis and has developed an economic methodology to evaluate potential additions to the exemptions to the 30-day advance submission rule for Outages, which was presented to CRR stakeholders in 2010. The ISO will implement a stakeholder process to review the results and discuss other options.

[9] The CRR Team confers on a regular basis with ISO Outage Coordination and Operations Engineers to review proposed scheduled outages. These reviews include discussions on the expected location and duration of these outages and leads to a determination as to which lines may be taken out of service in the full network model for purposes of the CRR Allocation and Auction process.

[10] For example, the high side of a 220 to 115 transformer is above 200kV so the entire transformer is subject to the 30-day rule.

A list of the transmission facilities that satisfy criteria 2 and 3 that define Outages that may have a significant effect upon CRR revenue adequacy is provided in the Operating Procedure T-113. The list will be reviewed by the ISO Regional Transmission Engineering Department on an annual basis and revised as appropriate.

Requests for planned Outages that may have a significant effect upon CRR revenue adequacy must be submitted to ISO Outage Coordination at least 30 days prior to the start of the calendar month for which the outage is planned to begin. This rule is intended to provide good outage data far enough in advance to allow the ISO to reflect them in the network model used for releasing CRRs and thereby minimize impacts to the revenue adequacy of CRRs.

The ISO emphasizes that the 30-day rule is not intended to prevent needed maintenance on significant facilities in circumstances where the 30-day rule cannot be followed without adversely affecting the grid reliability. Accordingly, the following exceptions to the 30-day rule will be used to approve outages without classifying them as forced:

1. Outages that can be initiated and completed within a twenty-four hour period.
2. Outages previously approved by ISO that are moved within the same calendar month either by the ISO or by request of the PTO.
3. ISO approved allowable transmission maintenance activities during restricted maintenance operations as covered in ISO operating procedure.

The ISO will review the history of exceptions annually to determine whether they are effective in promoting adequate information for CRR purposes, and whether use of these exceptions should continue to be classified as planned.

With regards to outages that cannot be initiated and completed within a 24-hour period, there are additional factors to consider. Section 36.4.3.2 states the 24-hour rule as being that a CRR Transmission Maintenance Outage is, in part, an outage that "cannot be initiated and completed within a twenty-four (24) hour period." The key consideration is whether, at 30 days prior to the start of the month, the transmission operator had a good-faith belief that the work could have been completed in less than 24 hours. If so, then the outage would not be a CRR Transmission Maintenance Outage that must be reported 30 or more days before the start of the month. If a transmission operator plans to take a series of outages that affect the same transmission element and in total exceed 24 hours but that individually are less than 24 hours, then the CAISO requests that the transmission operator report that series of outages at least 30 days before the start of the month. This is because that series of outages can have the same (or greater) impact on the CRR process as a single 24-hour outage that does meet the requirements of section 36.4.3.2.

10.3.2 Approach for handling outages

Each month the ISO will modify the CRR Full Network Model to reflect the collective impact of transmission outages that may have a significant impact on monthly CRR revenue adequacy. This impact will be determined through two complementary steps.

A. Power Flow Analysis

Using the data provided under Section 10.3.1 of the CRR BPM, each month the ISO will select line outages equal to or greater than a certain number of days for analysis through a series of power flow tests. The ISO may select line outages for study with varying durations in order to keep the number of power flow tests to be performed each month to a reasonable level. These expected outages will be studied and incorporated within the CRR Full Network Model in the following manner:

1. The expected outages are ranked in descending order by voltage (kV) magnitude.
    a. Transmission lines with equal kV ratings are ranked by the duration of the expected outage. For example, three 500kV lines would be ranked according to the number of days each would be expected to be out-of-service.

2. Power flow analyses would be run with each line taken out of the model.
    a. The power flow analyses would be run sequentially starting with the largest voltage magnitude and the longest outage duration.
    b. The power flow analyses will be cumulative, so that each new line taken out of the model will be added incrementally to lines already taken out of the model.

3. If the power flow analysis solves with a line taken out of the model, that line will be modeled as out-of-service in the CRR Full Network Model for that month.

4. If the power flow analysis diverges with a line taken out of the model, that line will remain in service within the CRR Full Network Model for that month in order to maintain the integrity of the model. The impact of expected outages that remain in service within the CRR Full Network Model will be accounted in the step B.

B. Scaling Factor

The ISO will derate the CRR Full Network Model by a global scaling factor each month to account for:

- expected outages that will remain in service within the CRR Full Network Model
- expected outages with short duration that are not studied in a power flow analysis

The ISO will use combination of engineering judgment (based on how many outages already applied to the model) and historical performance data when appropriate to determine the scaling factor to be used each month.

10.4 Modeling of Loop Flows

As part of the full network model, the ISO will model expected loop flows through the ISO balancing authority area in the Day-Ahead Market (DAM). To maintain consistency between the DAM and the CRR market, the CRR process will also model expected loop flows. In order to accomplish this, there are two approaches that can be applied. One approach is to adjust path limits, internal and/or external, to account for the effects of expected loop flows. If this approach is used participants would be notified through the release files made available through the CRR FNM posting. A second approach is for the CRR process to create a separate market, subject to the simultaneous feasibility test (SFT), to reflect the effect of expected loop flows. If this approach is taken the CRR process will create a source/sink nomination(s) to model the effects of expected loop flows and run the nomination(s) through a separate SFT on a monthly basis, prior to the running of the ETC market. The results of the modeling of expected loop flows will be made available once the market is posted, similar to how the ETC market results are made available. The CRRs awarded through this market will be identified by CRR type BASE_SCH. Similar to ETC and TOR awarded CRRs, the BASE_SCH CRRs will be held by the ISO.

10.5 Adjustments to Transmission Constraints

Pursuant to tariff section 27.5.6 and tariff section 36.4 the CRR model will reflect adjustments to the transmission constraints to follow the same adjustments to be made when operating the DAM. The intent is to mimic, as closely as possible, the same set of constraints enforced in the DAM, which helps to maintain revenue adequacy.

10.6 Forecast Load Methodology & Calculation of Monthly CRR Load Metric

For the monthly CRR Allocation process each LSE submits its forecasted Demand data to ISO through the CRR MUI. The ISO will follow the process outlined in section 7.2.2 of this BPM. The adjustment described in section 7.3.2 will help to ensure consistency between the Load data submitted for CRR purposes and the CEC data submitted for Resource Adequacy purposes. For further details on this process, please refer to section 7.3.2 of this BPM.

10.7 Available Capacity at Scheduling Points

10.7.1 Monthly Scheduling Point Residual

For the monthly CRR Allocation processes for import CRRs (i.e., CRRs at Scheduling Points), the calculation of the residual value set aside takes place after tier one of each monthly CRR Allocation. After tier 1 of the monthly CRR Allocation the ISO will calculate and set aside for the monthly CRR Auction 50% of the residual capacity at the Scheduling Points. The residual value set aside calculation will take into consideration any annual allocated or auctioned CRRs and Long Term CRRs that are valid for the respective month and time-of-use period as well as the results of tier 1 of the monthly CRR Allocation (See ISO Tariff § 36.8.4.2.2).

10.8 Load Migration

An AEE that loses or gains net Demand through Load migration must reflect that loss or gain in the monthly Demand Forecasts it submits to ISO for determining its monthly CRR Eligible Quantities for future monthly CRR Allocations. For more detail on the monthly adjustments to LSE's CRR holdings due to Load migration please refer to section 7.4 of this BPM.

11. Monthly CRR Auction

In this section you will find the following information:

- How bids are submitted for the monthly CRR Auction
- What creditworthiness requirements apply to the submission of bids
- How to effect a CRR "sale" through the auction

11.1 Monthly CRR Auction Overview

The monthly CRR Auction process takes place after the two-tiered monthly CRR Allocation process. Any Candidate CRR Holder or CRR Holder may participate in the monthly CRR Auction subject to the creditworthiness requirements under the ISO Tariff (See ISO Tariff §§ 36.5, 36.13.3, and 12). An entity that is already a CRR Holder is not required to go through the registration process again to participate in the CRR Auction, but is still subject to the creditworthiness requirements in ISO Tariff § 12. Candidate CRR Holders interested in the monthly CRR Auction may submit bids, once the market is opened, via the CRR MUI to the extent that they do not exceed their Aggregate Credit Limit. The minimum credit requirement to participate in a monthly CRR Auction may be supported from a Candidate CRR Holder's Aggregate Credit Limit (see the ISO BPM for Credit Management).

Once the bid submittal period is over, ISO closes the market and runs the SFT and optimization and returns results to the CRR Holders via the CRR MUI. ISO publishes a detailed timeline for the monthly CRR Allocation and CRR Auction processes 30 days prior to opening a market.

The allowable CRR Sources and CRR Sinks in the CRR Auction process are Generator PNodes, Scheduling Points, Trading Hubs, LAPs, MSS-LAPs, and Sub-LAPs.

11.2 CRR Buy Bid Submission

Bids to purchase CRRs via the CRR Auction must be submitted as described below. Once submitted to ISO, the Candidate CRR Holder may not withdraw the CRR bids after the CRR Auction submission window is closed. Candidate CRR Holders may bid for Point-to-Point CRR Obligations (See ISO Tariff § 36.13.4).

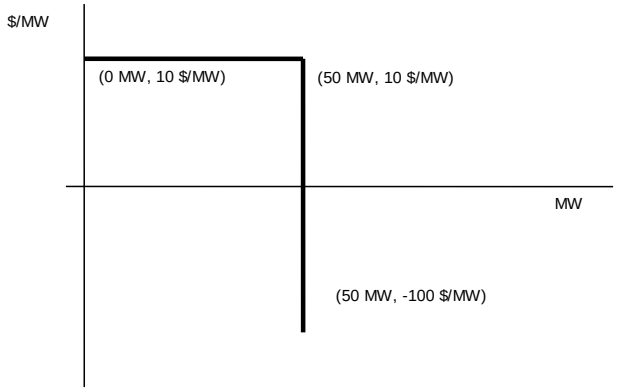
Each bid for a Point-to-Point CRR must specify the following information:

- The associated month and time-of-use period
- The associated CRR Source and CRR Sink

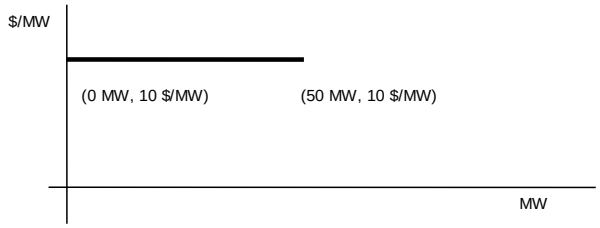
- A monotonically non-increasing piecewise linear bid curve in quantities (denominated in thousandths of MW) and prices ($/MW)

Bid prices in all CRR bids may be negative. In general, any bid point (quantity, price) is allowed. However, when the last bid point of any bid curve leads to have a vertical bid segment, such a point is not further considered downstream in the CRR application as it has no meaning in the optimization engine. Under this scenario, the bid is not rejected, there is no error message displayed to the participant, and the bid curve is processed without the last bid point.

As an illustration, let us consider an example in which a market participant submits a two-segment bid as shown in the following graph. The last bid point leads to a vertical segment and, therefore, is ignored.



In this case, both the pre-auction credit requirements and the auction clearing processes will use the equivalent one-segment bid shown below.

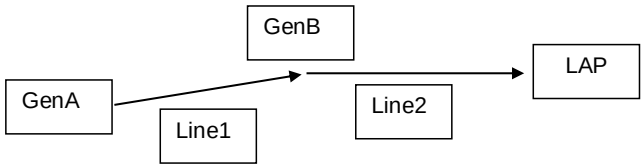


11.3 CRR Sell Bid Submission

If an entity is interested in removing a CRR from its portfolio there are two mechanisms by which this can be performed; the Secondary Registration System (please refer to section 13 of this BPM for more information on the SRS), or by offering to sell the CRR in the auction process. To sell a CRR in the auction the holder of the CRR must offer it for sale during an auction period for which the CRR is active. For example, if a CRR was acquired in the 2019 annual process for season 2, then that CRR could only be offered for sale in the 2019 monthly auctions for April, May and June of 2019. The MW of the first bid point must be zero and the maximum MW offered for sale must be less than or equal to the available MW of the CRR. If a CRR has been offered for sale in the SRS a CRR sell bid cannot be submitted in the auction until the SRS offer is expired.

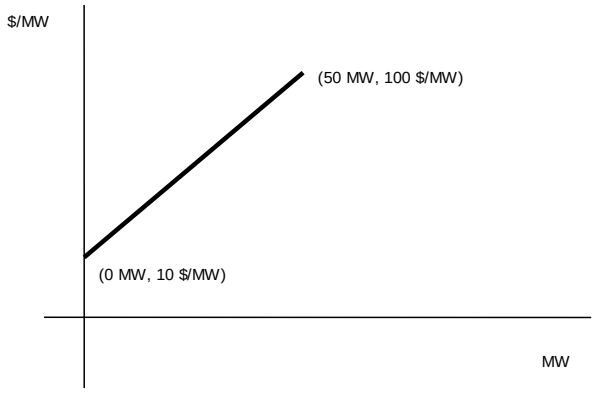
The high level concept of the sell offer is that the "selling" entity is offering the capacity that the particular CRR is taking up, not specifically that exact source/sink combination. When offering a CRR for sale the purchaser does not have to buy the exact CRR source/sink combination that is being offered, although that is a possible result of the running of the SFT. It is possible that the buying entity needs a certain portion of the capacity being offered for sale that is needed for flows from a different source/sink combination in order for its respective bid to clear the SFT.

The following example further describes this concept. Assume that entity #1 holds a CRR from GenA to LAP for 10MW and is offering this CRR for sale in an auction market. This CRR flows over two lines, Line1 and Line2 (see diagram below). If entity #2 goes into this auction and offers to buy from GenB to LAP for 10MW, which has flows only across Line2, and is willing to pay what entity #1 wants to be paid then the result would be that entity #1 would be paid by entity #2 to give up their CRR and would no longer hold the CRR from GenA to LAP for 10MW and entity #2 would end up with a CRR from GenB to LAP for 10MW.



Each bid to sell a CRR must specify the following information:

- The CRR ID that is being offered for sale
- The associated CRR Source and CRR Sink will be populated by the system
- A monotonically non-decreasing piecewise linear bid curve in quantities (denominated in thousandths of MW) and prices ($/MW), a slope bid curve example is shown below, but participants can also submit step bid curves also, similar in concept to buy offers. The maximum MW value in the bid curve cannot exceed the awarded CRR value.



Similar to buy bids collateral requirements for sell offers are determined by the type of bid curve submitted by the selling entity with the main difference being that credit margin data is not included in the calculation since if the sell offer is accepted the selling party will no longer hold those CRRs. For a sell offer with a positive bid curve, the seller is wanting to be paid to sell this CRR so no credit requirement is needed. For a sell offer with a negative bid curve, the seller is willing to pay someone to get rid of this CRR there will be a credit requirement.

Entities that acquire seasonal CRRs in the annual allocation or auction process can offer for sale those CRRs in the monthly auctions for the same period that the CRR is valid for. For example, if an entity acquired a season 1 CRR in the annual allocation process they can offer for sale the respective monthly periods in the January, February or March monthly auctions. When a seasonal CRR is sold in one of the monthly processes the CRR system splits the CRR into the respective periods for which it is valid and for the respective MW amounts but retains the original CRR ID. As an example, let's assume an entity acquired CRR ID 1234 which is for 100 MW for 2020 season 1 on peak. When the January 2020 monthly auction is held they sell 50 MW of CRR 1234. When this is done the CRR system will then reflect the following:

CRR 1234	1/1/2020 through 1/31/2020	50 MW
CRR 1234	2/1/2020 through 3/31/2020	100 MW

If the seller had sold the entire 100 MW in the January auction then the CRR system would reflect the following:

CRR 1234	2/1/2020 through 3/31/2020	100 MW

CRRs acquired through the allocation process can also be sold through the auction but since these CRRs were awarded to LSEs based on load serving obligation it is important to note that allocated CRRs will always be associated with the LSE that was awarded those CRRs through the allocation process. Therefore, sold allocation CRRs do not impact eligible quantity calculations and do not reduce the load migration calculations. For purposes of eligible quantity (SEQ and MEQ) and load migration calculations the original awarded CRR values are used.

12. CRR Allocations to Out-of-Balancing Authority Area Load Serving Entities (OBAALSEs)

In this section you will find the following information:

- CRR eligibility requirements for OBAALSEs
- CRR Source and CRR Sink verification information
- Responsibility for prepaying the Wheeling Access Charge

12.1 Requirements for OBAALSEs

OBAALSEs can participate in the annual and monthly CRR Allocation processes subject to the following conditions:

- The OBAALSE makes a showing of legitimate need by demonstrating ownership of or contract with a Generating Unit PNode internal to the ISO Balancing Authority Area or an executed Energy contract from a System Resource or Trading Hub that covers the time period of the CRRs being nominated (See ISO Tariff § 36.9.1).
- For CRRs sources at Scheduling Points, the OBAALSE demonstrates that the generating resources located outside of the ISO Balancing Authority Area that is used for imports are not in the OBAALSE's own Balancing Authority Area; (See ISO Tariff § 36.9.1).
- On an annual basis, the OBAALSE demonstrates that it has obtained firm transmission rights pursuant to the tariffs of intervening transmission providers between the ISO Balancing Authority Area and the location of the OBAALSE's load (See ISO Tariff § 36.9.1).
- The OBAALSE prepays or commits to pay the appropriate Wheeling Access Charge as described in Section 12.3 of this BPM and in ISO Tariff § 36.9.2, whichever is applicable.
- The external Load for which CRRs are nominated is not served through a TOR or ETC that has been designated as eligible to receive the reversal of Congestion charges.
- The external Load for which CRRs are nominated will be exposed to ISO Congestion charges because it is not served by Supply resources other than exports from the ISO Balancing Authority Area.

12.2 Verification Process for OBAALSEs

The verification process for demand external to the ISO Balancing Authority Area has some unique aspects that are described below.

12.2.1 Source Location Verification

For entities serving Load external to the ISO Balancing Authority Area that meet the requirements listed in Section 12.1 of this BPM and ISO Tariff § 36.9, the eligible CRR Source locations can be either Generating Unit PNodes located within the ISO Balancing Authority Area that were owned or contracted for, Trading Hubs or generating resources located outside of the ISO Balancing Authority Area that use Scheduling Points to import this Energy into the ISO Balancing Authority Area. For internal Generating Units to be used as verified sources the determination of legitimate need will be based on demonstration by the OBAALSE of an Energy contract from a Generating Unit that covers the time period for which the CRRs are being nominated. For Trading Hubs and Scheduling Points to be used as verified sources the determination of legitimate need will be based on demonstration by the OBAALSE of an Energy contract that covers the time period for which the CRRs are being nominated. This same showing of legitimate need will be required for nomination of Long Term CRRs. In addition, generation resources used for verification of Scheduling Points as CRR Sources for Qualified OBAALSEs may not be in the OBAALSE's Balancing Authority Area (See ISO Tariff § 36.9.1).

Source verification, for OBAALSEs, is done for all tiers of the annual CRR Allocation process in all years.

12.2.2 Source MW Verification

As it is for internal LSEs the verified source MW amount is derived from the PMax of the Generating Unit, if it is owned, or from the contract value at the Scheduling Point or Trading Hub that the OBAALSE intends to nominate as the CRR Source. For the annual allocation process the source MW amount is limited to 75% of the Generating Unit PNode's PMax if the unit is owned by the OBAALSE or otherwise to 75% of the contract value for that Generating Unit PNode, Scheduling Point or Trading Hub (See ISO Tariff §§ 36.9.4). For all CRR Sources that the OBAALSE is requesting the source verification is based on projected usage during the term for which the CRRs are being nominated. For verified sources at Scheduling Points the OBAALSE must demonstrate it owned or was party to a contract with a System Resource and that it had acquired transmission to deliver to the Scheduling Point being requested as a verified source location (See ISO Tariff §§ 36.9.1 and 36.8.4.2.1). The contract at the Scheduling Point must be for a minimum 30 day duration and may be subject to a pro-rata adjustment to reflect contracts that do not span the full period for which the CRR is being requested.

12.2.3 CRR Sink Location Verification

The eligible CRR Sink Locations are Scheduling Points that the entity historically used to serve its load. To verify a CRR Sink Location, the historical hourly export values will be based on the tagged Real-Time Interchange Export Schedules for the OBAALSE at that particular Scheduling Point (See ISO Tariff § 36.9.3). The historical period for purpose of the CRR Sink Location verification process is the same period as described in ISO Tariff § 36.8.2.

12.2.4 CRR Sink MW Verification

For the purpose of determining the Seasonal and Monthly CRR Eligible Quantities, the entity must submit two sets of data. The annual CRR Allocation process will use the total historical hourly export values, described above in section 12.2.3 of this BPM, from the prior year to derive the OBAALSE's Seasonal CRR Eligible Quantity and historical export values for the forecasted month to derive the OBAALSE's Monthly CRR Eligible Quantity. In addition, the OBAALSE will need to submit the prior year's historical hourly metered load data for its end-use customers that were exposed to Congestion Charges for use of the ISO Grid.

This data will be submitted using the CRR MUI. When submitting these two sets of data through the CRR system MUI using the historical load XML format, the first set of data listing hourly exports at each Scheduling Point will have the export Scheduling Point as the sink, whereas the second set of data listing hourly metered Load served by exports will use the Default LAP, of the region within which the OBAALSE is located, as the sink location. This allows the ISO to derive separate duration curves and determine the appropriate exceedance level. The CRR Sinks used in the nominations will still be at the Scheduling Point level.

From this data, the CRR system constructs a usage curve for each season or month and time of use and selects the MW level that is exceeded in 0.5% of the hours. The OBAALSE's Seasonal and Monthly CRR Eligible Quantities will be based on the lesser of (1) the total historical hourly export data for all Scheduling Points submitted as CRR Sinks and (2) the hourly metered Load for the external end-use customers served by the OBAALSE that were exposed to ISO Congestion Charges (See ISO Tariff § 36.8.2). The lesser of these two values is the external entity's Seasonal or Monthly CRR Load Metric. From this amount, ISO subtracts any load served by TOR or ETC to derive the Seasonal or Monthly CRR Eligible Quantity. The Monthly CRR Load Metric would also be adjusted by subtracting any CRRs cleared in the annual allocation process.

12.2.5 Eligible Quantity Calculation for OBAALSEs

Qualified OBAALSEs that request CRRs in the CRR Allocations may only use Scheduling Points for CRR Sinks. These entities must provide two sets of data on which the Seasonal and

Monthly CRR Eligible Quantities will be determined: one set includes the OBAALSE's historical hourly exports at the Scheduling Point that is the CRR Sink of the nominated CRRs and the second set of data includes hourly metered Load of the OBAALSE that was served by exports from the ISO Balancing Authority Area. The distinction between the two sets of data is to reflect the amount of Load that was being served by the use of the ISO Controlled Grid and subject to ISO Congestion charges. Therefore, if any of the exports from the ISO were subsequently used for anything other than to serve the OBAALSE's load it would not be included in the hourly metered Load data, which would be a lower value and subsequently used to determine the OBAALSE's Load Metric. Both sets of data will reflect values prior to subtraction of any ETCs or TORs. Once the data has been submitted into the CRR system any ETCs or TORs held by the OBAALSE would be subtracted from the respective load metrics. The ISO will use the lower load metric determined from the two data sets for purposes of deriving the Seasonal and Monthly CRR Eligible Quantities. If the second data set, based on hourly metered Load of the OBAALSE, derives the lower load metric then the OBAALSE will be given the option of distributing this single value to the Scheduling Points used for the first set of Load data. A description of this process is provided in the table at the bottom of this section. Supporting documentation would be final Hour Ahead schedules submitted to the ISO through the scheduling system as further described in 12.2.3 of this BPM (See ISO Tariff § 36.9.3).

When submitting these two sets of data through the CRR system MUI using the historical load XML format, the first set of data listing hourly exports at each Scheduling Point will have the export Scheduling Point as the sink, whereas the second set of data listing hourly metered Load served by exports will use the Default LAP, of the region within which the OBAALSE is located, as the sink location. This allows the ISO to derive separate duration curves and determine the appropriate exceedance level. When the upper bound is determined for the OBAALSE the CRR Sinks used in the nominations will be at the Scheduling Point level.

Example: OBAALSE Eligible Quantity Determination

Data Set	Sink Name	TOU	Peak	Exceedance	Season	ETC	Total Export Value After ETCs	Lower of Data Set #1 or #2
#1	SchedPt_1	OFF	300	275	S1	100	355	-
#1	SchedPt_2	OFF	200	180	S1	50	-	-
#1	SchedPt_3	OFF	75	50	S1	-	-	-
-	-	-	-	-	-	-	-	-
#2	Default LAP	OFF	400	350	S1	150	200	200

Notes:

1) Data Set #1 is the total exports, from the ISO, at each Scheduling Point

2) Data Set #2 is the hourly metered load served by exports from the ISO

3) This example only includes data for Season 1/Off Peak

4) Since data set #2 produced the lower Seasonal CRR Eligibility Quantity, the OBAALSE would have 200 MW to split between the three Scheduling Points requested in data set #1, as long as the amount requested is not larger than the value in the exceedance column, less the respective ETC amount on the particular Scheduling Point. So, in the example, 175MW (275-100) of the 200MW could come from SchedPT_1, or up to 130MW from SchedPt_2 or up to 50MW from SchedPt_3, as long as the combined amounts do not exceed the total 200MW. These amounts are then considered verified for the Season 1/Off Peak period and 75% will be available to request in the Annual Allocation process.

12.3 Calculation of Prepayment of Wheeling Access Charge

Out-of-Balancing Authority Area Load Serving Entities (OBAALSEs) are required to prepay or commit to pay the relevant Wheeling Access Charges (WACs) in order to participate in the CRR Allocation processes and be eligible to receive allocated CRRs (See ISO Tariff §§ 36.9.2 and 36.9.2.2). For each MW of CRR nominated, the nominating entity must prepay one MW of the relevant WAC, which equals the per-MWh WAC that is expected (at the time the CRR Allocation process is conducted) to be applicable for the period of the CRR times the number of hours comprising the period of the CRR. Pursuant to ISO Tariff § 36.9.2 an OBAALSE that is creditworthy under the requirements of ISO Tariff § 12 may elect to prepay WAC on a monthly basis for the Seasonal CRRs they seek to be allocated. The OBAALSE will need to demonstrate a commitment to pay for the entire term by submitting to the ISO a written sworn statement (declaration) to this effect.

To the extent that an entity prepays a quantity of the WAC and is not allocated the full amount of CRRs nominated, WAC prepayment for CRRs not allocated is refunded by ISO within 30 days following the completion of the relevant CRR Allocation process.

An OBAALSE that wants to request Long Term CRRs will be required to prepay the associated WAC for the full ten year term of the CRRs being nominated prior to participating in the allocation unless it is a creditworthy entity as determined under ISO Tariff § 12. Pursuant to ISO Tariff § 36.9.2 an OBAALSE that is creditworthy under the requirements of ISO Tariff § 12 may elect to prepay WAC on an annual or monthly basis for the Long Term CRRs they seek to be allocated. The OBAALSE that elects to prepay on a monthly basis will need to demonstrate a commitment to pay for the entire term prior to the beginning of each annual period by submitting to the ISO a written sworn statement (declaration) to this effect.

The declaration can be found on the ISO Website at: http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx. This declaration will also allow OBAALSEs to elect to prepay WAC in its entirety or in installments as described above. For the Annual CRR Allocation, OBAALSE's will have their Seasonal Eligibility Quantity set to the minimum of (1) their SEQ as calculated by the CRR system or, (2) the MWs they choose to prepay WAC for. For the Monthly CRR Allocations, OBAALSEs will have their Monthly Seasonal Eligibility Quantity set to the minimum of (1) their MEQ as calculated by the CRR System or, (2) the MWs they choose to prepay WAC for. OBAALSE's must indicate to the ISO what MW amount they are willing to prepay WAC for at least four (4) business days prior to the opening of Tier 1 of the annual or monthly allocations.

13. Secondary Registration System

In this section you will find the following information:

- How the Secondary Registration System operates

13.1 SRS Overview

ISO provides for registered Candidate CRR Holders and CRR Holders a Secondary Registration System (SRS) to facilitate and track the CRR bilateral transactions that occur between CRR Holders. The SRS is a subsystem within the CRR system.

Using the SRS, a CRR Holder may transfer ownership of CRRs to any entity eligible to be a CRR Holder. Transfers must be for at least a full day term consistent with the on-peak or off-peak specification of the CRR and must be in increments of at least a thousandth of a MW. The entity receiving the CRRs may be any entity eligible to be a CRR Holder. All CRRs that are traded continue to be subject to the relevant terms and conditions set forth in the ISO Tariff and relevant BPMs (See ISO Tariff § 36.7).

The SRS also enables any entity that specifically wishes to purchase or sell CRRs to post information describing those CRRs. The information that will be posted includes a description of the CRR for purchase or sale (CRR Source, CRR Sink, MW value, duration, time of use) and the price. It also includes a place to put contact information. As noted in section 9.3.2 and 11.3 of this BPM it is also possible to submit sell offers into the auction markets. There is a dependency between offers submitted through the SRS and those submitted through the auction. If an SRS trade is pending during the auction submittal window then that particular CRR cannot be offered for sale in the auction. Conversely, if a CRR is being offered for sale in an auction market that has not yet cleared then that CRR cannot be offered for transfer through the SRS either.

13.2 SRS Business Rules

CRR Holders must report to ISO, by way of the SRS, all bilateral CRR transactions. Both the transferor and the transferee of the CRRs must register the transfer of the CRR with ISO using the SRS five business days prior to the effective date of transfer of revenues associated with a CRR, or with sufficient time necessary for the ISO to evaluate the creditworthiness of the transferor and transferee, whichever is shorter. CRRs can be traded on a daily, TOU (on and off-peak) basis in increments as small as a thousandth of a MW. CRRs cannot be traded on an hourly basis. A CRR Holder could, for example, trade a CRR for January 22nd, On-Peak but could not trade just HE10 through HE16 of that day.

ISO does not assess any CRR Settlement charges or make any CRR Settlement payments with any entity other than the CRR Holder of record until the CRR transfer is successfully recorded through the SRS and the transferee meets all the creditworthiness requirements specified in ISO Tariff § 12.

Both the transferor and transferee must submit the following information to the SRS:

- The effective start and end dates of the transfer of the CRR
- The identity of the transferor
- The identity of the transferee
- The quantity of CRRs being transferred
- The CRR Sources and CRR Sinks of the CRRs being transferred
- The time of use period of the CRR

The transferee must meet all requirements of CRR Holders, including disclosure to ISO of all entities with which the transferee is affiliated that are CRR Holders or Market Participants (See ISO Tariff § 36.7.3). As part of the CRR registration process all entities complete and submit a CRR Holder Affiliate form, which can be found at the Registration Process and Registered Entities Process at http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx

13.2.1 Creditworthiness in SRS

The SRS portion of the CRR system is provided to facilitate the buying and selling of CRRs acquired through the CRR Allocation or CRR Auction. Within the SRS there is a functionality that performs a creditworthiness check of all SRS trades to ensure that the receiving party of the transaction has sufficient collateral to cover the ownership of the CRR. If the projected value of the CRR is negative, meaning that the expected revenue stream is negative and the CRR Holder would be expected to owe ISO for holding that CRR, then the new CRR Holder needs to have sufficient collateral posted with ISO to cover the term of the CRR. If sufficient collateral is available then the trade is confirmed. If there is not sufficient collateral, the trade is rejected until such time as the entity can post the additional required collateral. For Long Term CRRs the CRR Holder may sell or transfer only the term corresponding to the current calendar year as well as the calendar year covered by the most recently completed annual CRR Allocation. See CRR BPM Attachment H for additional details related to SRS trades.

14. Merchant Transmission Upgrades

14.1 Merchant Transmission Sponsor

The Project Sponsor of a Merchant Transmission Facility will be eligible for Merchant Transmission CRRs only if such entity has turned such facilities over to the ISO and has elected not to recover costs of its investment on that specific transmission upgrade through the ISO's transmission access charges or other regulatory cost recovery mechanism (See ISO Tariff § 36.11).

14.2 Merchant Transmission CRRs

Listed below are the basic characteristics of the Merchant Transmission CRR:

The duration of the Merchant Transmission CRRs will be for 30 years or the pre-specified intended life of the facility, whichever is less.

A Project Sponsor of a Merchant Transmission Facility may elect Merchant Transmission CRRs as either option CRRs or obligation CRRs or a combination of both.

The quantity and CRR Source-Sink pattern of Merchant Transmission CRRs allocated to the Project Sponsor for a Merchant Transmission Facility will be commensurate with the transfer capacity that the project adds to the ISO Controlled Grid, as determined by the process and methodology proposed in ISO Tariff § 36.11 and further described in this section 14.

The Project Sponsor of a Merchant Transmission Facility's entitlement to Merchant Transmission CRRs will begin when the Merchant Transmission Facility has been placed into full energized commercial operations, entered into the FNM at least 90 days in advance of commercial operations, and operational control has been turned over to the ISO.

14.3 Process and Methodology for Determining Merchant Transmission CRRs

The ISO proposes to follow a three-step process that compares the CRRs that are feasible on the network model before the Merchant Transmission Facility with the incremental CRRs that are feasible after the Merchant Transmission Facility.

14.3.1 Step 1: The Capability of the Existing Transmission System

In Step 1 the ISO determines the CRRs that the Project Sponsor for the Merchant Transmission Facility would not be eligible to be awarded as a result of its upgrade.

The ISO would begin with a Full Network Model that does not include the Merchant Transmission Facility, but includes all adjustments for Transmission Ownership Rights (TORs), and any Merchant Transmission Facility for which Merchant Transmission CRRs were previously allocated. The ISO would apply to this model all encumbrances on the system including previously released short-term and Long Term CRRs, Existing Transmission Contracts [ETCs], which would be modeled as Fixed CRRs. These Fixed CRRs should be feasible for this CRR model.

The Project Sponsor for the Merchant Transmission Facility would be allowed to submit, at one time, up to five Merchant Transmission CRR nominations specifying the source, sink and number of megawatts of incremental CRRs that it would like to receive for its upgrade. The ISO would add the nominated Merchant Transmission CRRs to the set of Fixed CRRs already modeled on the FNM but, in doing so, would replace the nominated MW quantity of each nominated Merchant Transmission CRR with a large, positive quantity. These quantities, for each source/sink Merchant Transmission CRR nomination, will be large enough to cause infeasibility when these CRRs are applied to the CRR model.

The ISO would next perform an optimization subject to a simultaneous feasibility test to determine the quantity of each nominated Merchant Transmission CRR that is feasible on the transmission grid (FNM) prior to including the Merchant Transmission Facility in the FNM. Since the Merchant Transmission CRR nominations are the only control variables in this optimization/SFT process, the nominated CRRs will be reduced to obtain feasibility. These cleared CRRs will be termed “Capacity CRRs” and will be modeled as additional fixed CRRs on the FNM that does not include the MT Facility. If the Merchant Transmission Facility has seasonal and/or time-of-use limit variation then a separate SFT would be performed for each time-of-use period and season, as needed.

14.3.2 Step Two: Mitigation of Impacts on Existing Encumbrances

This step will ensure that the addition of the Merchant Transmission Facility does not negatively impact any existing encumbrances through the end of the term for which the annual CRR Allocation and CRR Auction processes have already been conducted; including the most recently completed monthly CRR Allocation and CRR Auction processes. The ISO will test the simultaneous feasibility of all the Fixed CRRs identified above by adding the proposed Merchant Transmission Facility to the DC FNM and run the SFT, by time-of-use and season as needed, using the Fixed CRRs. This test is to ensure that the addition of the Merchant Transmission Facility does not negatively impact any of these other encumbrances. For any impacts identified in this step the Project Sponsor will be required to provide mitigation. This mitigation can include having the Project Sponsor hold counter-flow CRRs that are necessary to maintain the feasibility of the existing encumbrances over the same period.

14.3.3 Step Three: Incremental Merchant Transmission CRRs

This step will determine the incremental amount of CRRs that the Merchant Transmission Project Sponsor can be allocated as Merchant Transmission CRRs. The ISO would add the Merchant Transmission Facility to the CRR FNM, and then apply to that CRR model the various Fixed CRRs identified above, including previously released short-term and Long Term CRRs, ETC and any previously allocated Merchant Transmission CRRs, plus the "Capacity CRRs" and any counter-flow CRRs that were required as a result of the final test of Step two above. With this set-up the ISO would apply the Merchant Transmission CRR nominations (the original source-sink pairs and MW quantities nominated by the Project Sponsor of the Merchant Transmission Facility) and would award to the Merchant Transmission Project Sponsor as many of these as clear the SFT, by time-of-use and season, as needed. The ISO will also ensure that the Merchant Transmission CRRs are also feasible absent all Fixed CRRs.

14.4 Existing Capacity that is Not Currently Used by CRRs

Under the proposed methodology, the reservation of Capacity CRRs in Step 1 of the proposed three step allocation process for Merchant Transmission CRRs will ensure that any CRRs that the Merchant Transmission sponsor nominates that are feasible on the transmission grid prior to the Merchant Transmission upgrade will not be awarded to the Project Sponsor of the Merchant Transmission Facility as Merchant Transmission CRRs. The process for reserving Capacity CRRs is applied only to the Merchant Transmission CRRs that the Project Sponsor for the Merchant Transmission Facility nominates, however, it does not necessarily reserve all CRRs that might be feasible, unallocated and un-auctioned for the existing transmission system. The allocation of Merchant Transmission CRRs may rest on transmission capacity that is not used by prior encumbrances (i.e., ETC, Long Term CRRs, auctioned seasonal and monthly CRRs, allocated seasonal and monthly CRRs) that exist at the time that the determination is made of the award of the Merchant Transmission CRRs. An important point is that any such "fallow" transmission capacity could have been obtained by any qualified participant in the last annual or monthly CRR auction. Thus, by definition, the transmission capacity that Merchant Transmission CRRs appropriate is transmission capacity that no market participant chose to buy at any price.

14.5 Timing of Allocation to Merchant Transmission Project Sponsors

Pursuant to ISO Tariff § 36.11.2, no less than 45 days prior to the in-service date of the Merchant Transmission Facility the Project Sponsor needs to notify the ISO of the in-service date of the facility and that the Project Sponsor will be requesting Merchant Transmission CRRs associated with this facility. Since the process for the allocation of Merchant Transmission

CRRs will be completed after the in-service date of the facility the payment stream associated with those Merchant Transmission CRRs will be retroactive back to the in-service date.

14.6 Generator Interconnection Driven Reliability Network Upgrade Merchant Transmission CRR Process

Pursuant to section 14.3.2.1 of Appendix DD of the ISO Tariff an Interconnection Customer that incurs costs to construct Reliability Network Upgrades (RNUs) beyond the reimbursable amount shall receive CRRs for the portion of the RNUs that are not covered by cash repayment stated in this section. Those projects that do not meet the requirements as set forth in Tariff Section 36.11 will not qualify to receive CRRs for the portion of RNUs not covered by the cash repayment. Any CRRs will take effect upon the Commercial Operation Date (COD) of the Generating Facility in accordance with the Generator Interconnection Agreement (GIA). The awarding of Merchant Transmission (MT) CRRs for these RNUs will follow the same process as followed for standard Merchant Transmission CRRs but due to the unique nature of the partial funding for the RNUs, listed below are some additional process points.

- As with the standard MT CRR process the Interconnection Customer will be able to request five source-sink pairs for each time-of-use (TOU) period.
- From these source-sink pairs the CAISO will follow the standard MT CRR process to determine how much capacity was created by the RNU, if any.
- From the results above the CAISO will then take the ratio of the unreimbursed costs to total costs of the RNU project and multiply this ratio times the awarded MW values per source sink pair by TOU and create MT CRRs.
- MT CRRs will be awarded for 30 years or the life of the project, whichever is less.

Example of the above process:

1) Assume total RNU costs of $40 million, reimbursed for $15 million. Unreimbursed costs are $25 million. Ratio of unreimbursed costs to total costs is 25/40 or 62.5%
2) Interconnection Customer requests the following pairs for both on and off peak TOU periods ;
    a. SourceA to SinkZ for 100MW
    b. SourceB to SinkZ for 100MW

c. SourceC to SinkZ for 100MW

d. SourceD to SinkZ fo 100MW

e. SourceE to SinkZ for 100MW

3) For simplicity we will assume the same below awards from running the Simultaneous Feasibility Test (SFT) for both TOU periods:

a. SourceA to SinkZ for 75MW

b. SourceB to SinkZ for 50MW

c. SourceC to SinkZ for 0MW

d. SourceD to SinkZ fo 100MW

e. SourceE to SinkZ for 10MW

4) Based on the above SFT results the interconnection customer would be awarded the following MT CRRs for both TOU periods:

a. SourceA to SinkZ for 46.875MW (75 * 62.5%)

b. SourceB to SinkZ for 31.25MW (50 * 62.5%)

c. SourceC to SinkZ for 0MW (No awards in the SFT)

d. SourceD to SinkZ fo 62.5MW (100 * 62.5%)

e. SourceE to SinkZ for 6.25MW (10 * 62.5%)

15. Process for Handling Disconnected PNodes for CRR Purposes

When a Pricing Node (PNode) included in the ISO market model has been disconnected,[11] the ISO market software uses the Locational Marginal Price (LMP) at the closest electrically connected pricing node as the LMP at the affected location. Relevant aggregate pricing node (APNode) LMPs, notably Trading Hubs, will be changed accordingly. The methodology for

[11] A PNode may become disconnected due to an outage of facilities on the transmission grid that renders the PNode no longer electrically connected to the rest of the modeled grid.

locating the closest electrically connected PNode consists of performing a fixed level of electrical proximity from high to low search starting from the disconnected PNode and traversing the network along the FNM branches to locate a connected PNode. The branches that emanate from the disconnected PNode are traversed in descending priority order with respect to their admittance, which is used as a measure of electrical closeness. ~~When the IFM cannot identify an electrically connected PNODE within the fixed level of proximity, a post process will be performed to determine the next closest electrically connected PNode and replace the LMP of the disconnected PNode with this price. This price update will be done within the DAM price correction timeline.~~ During a significant outage event in which many PNodes at certain locations are disconnected, for example, a Public Safety Power Shutoff (PSPS) event in the IFM, it may not be possible to identify an electrically connected PNode within the fixed level of proximity. In such cases, the ISO market software uses the System Marginal Energy Cost (SMEC) as the LMP at such disconnected pricing node.

For the interties there are a couple of scenarios that could be encountered that relate to this situation:

1. The tie is radial - In this situation the hourly TTC will be set to zero and the tie will be electrically opened. Under this scenario, we would incorporate the pricing at the Scheduling Point similar to how we have agreed to price “Disconnected PNodes”.

2. The tie is looped - In this situation the hourly TTC will be set to zero and all schedules would be removed. Without any schedules we would not see any congestion so using the price at the Scheduling Point would be sufficient for settling on CRRs and nothing would need to be done to the prices.

16. Process for Handling CRR PNode Retirements

When a PNode is retired from the ISO Master File that is associated with an active CRR source or sink location the ISO will perform a process to re-map the retired PNode to the closest electrically connected PNode that is also a biddable location in the CRR processes and has the same source/sink designation as the retired location. For example, if the retired location is a generator type then the re-mapped location will be the closest electrically connected PNode that is a CRR biddable location that is also a generator type location. This process is similar in methodology to how a PNode that is disconnected in the ISO Markets is mapped to the closest electrically connected PNode, with the additional step of ensuring that the ultimate PNode mapping is to a PNode that is biddable in the CRR processes and is of the same location type. The mapping of the retired PNode to the closest electrically connected biddable PNode will go

into effect based on the retirement date as identified in Master File. Any DAM settlement will be done at the mapped location from the retirement date forward. Once the mapping is determined the CRR system runs a process to update the retired PNode name, source and/or sink location, to the mapped biddable location. This process is typically run a few days after the retirement date to make sure that all awarded CRRs are captured. In the event that the retired pricing node is associated with changes in topology of the ISO Controlled Grid, as provided in Section 36.8.7 of the ISO tariff the ISO will further modify the outstanding CRRs to ensure their simultaneous feasibility. For the situation involving the retirement of a resource that is part of a TH location the CRR team will remove the retired resource from the TH definition and renormalize all remaining generator resources within that TH definition.

17. CRR Related Grid Management Charges

There will be two types of CRR related grid management charges (GMC) effective on January 1, 2012.

1. CRR services charge (See ISO Tariff § 11.22.2.5.3). This charge code is designed to recover costs the ISO incurs for running the CRR markets. As such, this charge code will be applied to each CRR holder's net MW holdings of CRRs that are applicable to each hour. The rate for this charge will be calculated by dividing the annual GMC revenue requirement allocated to this service category by the forecast annual sum of awarded MW of CRRs per hour.

    a. Netting Process – To determine the value that will be assessed the CRR services charge a netting process will be performed that uses the daily ownership payload that is sent to Settlements. This payload data provides a single netted value for each source/sink/TOU combination for a particular trade day. With the netting process it is possible that an entity could hold several CRRs with the same source/sink/TOU that get netted and reflected as a single line item in the Settlements statement. In addition, if a CRR Holder has a CRR and the counter-flow for the same trade day/TOU these values will also get netted to a single line item on the settlements statement. In the table below is a hypothetical example of how an entity's total CRR holdings would be netted to arrive at the value to be considered for the CRR services charge.

Inventory Data - Not Netted

CRR ID	Start Date	End Date	TOU	Source	Sink	MW	CRR Type
1000	4/1/2011	6/30/2011	OFF	MALIN	DLAP PGAE	5.0	LSE
1100	4/1/2011	4/30/2011	OFF	MALIN	DLAP PGAE	2.0	LSE

1200	4/1/2011	6/30/2011	OFF	DLAP PGAE	MALIN	0.5	LSE_CNT
1300	4/1/2011	6/30/2011	OFF	MALIN	DLAP PGAE	1.0	LSE_LMT
2000	4/1/2011	6/30/2011	OFF	MALIN	DLAP PGAE	3.0	AUC
2100	4/1/2011	4/30/2011		DLAP PGAE	MALIN	4.0	AUC

Settlement / Ownership Data - Netted

CRR ID	Trade Day	OFF	Source	Sink	MW	CRR Type
1000	4/1/2011	OFF	MALIN	DLAP PGAE	7.5	LSE
2100	4/1/2011	OFF	DLAP PGAE	MALIN	1	AUC

2. CRR bid transaction fee (See ISO Tariff § 11.22.6). This fee is designed to recover a portion of the CRR costs on a transactional basis. The fee will apply to both the CRR allocation process and the CRR auction process. The rate is $1 per nomination or per bid, without consideration of the number of segments. The revenue from this transaction fee will offset costs recovered through CRR services. Thus, if the number of uncleared submitted nominations or bids increases, the CRR services rate for those participants who have nominations or bids cleared will decrease. For more details about these two GMC charge codes, please refer to the Business Practice Manual for Settlements.

18. Market Data Availability on Market User Interface

Market data typically available through the MUI public downloads is made available to market participants initially after the market setup for both allocation and auction markets. Three years following the end of the market effective period the following data will no longer be available.

Network (Only visible to entities that have executed the CRR FNM NDA)

1) PSSE raw file
2) Contingencies
3) Monitored lines and transformers
4) Interface definitions

Market

1) Source sink data
2) Base loading CRRs

Market Results

1) CRR result

2) Binding constraints
3) Source/sink clearing prices (for auction markets only)

Attachment A

CRR TIME OF USE DEFINITION

A. CRR Time of Use Definition

CRRs are defined either for on-peak or off-peak hours consistent with the WECC standards at the time of the relevant CRR Allocation or CRR Auction. The Time-of-Use definition is described as follows:

- For the normal weekdays, Monday to Saturday, the off-peak hours are the hours ending 1 through 6 and hour ending 23 and 24; the on-peak hours are the hours ending 7 through 22.
- Public holidays (listed in Exhibit A-1) and all Sundays are treated as off-peak. That is, all 24 hours are off-peak hours on these days.
- Based on NAESB Business Practices, Appendix A, which may be accessed using the following link:

  http://www.naesb.org/pdf2/weq_bklet_011505_iip_mc.pdf

  - If a public holiday falls on a Saturday, that Saturday is treated as a holiday (i.e., all 24 hours are off-peak hours)
  - If a public holiday falls on a Sunday, the following Monday is treated as a holiday, (i.e. all 24 hours are off-peak hours).
- Beginning in 2007 the start and end dates for Daylight Savings Time (DST) will change. DST will begin on the second Sunday of March and end the first Sunday of November.
- Hour ending 3 is excluded for the short day on March 9, 2008.
- Hour ending 25 is added for the long day on Nov 2, 2008.

- Exhibit A-1: Public Holidays

Summary of Public Holidays from Feb 1 2008 to Jan 31 2009		
Holiday	**Date**	**Day**
Memorial Day	5/26/2008	Monday
Independence Day	7/4/2008	Friday
Labor Day	9/1/2008	Monday
Thanksgiving Day	11/27/2008	Thursday
Christmas Day	12/25/2008	Thursday
New Year's Day	1/1/2009	Thursday

ISO will post a yearly update on the ISO website with an up to date definition of On and Off Peak.

Attachment B

SIMULTANEOUS FEASIBILITY TEST

B. Simultaneous Feasibility Test

The annual and monthly CRR Allocation and CRR Auction processes release CRRs to fulfill CRR nominations and bids as fully as possible, subject to a Simultaneous Feasibility Test (SFT). For the CRR Allocation, to the extent that CRR nominations are not simultaneously feasible, the nominations are reduced in accordance with the CRR Allocation optimization formulation until simultaneous feasibility is achieved. For the CRR Auction, to the extent that bids are not simultaneously feasible, the bids are reduced in accordance with the CRR auction optimization formulation.

The main purpose for applying the SFT is to help ensure that the CRRs created through an allocation or auction process are revenue adequate. Revenue adequacy is the situation in which, over a given period, at least as much congestion revenue is collected by the ISO than is paid out in CRR entitlements to the CRR Holders.

In the CRR Allocation process, the SFT is applied by modeling CRR Source nominations and CRR Sink nominations as injections and withdrawals, respectively, onto a Full Network Model (FNM). The location and amount of injection is based on the definition of the CRR Source in terms of its member Pricing Nodes (PNodes) and allocation factors[12]. The location and amount of withdrawal is based on the definition of the CRR Sink in terms of its member PNodes and allocation factors. The same process applies to the CRR Auction process. The application of the sources and sinks onto the FNM creates flows on operating constraints based on the nominated MW amount in the case of an allocation and the MW amount from the bid curve in the case of the auction. These flows, along with any flows due to Fixed CRRs (see below), are compared to the constraint limits. All nominated CRR Sources and CRR Sinks are applied simultaneously in the CRR Allocation process and likewise all CRR bids are applied simultaneously in the CRR Auction process. The comparison of the resulting flows against the constraint limits is performed simultaneously. This simultaneous comparison is the SFT. Note that Point-to-Point CRR nominations and bids are pre-balanced in terms of injection and withdrawal amounts for the SFT.

If the SFT fails, for a given set of nominations or bids, feasibility must be achieved. This is accomplished by reducing the MW quantity amounts associated with the nomination or bids. This reduction is performed through an optimization process. In fact, the SFT is embedded within an optimization formulation. The optimization formulation has an objective function and a set of constraints. During the optimization process, the objective function is either maximized

[12] Allocation Factors are the weights that define the fractional MW amount that is mapped from a Source or Sink to a Pnode. See the CRR Educational Material at: http://www.caiso.com/participate/Pages/Training/default.aspx

(or minimized which ever is the case) while all constraints are simultaneously satisfied (i.e., not violated).

Weighted Least Squares Optimization

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

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

When the CRR process first started in 2008 the optimization formula was to maximize CRRs. 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 current optimization formula, WLS distributes the curtailment across all CRR nominations that are effective in relieving the congestion, and thus spreads the curtailment among multiple allocation participants. The WLS is a more equitable formulation for the CRR allocation process; in that CRR nominations share the available capacity.[13]

2.1.1 Optimization Formulation

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 since multi-point CRRs have terminated.

[13] 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 CRR MW amounts 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 CRR MW amounts. 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	$\max\left(\sum_{i=1}^{N}\delta_i \cdot X_i\right)$	$\min\left(\sum_{i=1}^{N}\alpha_i\left(\overline{X}_i - X_i\right)^2\right)$	δ_i, α_i are proxy weighting factors where $\delta_i \geq 0$ and $\alpha_i = \frac{1}{\overline{X}_i}$
Flow Constraints for each constraint, *l*	$\sum_{i=1}^{N} X_i \cdot SF_{i,l} \leq hourlyTTC_l$		$SF_{i,l}$ is the shift factor (calculated from the Full Network Model) for the i^{th} control variable on the l^{th} constraint. HourlyTTC_l is the limit for the l^{th} constraint.
Control Variable upper and lower bound constraints for each variable, X_i	$0 \leq X_i \leq \overline{X}_i$		

2.1.2 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. $\Delta V_k = \sum_{i=1}^{N} \overline{X}_i \cdot SF_{i,k} - hourlyTTC_k$. 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:

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

$$R_{i,k} = \frac{\overline{X}_i \cdot SF_{i,k}^{\ 2}}{\sum_{j=1}^{N}(\overline{X}_i \cdot SF_{j,k}^{\ 2})}, \text{where} \sum_{i=1}^{N} R_{i,k} = 1$$

The reduction of the each control variable is as follows:

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

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

$$\Delta X_i = \frac{\overline{X}_i \cdot SF_{i,k}}{\sum_{i=1}^{N}(\overline{X}_i \cdot SF_{j,k}^{\ 2})} \Delta V_k$$

2.1.3 Examples

Example #1

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

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

$$R_{1,k} = \frac{X_1 \cdot SF_{1,k}^{\ 2}}{\left(X_2 \cdot SF_{2,k}^{\ 2} + X_1 \cdot SF_{1,k}^{\ 2}\right)}$$

$$R_{2,k} = \frac{X_2 \cdot SF_{2,k}^{\ 2}}{\left(X_2 \cdot SF_{2,k}^{\ 2} + X_1 \cdot SF_{1,k}^{\ 2}\right)}$$

$$\Delta X_1 = \frac{1}{SF_{1,k}} \cdot \Delta V_{k,1} \Rightarrow \Delta X_1 = \frac{X_1 . SF_{1,k}}{\left(X_2 \cdot SF_{2,k}^{\ 2} + X_1 \cdot SF_{1,k}^{\ 2}\right)} \Delta V_k$$

$$\Delta X_2 = \frac{1}{SF_{2,k}} \cdot \Delta V_{k,2} \Rightarrow \Delta X_2 = \frac{X_2 . SF_{2,k}}{\left(X_2 \cdot SF_{2,k}^{\ 2} + X_1 \cdot SF_{1,k}^{\ 2}\right)} \Delta V_k$$

Let $SF_{1,k}$ = 0.5; $SF_{2,k}$ = 0.2; ΔV_k = 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.

$$R_{1,k} = \frac{100 \times 0.5^2}{100 \times 0.5^2 + 50 \times 0.2^2} = \frac{25}{25+2} = \frac{25}{27}$$

$$R_{2,k} = \frac{50 \times 0.2^2}{100 \times 0.5^2 + 50 \times 0.2^2} = \frac{2}{25+2} = \frac{2}{27}$$

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

$$\Delta V_{k,1} = \frac{25}{27} \times 10 = 9.259$$

$$\Delta V_{k,2} = \frac{2}{27} \times 10 = 0.741$$

$$\Delta X_1 = \frac{1}{0.5} \times 9.259 = 18.518$$

$$\Delta X_2 = \frac{1}{0.2} \times 0.741 = 3.705$$

Table 2 Summary of the WLS example

Control Variable #	$SF_{i,k}$	$\Delta V_{k,i}$	ΔX_i
1	0.5	$\frac{25}{27} \times 10 = 9.259$	$\frac{1}{0.5} \times 9.259 = 18.518$
2	0.2	$\frac{2}{27} \times 10 = 0.741$	$\frac{1}{0.2} \times 0.741 = 3.705$
Total Flow Reduction of Overload		10	

In the WLS formulation, the reduction of 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.

Example #2

If the example above was optimized using Max CRR (this is the optimization that used to be 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

Table 3 Example with WLS and Max CRR

			WLS Method			***Max CRR Method***		
Control Variable	$SF_{i,k}$	*Nominated MW*	$\Delta V_{k,i}$	ΔX_i	*Cleared MW*	$\Delta V_{k,i}$	ΔX_i	*Cleared MW*
1	0.5	100	9.259	18.518	81.481	10	20	80
2	0.2	50	0.741	3.705	46.296	0	0	50
Totals		150	10	22.222	127.777	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 MW*	$\Delta V_{k,i}$	*18.1.1* ΔX_i	*Cleared MW (Truncated)*	$\Delta V_{k,i}$	ΔX_i	*Cleared MW*
1	0.5	100	$\frac{25}{37.005} \cdot 24.5$ = 16.5518	$\frac{50}{37.005} \cdot 24.5$ = 33.1036	66.896	24.5	49	51

2	0.49	50	$\frac{12.005}{37.005} \cdot 24.5$ = 7.9482	$\frac{24.5}{37.005} \cdot 24.5$ = 16.2208	33.779	0	0	50
Totals		150	24.5	49.3244	100.675	24.5	49	101

During the CRR Allocation optimization process, CRR Obligation nominations are allowed to provide counter-flow on constraints, whereas CRR Option nominations do not provide any counter-flow on constraints.

The objective function in the CRR Auction process is very similar to the objective function of the CRR Allocation. Nominations or bids that are tied, i.e. nominations having the same effectiveness on a binding constraint or bids having the same effective price for relieving a constraint, are pro-rata allocated/awarded based on the nominated or bid MW amounts.

Because the CRR entitlements are funded by Day-Ahead congestion revenue and the Marginal Cost of Congestion (MCC) component of a Locational Marginal Prices (LMP) are part of the entitlement formulation, the SFT is related to the Day-Ahead Market process. The relationship is through the use of the Full Network Model (FNM) and the limits on constraints. If the following two conditions apply for the SFT process and a particular hour of the DAM process revenue adequacy is guaranteed:

Condition #1: The shift factors used in CRR SFT process are the same that are used in the calculation of the MCC LMPs in the DAM.

Condition #2: The transmission constraint limits used in the CRR SFT process are equal to or more restrictive than those used in the DAM. The CRR SFT process can only calculate active power MW flows on MW flow constraints.

The two conditions are sufficient but not necessary for ensuring revenue adequacy. In other words, if the conditions do not hold, revenue adequacy is not necessarily violated.

There are instances however, where these conditions might not hold since the CRR Allocation and Auction process creates CRRs several weeks up to several months before the maturity date of the CRR has arrived. Because of this timing, certain assumptions need to be made about the data used in the SFT process. One such data item is the FNM. The FNM can be different for example during any hour of the Integrated Forward Market due to transmission outages. Shift factors are dependent on the FNM topology and outages affect the topology. Also, Load Distribution Factors impact the shift factors. Assumptions on the Load Distribution

Factors (allocation factors for the Default Load Aggregation Points) must also be made for each SFT process. These assumed Load Distribution Factors (LDFs) may be different during the IFM process, because the IFM may use actual State Estimation data from the previous day to update and make more accurate the LDFs used in the IFM.

The SFT process within each CRR Allocation and CRR Auction considers the following items. Some of these items will be described in more detail in the subsequent sections. :

Configuration of the FNM (i.e., network topology)

Transmission constraints

- The mapping definition of the CRR Sources and CRR Sinks to the FNM. This includes Pricing Nodes and allocation factors.
- CRR Options that are used to remove TOR capacity in the SFT.
- ETC capacity that is modeled in the SFT as CRR Obligation nominations
- CRRs that cleared in a previous allocation or auction markets within the same time period and time-of-use period, which are referred to as "Fixed CRRs". For a given tier, the CRRs allocated in previous CRR Allocation tiers as described in ISO Tariff § 36 are considered Fixed CRRs. For the processing of a tier 3 from a particular season and time-of-use period, the CRRs that were cleared in tiers 1 and 2 for that same season and time-of-use period and the CRR that were used to model the TOR capacity would be modeled as Fixed CRRs.

Note that the CRR SFT for the allocation and auction processes does not model unscheduled flows (sometimes called loop flows). The modeling of unscheduled flows is more closely related to the Integrated Forward Market (IFM). The modeling of CRRs for the CRR allocation and auction must be as consistent as possible with how modeling is done in the IFM. At this time, the IFM does not model unscheduled flows, so to be consistent the CRR model will not consider unscheduled flows. If it is determined that unscheduled flows should be modeled in the FNM used for the IFM, the CRR SFT will be modified to be consistent with the FNM modeling.

B.1 FNM Configuration

The SFT within each allocation and auction process utilizes a FNM. More specifically, the shift factors utilized in the optimization process that reduces CRR MW quantities under infeasible situations are directly derived from the DC (direct current) conversion of the FNM. The shift factors are dependent upon:

- The topology of the FNM (i.e., which transmission facilities are in-service and how these are transmission facilities are connected to one another)
- The DC conversion of the FNM

In the event that transmission outages and derates modeled for the monthly CRR Allocation and CRR Auction render previously issued Seasonal CRRs infeasible, ISO increases the transfer capacity on the overloaded facilities just enough to render all Seasonal CRRs issued for the respective month feasible without creating any additional capacity beyond what is needed for the feasibility of the Seasonal CRRs.

This section addresses the following questions:

- How is the topology of the FNM, that is converted, initially determined?
- What assumptions are made in the DC conversion of the FNM?
- When CRR participants download the FNM associated with the CRR process (assuming the CRR participants are qualified to do so), what is the content and format of the FNM data?
- What happens to previously awarded CRRs should the topology of the CRR FNM change such that a particular source or sink location is no longer in the model?

B.1.1 FNM Topology Determination

B.1.1.1 Origin of the FNM

To ensure consistency between the SFT and the Day-Ahead Market process, the FNM data is retrieved from the same database source as the FNM used in the DAM, HASP, and Real-Time Market processes. The construction of the FNM is described in the Business Practice Manual for Managing Full Network Model (FNM BPM).

B.1.1.2 Starting Base for the FNM

As a starting base to derive the final FNM for use in an SFT process (either annual or monthly), the FNM includes all transmission facilities that are energized and in-service at the time the allocation or auction process is initialized. ISO does not use expected in-service dates for determining which transmission facilities are included in the FNM.

B.1.1.3 FNM Topology for the Annual Process

During the annual allocation and auction process, CRRs with seasonal/time-of-use (TOU) terms are created. The creation of each seasonal/TOU CRR is accomplished through a process that includes an SFT. A different FNM may be used for each seasonal/TOU SFT process.

Seasonal switching schedules are applied to the FNM for the applicable seasons. These transmission facility connection operations are contained in the PTO's seasonal switching schedule.

For the FNM used in the annual SFT processes, all transmission facilities are modeled as in-service, taking into consideration those facilities associated with the seasonal switching schedule, with the following exception. If there is a known outage of a major transmission facility for a significant duration of any season (e.g., a 500 kV transmission facility) at the time the annual process is initiated, ISO will review whether the transmission facility should be modeled as an outage (i.e., out-of-service in the FNM) for each season that intersects with the scheduled outage period.

B.1.1.4 FNM Topology for the Monthly Process

During the monthly allocation and auction process, CRRs with monthly/time-of-use (TOU) terms are created. The creation of each monthly/TOU CRR is accomplished through a process that includes an SFT and thus is dependent upon the FNM used in the SFT.

For the FNM utilized in the monthly SFT processes, all transmission facilities are modeled as in-service, taking into consideration those facilities associated with the seasonal switching schedule and those facilities identified as being modeled out-of-service by applying the monthly outage selection criteria. The transmission facilities identified by applying the monthly outage selection criteria to all scheduled transmission outages at the initiation of the monthly process are modeled as out-of-service in the FNM.

B.1.1.5 Monthly Outage Selection Criteria

For the planning of each monthly CRR Allocation and Auction Process, the ISO will take into consideration all planned outages and constraint de-rates that the Participating Transmission Owners (PTO) have provided to the ISO (via the ISO OMS accessible through MPP).

The data that is provided by the PTOs for planned outages will include the identification of the transmission facilities and the planned start and end dates of the outage or de-rate of the

facility.[14] For each facility that is actually out of service over a given period of time, the ISO has the option to either remove this facility from the FNM or de-rate the facility or a corresponding constraint by some value through the associated constraint limit value.

The ISO is in the process of developing criteria for modifying the FNM topology and modifying constraint limits based on scheduled outages and de-rates.

Consistent with the ISO Tariff requirements, the ISO will announce these adjustments to the market prior to conducting the monthly CRR Allocation and CRR Auction.

B.1.2 DC Conversion of the FNM

The SFT process converts the FNM (AC FNM) into a DC FNM for the purposes of determining the shift factors used in the SFT process.

There are four assumptions made when creating the DC FNM:

Assumption #1: All generators and Loads within the FNM are neglected: the DC conversion of the FNM creates a DC FNM that is passive (i.e., no active components).

Assumption #2: All bus voltage magnitudes are 1.0 per-unit.

Assumption #3: All transmission branch resistances are ignored (i.e., resistance = 0.0 per-unit).

Based on Assumption #2 and Assumption #3, assume that if there is one branch from bus *i* to bus *j*, the real power (MW) flow on the transmission branch from bus *i* to bus *j* is:

$$P_{ij} = \frac{1}{x_{ij}} \sin\left(\theta_i - \theta_j\right)$$

where x_{ij} is the reactance of the branch that connects buses *i* and *j*. The angles θ_i and θ_j are the bus voltage phase angles for buses *i* and *j*, respectively in radians. Then:

Assumption #4: $\sin\left(\theta_i - \theta_j\right) = \theta_i - \theta_j$, i.e., the angle difference is small such that the sine function of the angle difference is assumed to be equal to the angle difference

Assumptions #2, #3, and #4 create a linear relationship between an injection (real power) into the DC FNM (along with a balanced withdrawal at the reference Location) and the active power

[14] The requirement for PTOs to provide scheduled outage information to the ISO is stated in Paragraph 1333 of the September 21, 2006 FERC Order.

flow on any transmission branch in the DC FNM. In other words, the shift factors determined from the DC FNM are not dependent on other items except the topology of the FNM and the reactance of the transmission branches.

B.1.3 Content and Format of the FNM for Market Participant Download

The CRR system actually imports an AC FNM into its internal database and stores the FNM as an AC FNM. In fact, the CRR system can import many AC FNMs. During the setup of a SFT, the CRR market operator picks the AC FNM that is the basis for the DC FNM that is used in the SFT process. During an SFT process, the CRR system creates a DC FNM from the conversion process described above and uses this DC FNM in the SFT process.

The AC FNMs are available to CRR participants through the CRR Market User Interface as long as the CRR participant meets certain criteria as described in ISO Tariff § 6.5.1.1 (e.g., signs a non-disclosure agreement with ISO). The AC FNM is made available in the Siemens PTI PSS/E (Power System Simulator for Engineering) version 26 format.

The AC FNM download includes bus data, generator data, load data, branch data and other related information. The generation pattern and load pattern is based on the original WECC base case from which this FNM was derived.

Each data record from the bus data, generator data, load data, branch data and sections includes an additional field at the end of each record that is called the “augmented bus name”, “augmented generator name”, “augmented load name” and “augmented branch name”. The data type for this field is a text string and the value of this field is unique. The only relevant fields are those associated with the bus data records and branch data records. The bus data record augmented field correlates to information in the Aggregated Pricing Nodes data sets. The branch data record augmented field correlates to information in the constraints and contingency data sets. The description of the formats for constraints, contingencies and APNodes sets for download from the CRR Market User Interface will be included in the CRR Market User Interface manual.

B.1.4 Changes to CRR FNM that Impact Fixed CRRs

If changes occur in the topology of the CRR Full Network Model (FNM) that eliminate a source or sink PNode from the model for a CRR that is still active a replacement PNode will be assigned. If, due to the topology changes, the reconfigured CRRs are not feasible they will be reduced until such time as feasibility is achieved. The reduction will be done pro-rata, based on awarded CRR amounts, if more than one CRR Holder is impacted. If both the source and sink PNode locations of an awarded CRR are eliminated due to the topology change then the

Seasonal CRRs would expire on the effective date of the withdrawal of the facilities from the ISO Controlled Grid (see section §36.8.7.2).

B.2 Transmission Constraints

During the SFT, transmission constraints will be enforced. The ISO will attempt to make these transmission constraints, to the extent possible, consistent with the transmission constraints that are enforced in the DAM. Consistent with § 36.4 of the ISO Tariff, ISO considers the following guidelines in determining the operating constraints to be used in the CRR FNM.

The transmission constraints that are used in the SFT are normal and emergency ratings of transmission lines and transformers as well as Transmission Interfaces and nomograms that are based solely on Transmission Interfaces (collectively referred to as generalized group limits in the CRR SFT process). See the FNM BPM for additional information on normal/emergency ratings and Transmission Interfaces and nomograms that are based solely on Transmission Interfaces. The emergency ratings of transmission and transformers will be enforced during contingency analysis.

Thermal limits of branches include normal and emergency thermal limits for the lines and transformers that comprise the branch. These limits generally do not vary by time of use (e.g., on-peak and off-peak) but may vary between summer and winter. Consequently, the use of summer and winter limits will be taken into account in the SFT.

Generalized group limits, which include simple Transmission Interface limits and nomograms limits, which are based solely on Transmission Interface flows, may consist of both single and multiple lines with a single limit. Some constraint limits do not vary with season or time of use, while others do.

During the annual CRR Allocation and CRR Auction process, the CRR team plans to use eight sets of variable constraint limits[15] representing each season of the year and time of use period for those constraints whose limits vary. The normal and emergency thermal ratings that are in MVA will be adjusted downward to take into consideration that reactive power is not modeled within the DC FNM. The CRR team works with ISO operating engineers to determine the appropriate adjustment to these limits.

[15] For the 2012 annual process, the general limits in a network model are the thermal limits of the lines represented but the constraint limits referred to in this sentence are those associated with Transmission Interfaces or interface limits. Starting with the annual process for 2015, the reference to constraints in this sentence will also include internal transmission elements. These "variable constraint limits" are variable because they can change each hour, so there is not a static set of values that can be used for every CRR allocation. This requires these variable constraint limits be reviewed/revised for each time CRR allocation time period so that they properly reflect seasonal and TOU variations.

Starting with the 2012 annual CRR allocation and auction processes there will be a new methodology used to derive the constraint limits enforced in the SFT. This new approach is called the revenue adequacy breakeven point methodology.

Based on historical data, the revenue adequacy breakeven point is a value at which a particular transmission element would have resulted in being revenue adequate, for a particular season and TOU period. If the ISO had chosen this breakeven point as the basis for the CRR release amounts, then for that season and TOU, there would have been CRR revenue adequacy. Typically, most revenue inadequacy has been driven by over-awarding CRRs at the interface locations but on occasion there have been significant revenue shortfalls on internal transmission paths also. For the initial implementation of this methodology for the 2012 annual CRR processes it will be limited to interface locations listed in the CRR FNM release. Commencing with the annual CRR processes for the 2015 annual period, the ISO will apply the same revenue adequacy breakeven point methodology as referenced in the release documents for the annual CRR FNM. Based on the derivation of the breakeven points for individual transmission interfaces, the main steps of the resulting process for using the revenue adequacy breakeven point methodology are as follows:

1. As part of the generation of the Monthly Market Performance CRR Report the ISO will generate the list of transmission elements that contributed to revenue inadequacy.

2. Each year, prior to releasing the final data CRR FNM data, the ISO will gather the historical hourly Total Transfer Capability (TTC)_data, thermal ratings on internal transmission elements, and the hourly CRR settlement data for the last three-year period (or the amount of data since the start of the nodal LMP market) that ends on last day of the last month for which the whole months data is available prior to conducting the annual CRR processes.

3. Taking this historical data set, the ISO computes the break-even points for each interface direction and transmission element, and for each season/TOU.

4. Once the various break-even points are known, the ISO lists all interfaces, transmission elements, the respective break-even hourly TTC or thermal rating values (if applicable), sorted by interface, transmission element, direction, season and TOU. This data is released to parties that have executed the CRR NDA as part of the CRR FNM data release package.

5. The set-aside process and the modeling process for the 30-day monthly outages will not be impacted by the methodology for selecting the hourly TTC or thermal rating values.

To address changes in grid topology, the ISO will apply the historical breakeven point to the seasonal TTC and thermal ratings. For example if the historical breakeven point were 1,000 MW on a particular interface, then 65% of the new seasonal TTC or thermal rating, or 650 MW, would be made available in the annual process. If transmission enhancements increased the seasonal TTC or thermal rating from 1000 MW to 1500 MW, then the capacity used for the CRR annual process would be set at 1125 MW resulting in an increase of 375 MW from using the historical hourly TTC or thermal rating value. The same approach will be used in instances where the Seasonal TTC or thermal rating is reduced from the historical level.

B.2.1 Contingency Analysis

During the running of the CRR SFT the software will perform contingency analysis. The CRR SFT will perform preventive contingency analysis and similar to the forward markets the CRR SFT will also enforce generator contingencies under the Generator Contingency and Remedial Action Scheme Modeling (GCARM) policy. With the GCARM policy implementation the impact of any contingency case that isolates a source or sink in the CRR SFT will be handled by redistributing the injection or withdrawal at the isolated location to the list of frequency responsive resources as defined in the contingency GDF file provided to participants with access to the CRR FNM data. If during the running of contingency analysis a contingency or a modeled outage isolates one of the resources listed in the set of contingency GDFs then that resource will be removed and the respective GDFs for the remaining resources will be re-normalized. For example assume the set of resources and the respective GDFs is as noted below in the first table (Normal Set of GDFs) and let's assume that in one of our contingencies a line is removed that isolates GenA. In this scenario the CRR software would remove GenA from the list of resources and renormalize the remaining GDFs as shown in the second table below.

Normal Set of GDFs

GenA 20%

GenB 10%

GenC 30%

GenD 40%

Updated GDFs with GenA Isolated

GenA 0%

GenB 12.5%

GenC 42.86% (rounded)

GenD 57.14% (rounded)

B.3 Pricing Nodes and Allocation Factors

Within the SFT process, CRR Sources and CRR Sinks within nominations or bids are mapped back to the FNM through PNodes or APNodes. Since APNodes are comprised of two or more PNodes, each source and sink is mapped to the FNM through one or more PNodes. If the mapping for certain sources or sinks only consist of one PNode, the allocation factor is by default one. If the mapping for certain sources or sinks consists of two or more PNodes, (i.e., modeled as an APnode), an allocation factor must be defined for each PNode and this allocation factor will determine the fractional amount of the injection or withdrawal that will be modeled at the PNode. The allocation factors for a particular APnode must be normalized, i.e., they sum to one. Each allocation factor must be greater than or equal to zero and less than or equal to one.

The PNode and APNode sets used for modeling CRR Sources and CRR Sinks will be consistent with the corresponding resources used in the DAM, to the extent possible. It is not expected that the underlying APNode definitions will change often and as such the associated allocation factors will remain consistent. Should an APNode definition change the associated allocation factors will be updated in the next available CRR market and any fixed and new CRRs associated with this APNode will be applied through the SFT using this new definition. The allocation factors for the Default LAPs, Sub-LAPs, MSS LAPs and Participating Load are based on Load Distribution Factors (LDFs). As defined in the ISO Tariff, the Trading Hub allocation factors are based on the weighted average generation output of all Generating Units within a Trading Hub. Sources, representing Generating Units that are modeled, as aggregated units will use allocation factors based on Generation Distribution Factors. Listed below are the main areas in which ISO applies the use of various types of allocation factors.

B.3.1 Default Load Aggregation Points

Pursuant to § 27.2 of the ISO Tariff, there are three Default Load Aggregation Points (Default LAPs), one for each of the service territories of PG&E, SCE, and SDG&E. The allocation factors for these APNodes will be based on the respective LDFs and will be used to allocate the CRR Sink MWs to the underlying PNodes. Consistent with § 36.8.2 of the ISO Tariff, ISO creates and maintains different sets of LDFs by season and time of use period (i.e., on-peak and off-peak) to be used in the CRR Allocations and CRR Auctions.

B.3.2 Sub-Load Aggregation Points

As provided in §§ 36.8.3.5.3, 36.8.3.6.1 and 36.8.3.2 of the ISO Tariff respectively, the Sub-Load Aggregation Points (Sub-LAPs) may be used in tier 2 or 3 of the annual CRR Allocation, in tier 1 or 2 of the monthly CRR Allocation, and in the CRR Auctions. The allocation factors for these Sub-LAPs are based on allocation factors from the Default LAPs (i.e., PG&E, SCE and SDG&E Aggregated Pricing Nodes). Each Sub-LAP is associated with a Default LAP. The PNodes within a particular Sub-LAP form a subset of the PNodes within the associated Default LAP. For a given season and time of use period, the allocation factor for each PNode within a Sub-LAP is based on the re-normalization of the set of PNode allocation factors that are associated with the Default LAP.

B.3.3 Metered Subsystem Load Aggregation Points

ISO Tariff § 36.10, CRR Allocation to Metered Subsystems

The LAP used for the Metered Subsystem (MSS) that chooses net settlement is comprised of the PNodes specifically identified as being part of the MSS (i.e. MSS LAP). The PNodes that are part of the net MSS are those PNodes identified in the CRR FNM. The allocation factors used for this purpose will be based on LDFs.

B.3.4 Participating Load

The allocation factors used in APNodes or the Custom LAPs associated with Participating Load will be based on Load Distribution Factors.

B.3.5 Trading Hubs

ISO's Trading Hubs facilitate bilateral Energy transactions. Certain Trading Hubs are defined based upon Generation resources within Existing Zones (regions formally referred to as NP15, SP15, and ZP26). These Trading Hubs, known as Existing Zone Generation (EZ-Gen) Trading Hubs, are used in settlement of Inter-SC Trades as provided in § 11.9.1 of the ISO Tariff, as a CRR Source during the CRR Allocation process as provided in §§ 36.8.3.4 and 36.8.4 of the ISO Tariff, and as either a CRR Source or a CRR Sink in the CRR Auction process as provided in § 36.13.5 of the ISO Tariff.

Each Trading Hub is comprised of all Generating Unit PNodes within that Existing Zone. The allocation factor for each PNode within a Trading Hub is based upon the ratio of the total output of Energy at a PNode divided by the total Generation output in that Existing Zone over a given reference period. In the event there is a FNM model change during the course of conducting the monthly process the allocation factors will be treated as follows:

- The ISO will keep the allocation factors used in the previous annual process for the trading hubs for the entire year. So for the 2009 process, the allocation factors were based on 2007 data (January 1, 2007 – December 31, 2007) and each month of the 2009 process will use the factors even if the definitions of the trading hubs changed (generators retired, added, and modified).
- The new PODs will replace old PODs in the Trading Hub definitions. For those generators that have retired that are part of a TH location the CRR team will remove the retired resource from the TH definition and renormalize all remaining generator resources within that TH definition.
- The ISO will update the allocation factors annually as stated in the ISO Tariff section 27.3. This annual update will coincide with the CRR Annual Process.
- The Allocation Factors used in the annual and monthly CRR processes will also be used in the real-time and forward markets.

B.3.6 Generating Units Comprised of Multiple PNodes

Sources representing Generating Units that consist of more than one PNode will have allocation factors to distribute the CRR Source MW nomination distributed to the individual PNodes that make up the APNode of the Generating Unit. The total of these allocation factors will equal one and be based on Generator Distribution Factors.

B.3.7. Allocation Factors for Fixed CRRs in the SFT

During the SFT process, Fixed CRRs will be applied to the FNM using the allocation factor set associated with the APNode mapping file provided in the FNM related data that will be used in the CRR market that is being run.

B.4 Modeling of Transmission Rights

Prior to beginning the annual allocation process the ISO will need to determine how to model the transmission rights described in this section. As provided in § 36.4 of the ISO Tariff, the ISO will model Transmission Ownership Rights (TORs), Existing Transmission Contract (ETC) rights in the FNM. The ISO's modeling of these various transmission rights is based on its consultations with the respective Transmission Owners.

B.4.1 Transmission Ownership Rights

TORs involve existing transmission facilities located within the ISO Balancing Authority Area that are non ISO-Controlled Grid (i.e., not under the direct control of ISO). As provided in §§ 11.2.1.5 and 11.5.7 of the ISO Tariff, TOR Self-Schedules is not subject to Congestion charges. As such, pursuant to § 36.4 of the ISO Tariff, the appropriate TOR capacity will be removed from the FNM prior to running the CRR Allocation and CRR Auction markets by using Point-to-Point CRR Options. These Point-to-Point CRR Options will be held by the ISO.

B.4.1.1 PacifiCorp Transmission Ownership Rights

Pursuant to an amendment of the Operating Agreement between the ISO and PacifiCorp, which was filed on January 24, 2013 and accepted by FERC on March 29, 2013[16], a new process was defined by which PacifiCorp could transfer some of their Transmission Ownership Rights (TORs) to another Candidate CRR Holder. Once transferred these CRRs are identified by a new CRR type referred to as MT_TOR (Merchant Transmission TOR). There are several rules that apply to this transfer:

1) PacifiCorp must notify the ISO of the transfer of any TOR capacity 10 calendar days prior to the release of the preliminary (version zero) CRR FNM applicable for the first month of the quarter for which the capacity is being released. For example, the first quarter that this new process was made available was for quarter/season 2 of 2013. The first month of this quarter is April 2013. The preliminary (version zero) CRR FNM release for April 2013 was posted on February 25, 2013; ten-days prior to this date would be February 15, 2013.
2) This notification must be done using the MT_TOR Election form that is available from the ISO by sending an e-mail to crrdata@caiso.com or trtc@caiso.com, requesting the form. In the election form the SCID of the transferee must be for an entity that is a fully registered Candidate CRR Holder at the time the election form is submitted.
3) The election to convert TORs to MT_TORs is done for the entire quarter and cannot be changed once the election form has been submitted.
4) The transfer will be affected prior to the start of the first active month of the quarterly term. Once the transfer has been completed the holder of these CRRs may at that time treat these CRRs in the same manner as CRRs acquired through the allocation or auction processes. The MT_TOR CRRs will be created as CRR Options, similar to how the TORs are modeled.
5) Since the new MT_TOR CRRs can be traded through the Secondary Registration System it is necessary that the CRR team be notified of the intent to transfer so that the receiving Candidate CRR Holder can be properly set up to hold this new CRR type. If the receiving entity is not set up properly the SRS trade will not go through.
6) A key difference between CRRs awarded through the allocation or auction and the new MT_TOR CRRs has to do with the MW value on which Settlements is based. CRRs awarded through the allocation or auction are always settled at the awarded MW value whereas the MT_TOR CRRs can be derated hourly based on the ratio of the operating transfer capability (OTC) and the total transfer capability (TTC) of the particular flowgate/intertie constraint and flowgate/intertie constraint direction that was associated with the source to sink combination of the original TOR from which the CRR holding was converted from.

[16] http://www.caiso.com/Documents/Mar29_2013OrderAcceptingAmendedOperatingAgreementER13-794.pdf

B.4.2 Existing Transmissions Contract Rights

As provided in § 11.2.1.5 of the ISO Tariff, ETC will not be subject to Congestion charges, pursuant to the rights that are contained in the respective contracts. The ETC rights will be modeled as Point-to-Point Obligations. The location of the ETC sinks will be modeled at the actual ETC load location rather than being included as part of a Default LAP. These Point-to-Point CRR Obligations will be held by the ISO. For ETCs, ISO is responsible for preventing ETC capacity from being made available to LSEs and those participating in the CRR Auction. Consequently, ISO submits high priority (determined by weighting factors input into the CRR System) CRR nominations into the CRR Allocation corresponding to existing ETCs. The cleared amounts are used to prevent others from obtaining the ETC capacity.

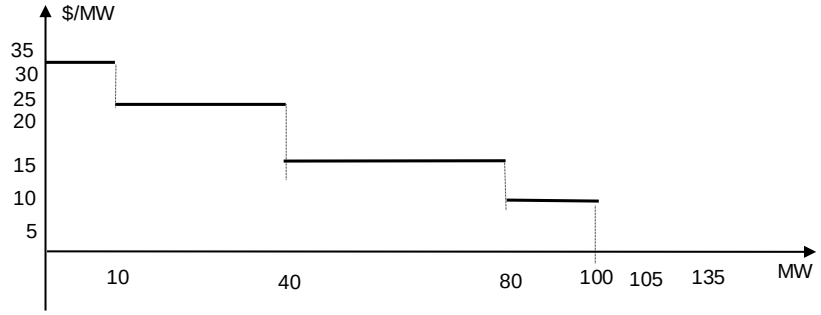
Attachment C

MAXIMUM PURCHASE AMOUNT CALCULATION

C. Maximum Purchase Amount Calculation Examples

Following is an example of how the CRR system determines the maximum purchase amount for a Point-to-Point (PTP) CRR Auction buy bid.

Exhibit C-11: PTP Bid



Assume a bid curve with the following bid points:

Bid 1 (0, 30)
Bid 2 (10, 30)
Bid 3 (10, 25)
Bid 4 (40, 25)
Bid 5 (40, 15)
Bid 6 (80, 15)
Bid 7 (80, 10)
Bid 8 (100, 10)
Bid 9 (100, 0)

With the above bid curve it is possible to determine what the maximum bid exposure would be. This sample bid can be used to complete the maximum bid exposure calculation for a PTP CRR bid. Each bid segment in the bid represents the maximum price that the buyer is willing to pay for the CRR for each MW within the bid segment. For example, in the segment from 40 MW to 80 MW, the buyer is not willing to pay more than $15/MW for each additional MW in this segment. Also, since the prices in the CRR Auction are based on the marginal bids, if the buyer was awarded, say, 50 MW, the price to be paid for the total of the 50 MW would not exceed $15/MW for the whole 50 MW. The same logic applies to each segment.
Exhibit C-1 provides a summary of these price limits.

Exhibit C-1: Maximum Prices To Be Paid Over Certain MW Limits

Maximum Price ($/MW) To Pay for All MW Purchased	Buying at Least This Many MW	Buying at Most This Many MW	Potentially Maximum Amount to Pay ($) for MW Purchased {Price × Quantity}
30	0	10	300 = 30 × 10

25	10	40	1,000 = 25 × 40
15	40	80	1,200 = 15 × 80
10	80	100	1,000 = 10 × 100

In this example, the maximum amount that the buyer would pay (i.e., the maximum purchase amount) would be $1,200. If *P*(*Q*) represents the price function of the net sink bid curve for each MW value (*Q*), the maximum purchase amount is calculated as:

$$\max_{Q \in [0,\, Q_{\max}]} \left(P(Q) \times Q,\, 0 \right)$$

Attachment D

APNODE NAME CHANGE

D. APNode Name Change

Currently CRRs are awarded based on existing APNode names (i.e. Sources and Sinks). It is not uncommon for these names to change when the various DB models are updated and new markets are run. Data retrieved from the CRR system may not be modified to reflect new APNode names; however, the Settlement system will publish statements based on new APNode names. For the purpose of syncing CRR system data with Settlements data, a document will be posted that contains APNode name change mapping details.

Attachment E

Calculating CRR Auction Clearing Prices

E. Calculating CRR Auction Clearing Prices

The ISO will publish all CRR APNode Clearing Prices regardless whether the APNode was used as a source or sink in the set of CRR Auction bids. In normal circumstances, the clearing price of the CRR can be derived as the difference between the clearing prices at APNode1 minus the clearing price at APNode 2. The ISO publishes all CRR APNode clearing pricing so that Market Participants can use them for price discovery (i.e. allow them to derive the CRR clearing prices on any potential CRR path). For example, suppose an entity wanted to calculate what the CRR auction clearing price was between SourceA and SinkB. If the clearing price at SourceA is -$40 and the clearing price at SinkB is -$50. The auction clearing price between SourceA and SinkB is equal to the CRR Source MCP minus the CRR Sink MCP:

-$40 - (-$50) = $10.

In this example an entity awarded one MW from SourceA to SinkB would pay $10, if the result of taking the CRR Source MCP minus the CRR Sink MCP is a negative value then an entity awarded this CRR would be paid through the auction clearing process.

For an entity that has cleared a sell offer they can perform the same calculation to determine the clearing price for the CRR they sold. If the result of the Source minus Sink calculation is a positive value then the entity will be paid that amount for the sold CRR, if the result is a negative value the selling entity will be charged. As with buy bids the bid curve submitted will determine the range within which the bid will be accepted. If the bid curve does not include a negative price bid segment then the software will not clear the sell offer at a negative clearing price.

Attachment F

Binding Constraints Clearing Prices in Auction

F. Binding Constraints Clearing Prices in Auction

Each binding constraint's clearing price represents the total system-wide CRR value incremental change if the limit of this constraint increases by 1 MW, given all other inputs remain the same.

For an interface constraint, the clearing price represents the value of the interface as a whole. The total flow on each interface is made up of the contributions from each of the branches that define the interface. It is possible for one of the branches to have a binding constraint but the interface as a whole is not binding. It is also possible to have no branches with binding constraints within the interface but the interface is still binding.

If one of the branches within the interface becomes binding, the model will report a separate clearing price for it.

The relationship between CRR Clearing prices and Binding Constraint Clearing Prices is:

The CRR clearing price is equal to sum of (shift Factor * Clearing price of the binding constraint.) over all the binding constraints.

$$MCP_i - MCP_j = \sum_L \mu_l \bullet SF_{l,i\_to\_j}$$

μ_l : Clearing price of the binding constraint l

SF_{l,i_to_j} : Shift Factor on l from injection at i and withdraw from j

Attachment G

Calculation and Use of Congestion Revenue Rights Credit Margin Data

G. Calculation and Use of Congestion Revenue Rights Credit Margin Data

1.1 Methodology for Calculating CRR Credit Margin

CRR credit margin is designed using the Value-at-Risk (VaR) approach. It is determined based on the estimate of the downside financial risk of the CRR in order to cover the worst-case loss with a specific confidence level over a given period of time. According to the Tariff, CRR credit margin is determined such that, in case of default by a CRR holder, the probability that the CRR credit requirement cannot fully cover the financial loss over the remaining term of the CRR will not exceed 5 percent.

Based on such principle, the credit requirement ($/MW) for holding a one-MW Short-Term CRR (ST-CRR, with a term up to one year) is defined as the negative of the auction price plus the credit margin of the ST-CRR.

$$Credit\ Requirement = -\min(CRR\ Auction\ Price, Historical Expected Value) * MW + (Credit\ Margin * MW)$$

The credit margin ($/MW) is defined as the difference between the expected value and the fifth percentile value of the congestion revenue generated by the one-MW ST-CRR.

$$Credit\ Margin = Expected\ CRR\ Cong.\ Reven. - 5th\ Percentile CRR\ Cong.\ Reven.$$

where the Expected and the 5th Percentile CRR Congestion Revenue are determined based on the probability distribution of the congestion revenue of the one-MW ST-CRR, which is derived based on the historical LMP data. The expected value is estimated as the simple average of the congestion revenues.

The credit margin for a Long-Term CRR (LT-CRR) is defined the same as that for ST-CRR.

Exhibit 1-1 illustrates the probability distribution of congestion revenue of a one-MW CRR and the definition of credit margin.

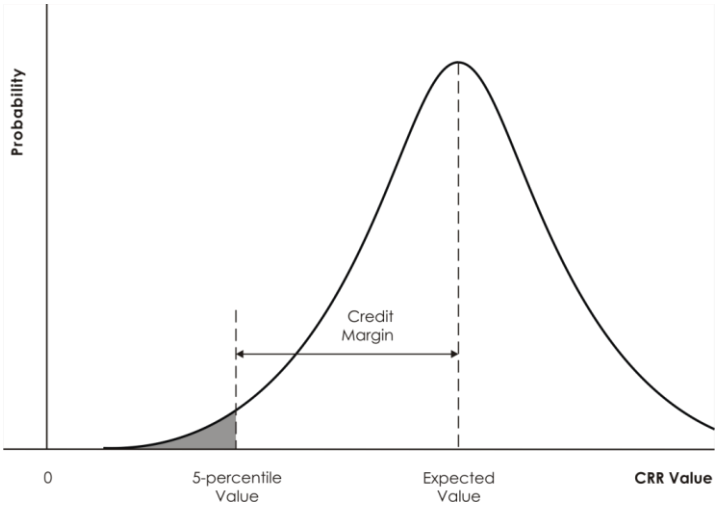


Exhibit 1-1: Probability Distribution of CRR Congestion Revenue

1.2 Procedure for Credit Margin Calculation

The credit margins, on a per MW basis, for both ST-CRRs and LT-CRRs are based on probability distributions of hourly congestion revenue, which are derived from marginal congestion costs of historical LMPs; marginal congestion cost is the congestion component of the LMP.

The credit margins have three time-of-use categories, on-peak, off-peak and Sunday. The off-peak hours are the hours ending 1 through 6 and hour ending 23 and 24 from Monday to Saturday; the on-peak hours are the hours ending 7 through 22 from Monday to Saturday; and Sunday is the calendar Sunday from hours ending 1 through 24. The credit margins are calculated for each month by time-of-use (TOU) period. Therefore, the credit margins can vary from one month to the next and from on-peak to off-peak to Sunday.

According to the ISO Tariff, ST-CRRs and LT-CRRs can be traded bilaterally for a term as short as one day. The term of the credit margin needs to match the granularity of the secondary trading in order to determine the credit requirements for such CRRs. The credit margin is therefore defined with daily granularity measured in $/MW-Day.

This section explains the credit margin calculation procedure.

1.2.1 Step 1: Calculate hourly CRR congestion revenues

Hourly congestion revenue ($/MWh) for a one-MW CRR is the difference between the LMP congestion components at the sink (sk) and the source (sr). That is, the congestion revenue for this CRR at hour h is:

$$CRR\,Cong.Reven._{sr,sk,h}\,(\$/MWh) = LMP\,Cong.Comp._{sk,h} - LMP\,Cong.Comp._{sr,h}$$

Hourly congestion revenues for all CRRs are calculated for all hours covered by the historical LMP data.

1.2.2 Step 2: Calculate hourly credit margins

The next step is to calculate the expected value and the 5th percentile value using statistics software based on the hourly congestion revenue for each CRR. Hourly credit margin ($/MWh) of the CRR is the difference of the two values.

For example, for a CRR from source sr to sink sk, its hourly credit margin in month m and TOU period p (on-peak, off-peak and Sunday) and hour h is

$$Credit\,Margin^{Hourly}_{sr,sk,m,p} = \max(0, Exp.Cong.Reven._{sr,sk,m,p}^{Hourly} - 5th\,Per.Cong.Reven._{sr,sk,m,p}^{Hourly})$$

where Hourly indicates the credit margin is on an hourly basis, the Expected and 5th Percentile CRR Congestion Revenue are calculated based on all data samples of hourly congestion revenue of the CRR from source sr to sink sk in month m and time period p of all years in the historical data. The expected value is the simple average of the hourly congestion revenues. In some extreme cases the probability distributions are very left-skewed (negatively skewed) such that the expected CRR congestion revenues are smaller than the 5th percentile values. In such cases, the credit margins are set to zero. This is consistent with the purpose of using credit margin discussed in section 1.1.

1.2.3 Step 3: Convert hourly credit margins to daily values

According to the ISO Tariff, ST-CRRs can be traded bilaterally or through the ISO-held auctions for a term as short as one day. The term of the credit margin must be able to match the granularity of the secondary trading in order to determine the credit requirements for such CRRs. The credit margin for a ST-CRR is therefore defined based on a daily granularity measured in $/MW-Day.

Since a LT-CRR can be traded the same way as a ST-CRR for the remaining portion of the current year and the year after, its credit margin for this period is also defined in $/MW-Day, in the same manner as for a ST-CRR.

The daily credit margin ($/MW-Day) for a CRR for month m TOU period p is

$$Credit\,Margin^{Daily}_{sr,sk,m,p} = \sqrt{n_p^{Daily}} \times Credit\,Margin^{Hourlyly}_{sr,sk,m,p}$$

where, Daily indicates that the term of the credit margin is on a daily basis, and n_p^{Daily} is the number of peak or off-peak hours in a day.[17] For example, it is 16 for on-peak and 8 for off-peak during weekdays (Monday through Saturday), and 24 for Sundays.[18]

1.3 Data Used for Calculating CRR Credit Margins

The basic data for calculating CRR credit margins are hourly LMP congestion prices. The calculation will be based on the most current 36 months of data. When there are multiple credit margins for the same source sink pair due to APNode remapping, the maximum credit margin is going to be used in the credit calculations. The credit margin for a CRR with source and sink the same is zero and will not be included in the credit margin data posting.

Some of the historical conditions caused great deviations of congestion revenues from their normal range for some CRRs in certain months. It is obvious that the data samples affected by certain of these historical conditions are not representative of future network conditions. Including such data samples in the calculation of future credit margins may produce inaccurate results. Some criteria are set to exclude certain data samples. Specifically, if the standard deviation of the hourly congestion revenues in one month in one year exceeds $15/MWh for off-peak or Sunday, the off-peak or Sunday hourly samples of that CRR in that specific month are excluded from the calculation. Similarly, if the standard deviation of the hourly congestion revenues in one month in one year exceeds $20/MWh for on-peak, the on-peak hourly samples of that CRR in that specific month are excluded from the calculation.

If any source or sink does not have a full 36 months of data, such as new generators, the congestion component of the closest biddable PNode's or APNode's LMP will be used for the missing period to generate the credit margin for that CRR.

1.4 Credit Margin Posting

At a minimum, the ISO will provide an annual calculation and posting of the credit margin data based on the most current data available. However, as documented in Tariff section 12.6.3.4, the ISO may reassess the credit margin at any time and can request additional financial security if warranted. Such posting will include a complete list of all possible source/sink combinations and its associated credit margin value. The credit margins will be posted at least 30 days prior to the start of the annual allocation.

[17] The scaling calculation assumes independent CRR congestion revenue movements and constant volatility across time periods.

[18] It is assumed that there are 52 whole weeks each year for the simplicity of calculation. The additional one day (two days for a leap year) could be a weekday or a weekend. Holidays are also not considered.

Example:

If we anticipate starting the 2010 annual allocation on 11/3/2009, we would post the credit margin data no later than 10/3/2009. The first day of the 36 month calculation period would be 9/1/2006 and the last day of the 36 month period would be 8/31/2009.

Attachment H

Credit Requirement

H. Credit Requirement

1. Pre-Auction Credit Requirement

The pre-auction credit requirement is designed such that the collateral required for participating in the auction should be sufficient to cover both the payments due to the ISO for winning the auction and the initial credit requirement for holding the winning CRRs based on the CRR auction price. In other words, the pre-auction credit requirement calculation calculates the maximum possible credit exposure of each CRR bid should the market participant win the CRR bid it made in the auction and includes the Credit Margin.

Bids are created within auction bid portfolios. Auction bid portfolios may contain multiple individual bids and participants may create and submit multiple portfolios. The pre-auction credit requirement is calculated and summed together for all bids contained in a single portfolio at the time of the bid portfolio submission. This calculated value is validated against the CRR Holder or Candidate CRR Holder's secured form of Financial Security as defined in the BPM for Credit Management, , in order of receipt, to ensure that the CRR Holder or Candidate CRR Holder has sufficient secured form of Financial Security to hold all the CRR's in their auction bid portfolio. There is also a minimum credit requirement for participating in a CRR auction. As identified in Tariff section 12.6.2, the minimum credit requirement for participating in a monthly CRR auction is $100,000 and $500,000 for participating in an annual CRR auction and they have to be secured form of Financial Security. In the event that a participant submits a CRR auction bid portfolio and does not have sufficient secured form of Financial Security to hold all the bids provided in the bid portfolio, the CRR Holder or Candidate CRR Holder's bid portfolios will be rejected on a last-in, first-out basis when it is targeted to a CRR market. Bids within an auction portfolio may be modified and the auction portfolio may be re-submitted for re-evaluation. See the BPM for Credit Management for examples of how an entity's secured form of Financial Security is used during the auction.

Prior to the opening of the auction, if a CRR Holder or Candidate CRR Holder believes that their secured form of Financial Security is not sufficient to cover their anticipated credit requirement for participating in the auction they may post additional secured forms of Financial Security by notifying the ISO's Finance team. See the BPM for Credit Management for acceptable forms of Financial Security for CRRs. It is important to note that even if a market participant posts additional secured forms of Financial Security to increase their Aggregate Credit Limit, this value can be reduced as a result of non-CRR market liabilities.

1.1 Pre-Auction Credit Requirement Calculation

As identified in Tariff section 12.6.2, CRR Holder's and Candidate CRR Holder's must have Available Credit that exceeds the greater of the minimum credit requirement as noted above or the sum of the maximum credit exposures of all of the CRR Holder's or Candidate CRR Holder's bids for CRRs submitted in the CRR Auction. The maximum credit exposure of a positively valued CRR bid is the maximum value of the CRR Holder's or Candidate CRR Holder's bid quantity (MW) multiplied by the sum of bid price

corresponding to the bid quantity and the Credit Margin of the CRR within the range of the minimum and maximum bid quantities submitted by the CRR Holder or Candidate CRR Holder. The maximum credit exposure of a negatively valued CRR is the maximum bid quantity (MW) submitted by the CRR Holder's or Candidate CRR Holder multiplied by the Credit Margin of the CRR. The ISO will calculate and provide all Credit Margin values as described in Attachment G of this BPM. The detailed logic involved in calculating the pre-auction credit requirement is shown below in sections 1.1.A and 1.1.B. Examples are also provided in section 1.2. Examples are also provided in section 1.2.

A. Formulation to determine highest credit exposure of a segment of the bid curve

A bid curve for a buy bid must be monotonically decreasing. The bid curve can contain up to 20 MW-price points. A bid segment is defined as a line between two MW-price points as shown in equation 1.

$$\textbf{Linear Bid Price} = m \cdot MW + n \quad (1)$$

Where

C_{i+1} and C_i	are bid price ($/MW) at bid point *i* and *i+1* respectively for buy bids, $C_{i+1} \leq C_i$
MW_i and MW_{i+1}	are bid MW at bid point *i* and *i+1* respectively where $MW_i \leq MW_{i+1}$
m	is the slope of the bid segment It is equal to zero when $MW_i = MW_{i+1}$ or $C_{i+1} \leq 0$ and $C_i \leq 0$. Otherwise, $m = \frac{(C_{i+1} - C_i)}{(MW_{i+1} - MW_i)}$ (2)
n	is a constant bid price of the segment. It is defined as

$$n = C_i - m \cdot MW_i \quad (3)$$

The bid credit exposure is calculated based on the linear bid price plus credit margin as shown in equation 4.

$$\textbf{Linear Bid Price plus CM} = m \cdot MW + n + \overline{CM} \quad (4)$$

Where

$$\overline{CM} = \frac{\sum_{M,TOU}(CM*d)}{\sqrt[2]{\sum_{M,TOU} d}} \quad (5)$$

d	is the number of days for a specific TOU and month
CM	is the credit margin ($/MW-Day for a specific TOU and month
M	is the number of months in an auction effective period
TOU	is defined as off-peak and 24 hour off-peak for an off-peak bid and on-peak for an on-peak bid

From the linear bid price plus credit margin in equation (4), the cost ($) of the bid segment, which is Credit Exposure, is defined as:

Credit Exposure $(CE) = m \cdot MW^2 + (n + \overline{CM}) \cdot MW \quad (6)$

To determine the MW where the highest credit exposure (*MW**) of this bid segment is at, solve for the MW value where the partial derivative of the Credit Exposure is equal to zero.

$$\frac{\partial CE}{\partial MW} = 2 \cdot m \cdot MW^* + n + \overline{CM} = 0 \quad (7)$$

$$MW^* = -\frac{(n+\overline{CM})}{(2*m)} \quad (8)$$

The *MW** as shown in the equation 8 yields the highest credit exposure of the bid segment only when *MW** is between two bid MW points (MW_i and MW_{i+1}) and *m* is not equal to zero.

If $\mathrm{MW}^* < \mathrm{MW}_i$, set $\mathrm{MW}^* = \mathrm{MW}_i$;

if $\mathrm{MW}^* > \mathrm{MW}_{i+1}$, set $\mathrm{MW}^* = \mathrm{MW}_{i+1}$.

If *m* equals zero, the MW_{i+1} is used to calculate the highest credit exposure of the bid segment ($MW^* = MW_{i+1}$).

Using *MW**, the credit exposure in the equation 6 becomes:

Bid Segment Credit Exposure = $m \cdot MW^{*2} + (n + \overline{CM}) \cdot MW^{*}$ (9)

Treatment of Negative Bid Prices

The maximum value between zero and bid price is used in the credit exposure calculation. Therefore, when a bid curve contains one or multiple negative bid price points the below equations apply.

1. When a buy bid segment is between a positive bid price and a negative bid price (C_i>0 and C_{i+1} <0), the bid MW where the bid price is equal to zero is determined by performing a linear interpolation as shown in the equation 10.

   Interpolated MW = $MW_i + \frac{C_i \cdot (MW_{i+1} - MW_i)}{(C_i - C_{i+1})}$ (10)

   The credit exposure calculation is performed such that there are two bid segments. One segment is between bid points (MW_i, C_i) and (the interpolated MW, 0). The other segment is between bid points (the interpolated MW, 0) and (MW_{i+1}, C_{i+1}).

2. When a buy bid segment is between two negative bid prices (C_i <0 and C_{i+1}<0), the slope of the bid segment (m) as shown in equation 2 is set to zero.

B. Final Maximum Bid Exposure

The final pre-auction credit requirement of a CRR bid is the maximum value of the highest credit exposure of all bid segments.

Note: Payments due to participants directly resulting from negatively valued awarded CRRs (those that will result in payment due to the participant) will be made to the participant's collateral account to meet the credit requirement for holding the awarded CRRs. Please reference the BPM for Credit Management and BPM for Settlements and Billing for detailed information on the settlement of negatively valued CRRs.

1.2 Numerical Examples

Provided below are 5 examples covering various scenarios for the calculation of the pre-auction credit requirement Credit Margin value is defined by the source-sink path, TOU and effective period for a given CRR bid as shown on the ISO website (http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx). There are three TOUs used for Credit Margin. In addition to ON- and OFF-PEAK, OFF24 is defined for Sunday and Holidays which contain only off-peak hours.

Table 1: Effective Credit Margin Calculation for Examples 1 through 3

Credit Margin Calculation						
Month	**TOU**	**# of days (*d*)**	**Credit Margin (*CM*)**	***d**CM**	$\overline{CM} = \frac{\sum_{M,TOU}(CM * d)}{\sqrt[2]{\sum_{M,TOU} d}}$	
Jan	OFF	25	14.786062	369.65155	162.9270258	Seasonal
Jan	OFF24	6	30.924043	185.54426	99.71611008	Jan
Feb	OFF	24	14.157162	339.77188	83.58850175	Feb
Feb	OFF24	4	25.634224	102.5369	98.4518859	Mar
Mar	OFF	27	16.136044	435.67319		
Mar	OFF24	4	28.120927	112.48371		

1.2.1 Example 1

Example 1 includes a slope bid curve containing 8 bid points (7 segments) with positive and negative prices where the prices only deviate by small increments as shown in Table 2. The calculations of effective credit margin and bid segment credit exposure are shown in Tables 1, 3 (annual) and 4 (monthly) respectively.

Table 2: Bid curve and credit exposure calculation for example 1

Bid Curve		
Bid Point Number	**Bid MW**	**Bid Price ($/MW)**
1	0	5
2	5	4
3	10	3
4	15	2
5	20	1
6	25	0
7	30	-1
8	35	-2

Table 3: Bid curve and credit exposure calculation for the seasonal (annual) value for example 1

MW	$/MW	Seasonal Effective CM	m	n	-(n+CM)/(2m)	MW*	Exposure of MW*	**Maximum Bid Credit Exposure**	**Pre-Auction Credit Requirement = max($500k,Max Bid Credit Exposure)**
0	5	162.9270	-0.2	5	419.8176	5	$834.6351	**5,702.45**	**500,000.00**
5	4	162.9270	-0.2	5	419.8176	10	$1,659.2703		

10	3	162.9270	-0.2	5	419.8176	15	$2,473.9054		
15	2	162.9270	-0.2	5	419.8176	20	$3,278.5405		
20	1	162.9270	-0.2	5	419.8176	25	$4,073.1756		
25	0	162.9270	0	0	0.0000	30	$4,887.8108		
30	-1	162.9270	0	0	0.0000	35	$5,702.4459		
35	-2	162.9270							

Table 4: Bid curve and credit exposure calculation for the monthly (January) value for example 1

MW	$/MW	Jan Effective CM	m	n	-(n+CM)/(2m)	MW*	Exposure of MW*	Maximum Credit Exposure	Pre-Auction Credit Requirement = max($100k,Max Bid Credit Exposure)
0	5	99.7161	-0.2	5	261.7903	5	$518.5806	3,490.06	100,000.00
5	4	99.7161	-0.2	5	261.7903	10	$1,027.1611		
10	3	99.7161	-0.2	5	261.7903	15	$1,525.7417		
15	2	99.7161	-0.2	5	261.7903	20	$2,014.3222		
20	1	99.7161	-0.2	5	261.7903	25	$2,492.9028		
25	0	99.7161	0	0	0.0000	30	$2,991.4833		
30	-1	99.7161	0	0	0.0000	35	$3,490.0639		
35	-2	99.7161							

1.2.2 Example 2

Example 2 includes a slope bid curve containing 8 bid points (7 segments) with positive and negative prices where the prices deviate from large positive prices to large negative prices as shown in Table 5. The calculations of effective credit margin and bid segment credit exposure are shown in Tables 1, 6 (annual) and 7 (monthly) respectively.

Table 5: Bid curve and credit exposure calculation for example 2

Bid Curve		
Bid Point Number	**Bid MW**	**Bid Price ($/MW)**
1	0	750
2	5	600
3	10	450
4	15	300
5	20	150
6	25	0
7	30	-150
8	35	-300

Table 6: Bid curve and credit exposure calculation for the seasonal (annual) value for example 2

MW	$/MW	Seasonal Effective CM	m	n	-(n+CM)/(2m)	MW*	Exposure of MW*	Maximum Credit Exposure	Pre-Auction Credit Requirement = max($500k,Max Bid Credit Exposure)
			-	75			$3,814.635		
0	750	162.9270	30	0	15.2155	5	1	6,945.30	500,000.00
5	600	162.9270	-	75	15.2155	10	$6,129.270		

			30	0			3		
			-30	75			$6,943.9054		
10	450	162.9270		0	15.2155	15			
			-30	75		15.215	$6,945.2980		
15	300	162.9270		0	15.2155	5			
			-30	75			$6,258.5405		
20	150	162.9270	30	0	15.2155	20			
							$4,887.8108		
25	0	162.9270	0	0	0.0000	30			
							$5,702.4459		
30	-150	162.9270	0	0	0.0000	35			
35	-300	162.9270							

Table 7: Bid curve and credit exposure calculation for the monthly (January) value for example 2

MW	$/MW	Jan Effective CM	m	n	-(n+CM)/(2m)	MW*	Exposure of MW*	Maximum Credit Exposure	Pre-Auction Credit Requirement = max($100k,Max Bid Credit Exposure)
			-30	75			$3,498.5806		
0	750	99.7161		0	14.1619	5		6,016.81	100,000.00
			-30	75			$5,497.1611		
5	600	99.7161		0	14.1619	10			
			-30	75		14.161	$6,016.8122		
10	450	99.7161		0	14.1619	9			
			-30	75			$5,995.7417		
15	300	99.7161		0	14.1619	15			
			-30	75			$4,994.3222		
20	150	99.7161	30	0	14.1619	20			
							$2,991.4833		
25	0	99.7161	0	0	0.0000	30			
							$3,490.0639		
30	-150	99.7161	0	0	0.0000	35			
35	-300	99.7161							

1.2.3 Example 3

Example 3 includes a slope bid curve containing 2 bid points (1 segment) with positive and negative prices where the prices deviate from large positive prices to large negative prices as shown in Table 8. Calculating the interpolated MW is required in this scenario. The calculations of effective credit margin and bid segment credit exposure are shown in Tables 1, 9 (annual) and 10 (monthly) respectively.

Table 8: Bid curve and credit exposure calculation for example 3

Bid Curve		
Bid Point Number	**Bid MW**	**Bid Price ($/MW)**
1	0	750
2	35	-300

Table 9: Bid curve and credit exposure calculation for the seasonal (annual) value for example 3

MW	$/MW	Seasonal Effective CM	m	n	-(n+CM)/(2m)	MW*	Exposure of MW*	Maximum Credit Exposure	Pre-Auction Credit Requirement = max($500k,Max Bid Credit Exposure)
0	750	$ 162.927	- 30	75 0	15.215	15.21 5	$ 6,945.298	6,945.30	500,000.00
25	0	$ 162.927	0	0	0	35	$ 5,702.446		
35	-300								

Table 10: Bid curve and credit exposure calculation for the monthly (January) value for example 3

MW	$/MW	Jan Effective CM	m	n	-(n+CM)/(2m)	MW*	Exposure of MW*	Maximum Credit Exposure	Pre-Auction Credit Requirement = max($100k,Max Bid Credit Exposure)
0	750	$ 99.716	- 30	750	14.1619	14.161 9	$ 6,016.8122	6,016.81	100,000.00
25	0	$ 99.716	0	0	0	35	$ 3,490.0639		
35	-300								

1.2.4 Example 4

Example 4 includes a slope bid curve containing 8 bid points (7 segments) with positive and negative prices where the prices deviate from large positive prices to large negative prices as shown in Table 12. Calculating the interpolated MW is not required in this scenario. The calculations of effective credit margin and bid segment credit exposure are shown in Tables 11, 13 (annual) and 14 (monthly) respectively.

Table 11: Effective Credit Margin Calculation

Credit Margin Calculation						
Month	**TOU**	**# of days (*d*)**	**Credit Margin (*CM*)**	***d**CM**	$\overline{CM} = \frac{\sum_{M,TOU}(CM * d)}{\sqrt[2]{\sum_{M,TOU} d}}$	
Jan	OFF	25	10	250	64.72128278	Seasonal
Jan	OFF24	6	1	6	45.97895732	Jan
Feb	OFF	24	7.5	180	35.52866046	Feb

Feb	OFF24	4	2	8	30.53290134	Mar
Mar	OFF	27	6	162		
Mar	OFF24	4	2	8		

Table 12: Bid curve and credit exposure calculation for example 4

Bid Curve		
Bid Point Number	**Bid MW**	**Bid Price ($/MW)**
1	0	750
2	5	600
3	10	450
4	15	300
5	20	150
6	25	0
7	30	-150
8	35	-300

Table 13: Bid curve and credit exposure calculation for the seasonal (annual) value for example 4

MW	$/MW	Seasonal Effective CM	m	n	-(n+CM)/(2m)	MW*	Exposure of MW*	Maximum Credit Exposure	Pre-Auction Credit Requirement = max($500k,Max Bid Credit Exposure)
				-75			3323.6064		
0	750	64.7213	30	0	13.5787	5.0000		5,531.42	500,000.00
				-75		10.0000	5147.2128		
5	600	64.7213	30	0	13.5787	0			
				-75		13.5787	5531.4231		
10	450	64.7213	30	0	13.5787				
				-75		15.0000	5470.8192		
15	300	64.7213	30	0	13.5787	0			
				-75		20.0000	4294.4257		
20	150	64.7213	30	0	13.5787	0			
						30.0000	1941.6385		
25	0	64.7213	0	0	0.0000	0			
						35.0000	2265.2449		
30	-150	64.7213	0	0	0.0000	0			
35	-300	64.7213							

Table 14: Bid curve and credit exposure calculation for the monthly (January) value for example 4

MW	$/MW	Jan Effective CM	m	n	-(n+CM)/(2m)	MW*	Exposure of MW*	Maximum Credit Exposure	Pre-Auction Credit Requirement = max($100k,Max Bid Credit Exposure)

			-	75			3229.894		
0	750	45.9790	30	0	13.2663	5.0000	8	**5,279.85**	**100,000.00**
			-	75		10.000	4959.789		
5	600	45.9790	30	0	13.2663	0	6		
			-	75		13.266	5279.854		
10	450	45.9790	30	0	13.2663	3	2		
			-	75		15.000	5189.684		
15	300	45.9790	30	0	13.2663	0	4		
			-	75		20.000	3919.579		
20	150	45.9790	30	0	13.2663	0	1		
						30.000	1379.368		
25	0	45.9790	0	0	0.0000	0	7		
						35.000	1609.263		
30	-150	45.9790	0	0	0.0000	0	5		
35	-300	45.9790							

1.2.5 Example 5

Example 5 includes a step-wise bid curve containing 15 bid points (14 segments) with positive and negative prices as shown in Table 16. There is a small deviation in prices and high credit margin values. Calculating the interpolated MW is not required in this scenario. The calculations of effective credit margin and bid segment credit exposure are shown in Tables 15, 17 (annual) and 18 (monthly) respectively.

Table 15: Effective Credit Margin Calculation

Credit Margin Calculation						
Month	**TOU**	**# of days (*d*)**	**Credit Margin (*CM*)**	***d**CM**	$\overline{CM} = \frac{\sum_{M,TOU}(CM * d)}{\sqrt[2]{\sum_{M,TOU} d}}$	
Jan	OFF	25	500	12500	2698.476937	Seasonal
Jan	OFF24	6	400	2400	2676.119	Jan
Feb	OFF	24	300	7200	1511.857892	Feb
Feb	OFF24	4	200	800	484.9343155	Mar
Mar	OFF	27	100	2700		
Mar	OFF24	4	0	0		

Table 16: Bid curve and credit exposure calculation for example 5

Bid Curve		
Bid Point Number	**Bid MW**	**Bid Price ($/MW)**
1	0	5
2	5	5
3	5	4
4	10	4
5	10	3
6	15	3
7	15	2
8	20	2
9	20	1
10	25	1

11	25	0
12	30	0
13	30	-1
14	35	-1
15	35	-2

Table 17: Bid curve and credit exposure calculation for the seasonal (annual) value for example 5

MW	$/MW	Seasonal Effective CM	m	n	-(n+CM)/(2m)	MW*	Credit Exposure	Maximum Credit Exposure	Pre-Auction Credit Requirement = max($500k,Max Bid Credit Exposure)
0	5	2698.477	0	5	#DIV/0!	5	13517.385	94,446.69	500,000.00
5	5	2698.477	0	5	#DIV/0!	5	13517.385		
5	4	2698.477	0	4	#DIV/0!	10	27024.769		
10	4	2698.477	0	4	#DIV/0!	10	27024.769		
10	3	2698.477	0	3	#DIV/0!	15	40522.154		
15	3	2698.477	0	3	#DIV/0!	15	40522.154		
15	2	2698.477	0	2	#DIV/0!	20	54009.539		
20	2	2698.477	0	2	#DIV/0!	20	54009.539		
20	1	2698.477	0	1	#DIV/0!	25	67486.923		
25	1	2698.477	0	1	#DIV/0!	25	67486.923		
25	0	2698.477	0	0	0	30	80954.308		
30	0	2698.477	0	0	0	30	80954.308		
30	0	2698.477	0	0	0	35	94446.693		
35	0	2698.477	0	0	0	35	94446.693		
35	0	2698.477	0	0	0	0	0.000		

Table 18: Bid curve and credit exposure calculation for the monthly (January) value for example 5

MW	$/MW	Jan Effective CM	m	n	-(n+CM)/(2m)	MW*	Credit Exposure	Maximum Credit Exposure	Pre-Auction Credit Requirement = max($100k,Max Bid Credit Exposure)
0	5	2676.119	0	5	#DIV/0!	5	13405.595	93,664.17	100,000.00
5	5	2676.119	0	5	#DIV/0!	5	13405.595		
5	4	2676.119	0	4	#DIV/0!	10	26801.19		
10	4	2676.119	0	4	#DIV/0!	10	26801.19		
10	3	2676.119	0	3	#DIV/0!	15	40186.785		
15	3	2676.119	0	3	#DIV/0!	15	40186.785		
15	2	2676.119	0	2	#DIV/0!	20	53562.38		
20	2	2676.119	0	2	#DIV/0!	20	53562.38		
20	1	2676.119	0	1	#DIV/0!	25	66927.975		
25	1	2676.119	0	1	#DIV/0!	25	66927.975		

25	0	2676.119	0	0	0	30	80283.57001		
30	0	2676.119	0	0	0	30	80283.57001		
30	0	2676.119	0	0	0	35	93664.16501		
35	0	2676.119	0	0	0	35	93664.16501		
35	0	2676.119	0	0	0	0	0		

2. Post Auction Credit Requirements

2.1 Winning Bid

Once all bids are submitted and the auction market submittal window is closed the auction market will be run and results generated. After the auction results have been posted, the winning bid is calculated (see equation below) for each CRR i and sum the totals by participant to calculate the total winning bid per participant.

$$Winning\ Bid = \sum_{i} Auction\ Clearing\ \Pr ice_i * Cleared\ MW_i$$

ISO's Finance team receives this calculated value which is used in making EAL adjustments and returning any excess collateral. The return of such collateral will be managed according to the credit policy and the BPM for Credit Management. Final auction results will also be transferred to the ISO's settlement system where the auction invoices will be generated. This invoice will then be considered as part of the SC liability calculation until it is paid.

2.2 CRR Holding Requirements

For any CRR in a CRR Holder's portfolio, regardless of their origin (allocation, auction, load migration or SRS trades), the corresponding credit requirement is calculated as follows:

$$Credit\ Requirement_{i,p} = \sum_{m=1}^{M_{i,p}} \left(\sum_{d=1}^{D_{i,m,p}} \left(-\min\left(AucPrice_{i,d,m,p}, HistExpValue_{i,d,m,p} \right) \times MW_{i,d,m,p} \right) \right) + \frac{\sum_{m=1}^{M_{i,p}} \left(\sum_{d=1}^{D_{i,m,p}} \left(Credit\ Margin_{i,d,m,p}^{Daily} \times MW_{i,d,m,p} \right) \right)}{\sqrt{\sum_{m=1}^{M_{i,p}} D_{i,m,p}}}$$

- ***i, d, p*** and ***m*** apply to CRR, day, TOU and month, respectively
- M_{ip} – remaining months in the term of CRR ***i*** for TOU period ***p***
- $D_{i,m,p}$ – remaining number of days CRR ***i*** has in month ***m*** and TOU period ***p***

- ***MW*$_{i,d,m,p}$** – volume (MW) of CRR ***i*** on day ***d*** in month ***m*** and TOU period ***p***
- $CreditMargin^{Daily}_{i,d,m,p}$ -- daily credit margin ($/MW-Day) for CRR ***i*** on day ***d*** in month ***m*** and TOU ***p***
  - Daily prices are the daily average of the respective annual and monthly auction prices. The most current auction price available for the relevant period will be used to derive the daily price.
- ***AucPrice*$_{i,d,m,p}$** – daily auction clearing price ($/MW-Day) of CRR ***i*** on day ***d*** in month ***m*** and TOU period ***p***
- ***HistExpValue*$_{i,d,m,p}$** – daily historical expected values ($/MW-Day) of CRR ***i*** on day ***d*** in month ***m*** and TOU period ***p***

The summation through all CRRs for both TOU in each CRR holder's portfolio is the credit requirement**.** There are two data elements that are used for the first part of the above Credit Requirement calculation; "Auction Price" or "Historical Expected Value". The "Auction Price" is the daily auction clearing price for that CRR which is derived from the APNode Clearing Price in the auction process within the CRR system; The "Historical Expected Value" is the three year average daily historical expected value of that CRR derived from the marginal congestion component of LMPs in the Day Ahead Market. The CRR system uses the lower of the daily auction clearing price and the three year average daily historical expected value when calculating the CRR credit requirement. The general formula to derive the daily auction clearing price for a CRR is the daily Source MCP minus daily Sink MCP. When using the three year average daily historical expected value of the CRR the CRR system calculates the CRR value by taking the Sink MCC minus the Source MCC.

For example, if we assume that the daily auction clearing price is lower and hence a more conservative indicator of what the daily congestion would be on a CRR path from A to B with congestion in the direction of A to B then we would have the following data:

SourceA MCP from Auction	$10
SinkB MCP from Auction	$5

Source minus Sink results in a positive $5 price that the CRR Holder would pay for this CRR since the expectation would be that this CRR would have a revenue flow for the CRR Holder.

SourceA LMP-MCC from DA Market	$5
SinkB LMP-MCC from DA Market	$10

The Settlement for the CRR Holder would be the Marginal Congestion Component (MCC) of the LMP at the Sink minus the MCC of the LMP at the Source which in this example would provide a positive $5 revenue stream for the CRR Holder.

For the computation of the credit requirements, the number of days will be counted for each specific path, asset owner, and TOU for CRRs with a netted MW value greater than zero. For example to determine the number of days for a CRR valid for the month of January 2008, ON Peak, the calculation would take 1/1/08 through 1/31/08 and would count the days between 1/1/08 and 1/31/08 leaving out any days that are Sundays or holidays and all days where the netted MW is zero.

As per Tariff requirements as further described in Section 7 of this document, in order to account for load migration between LSEs the ISO creates and allocates new CRRs to both the load-losing and load-gaining LSEs. If the load losing LSE has already sold the allocated CRRs prior to load migration or the LSE has procured offsetting counter-flow CRRs through auctions, there is a potential risk that the load losing LSE may not have enough credit coverage to cover the counter-flow CRRs from load migration. For this reason, the credit requirement functionality contains two business logics to ensure enough credit coverage exists at all times. The first business logic disallows netting between allocated CRRs and auctioned CRRs in the calculation of the credit requirement. This avoids LSEs from cashing out their allocated CRRs and eliminating ongoing credit requirements for holding allocated CRRs. The second business logic is to ensure that LSEs selling allocated CRRs will keep sufficient credit coverage to cover the counter-flow CRR that offset the CRR being sold so that in case those CRRs are migrated.

The credit functionality groups CRRs into three categories: Auction, Allocation and Financial. Allocation CRRs are grouped into one short-term and various long-term groups before netting MW of positive flow and counter flow CRRs on the same paths within the same group. All CRRs from monthly and seasonal allocations, from any long-term allocation with remaining effective period less than a year are included in the short-term group. CRRs arising from migration will be treated as allocation CRRs, as per current rules. CRRs acquired through secondary markets are put in the Auction group and netted according to their corresponding grouping rule. The SRS system will only allow the trading of long term CRR whose effective date is within one year from the date the transaction happened to be sold.

Therefore, there will be six (6) netting CRR groups as follows:

- **Short Term Auction group** contains CRRs obtained from annual and monthly Auctions, and SRS trades.
- **Short-term Allocation group** contains (1) CRRs obtained from monthly and seasonal allocation process, (2) load migration CRRs created for load transfer of CRRs from seasonal allocations and (3) CRRs obtained from long-term allocations which have remaining effective periods less than a year.
- **Long-term Allocation group (LT1)** contains the current 12 months (current date plus 365 days) of CRRs obtained from long-term allocations which have remaining effective periods longer than a year but less than nine years. Load migration CRRs created for load transfer of CRRs originated from markets in the LT1 group are also included in the LT1 group.
- **Long-term Allocation group (LT2)** contains the first 12 months of CRRs obtained from long-term allocations which their effective periods have not been started. Load migration CRRs created for load transfer of CRRs

originated from markets in the LT2 group are also included in the LT2 group.

- **Long-term Allocation group (LT3)** contains the first 12 months CRRs obtained from long-term allocations which their effective periods have not been started and will be started a year later than long-term allocations in LT2. Load migration CRRs created for load transfer of CRRs originated from markets in the LT3 group are also included in the LT3 group.
- **Financial group** tracks only the extra requirement of the selling of annual allocated CRRs, including CRRs from load migration being traded. CRRs bought through the SRS will not be considered in this group as they are not subject to load migration; instead, they will be included in the Auction group.

Given the various scenarios of load migration and SRS trades that can happen, in order to ensure sufficient credit coverage when annual allocated CRRs are traded through the SRS, for the financial group the seller submitting an SRS trade must hold credit for the following MW amount

Min (Net Allocation CRR sold, Net Allocation CRR held)

This extra credit requirement is only applied to seasonal allocated CRRs being sold, either from annual allocation or from migration. The financial component will be zero when the net amount sold (including the SRS that would be traded) is a counter-flow CRR to the Net Allocation CRR held because in this condition the selling of a net counter-flow will not further increase the credit requirements. When calculating the Total CRR Value, the component of the financial group will only be considered when it is greater than zero

Net Allocation CRR sold includes both the portion already sold of the allocated CRR by summing all previous SRS selling transactions plus the portion currently being traded; CRRs bought through the SRS will not be netted to determine this component as they are not subject to load migration. Net Allocation CRR held is the MW allocated from annual Allocation processes plus/minus the MW from load migration, excluding SRS transactions. Both kinds of nettings occur at the time credit requirement is performed.

The financial group will be for credit calculation purpose only and will not be permitted to netting with any other existing group. This will guarantee that the credit from one group does not offset the credit from another.

After netting the MW amounts within each group, the credit requirement is calculated for each of the six groups as previously described. With the disaggregation of netting between the financial, auction and the various allocation groups, the credit holding requirement for each CRR holder is as follows:

Credit Holding Requirement (Part of CRR EAL) =

max (0, LT1+LT2+LT3+ST Allocation)+max(0, ST Auction)+max(0, Financial)

By treating the allocation, auction and financial groups independently, the credit requirement from the auction or from SRS trades will never be offset with negative values from the other allocation groups. The table below provides an example of this disaggregation:

Participant Name	LT2	LT3	ST ALLOCATION	ST AUCTION	Credit= max(0,LT2+LT3+ST alloc)+max(0, ST auction)
A			-500	400	$400
B	-14,000	-16,000	-34,000	-600	$0
C	130	200	-200	100	$230
D	-39,000	40,000	300	300	$700
E			500	400	$900
F	-1,000	1,000	1,000	-2,000	$1,000

Example 1:

a) AO2 has a CRR for A->B 100 MW allocated in the annual process

b) Then 30 MW are migrated out from AO2 and a counter-flow CRR is allocated to it; so its portfolio after load migration is

A->B 100 MW

B->A 30 MW

If credit requirements are calculated at this stage it would be for A->B 100-30=70 MW, and there is no financial component for credit requirements as no CRR have been traded through the SRS.

c) In a further step, if AO2 sells a portion of its counter-flow CRR, say B->A 15 MW, at this stage its credit requirements will be defined by two components:

AO2 now has the physical credit component for its CRR holdings A->B 100-(30-15)=85 MW, and a financial component which will be zero as the computation of this component is not triggered by this selling of a CRR which is a net counter-flow CRR to the originally allocated CRRs.

d) Furthermore, assume that in a subsequent step, AO2 sells a portion of its positive CRR, say A->B 10MW. Its credit requirement will be defined as follows:

For the physical CRR holdings, there will be a credit requirement for: A->B 100-(30-15)-10=75 MW and its financial component will still be zero as the net balance of the sold CRR (-15+10) is still a counter-flow to the originally allocated CRR.

e) Now assume that instead of selling 10 MW of the positive CRR, it sells 20 MW; under this scenario AO2's credit requirements will be as follows:

For physical CRRs holdings, there will be a credit requirement for A->B 100-(30-15)-20=65 MW, and there will also be a financial component determined as min(-15+20,100-30)=min(5,70)= 5 MW for CRR B->A.

Example 2: Assume AO2 has a portfolio from an annual allocation which is composed of two CRRs:

C->B= 20 MW

B->C= 50 MW

Its credit requirement due to its physical CRR holdings is for B->C=50-20=30 MW If now AO2 sells the following portion of its CRRs

C->B= 10 MW

B->C= 50 MW

Its credit requirement due to physical CRR holdings is for C->B = (20-10)-(50-50)=10 MW, and its credit requirement for the financial component is min(50-10,[50-0]-[20-0])=min(40,30)=30 for path C->B.

If then, due to load migration, AO2 gets the following counter-flow CRRs

B->C= 12 MW

C->B= 20 MW

Its requirement for physical holding is C->B= (20-10-12)-(50-50-20)=-2+20=18 MW, and its financial component will be Min(50-10,[50-20]-[20-12])=min(40,30-8)=min(40,22)=22 for CRR C->B.

Given the concern of maintaining proper levels of credit requirements, the ISO will update the CRR Credit Holding Requirements, at a minimum, on a monthly basis using

the most recent auction prices that are applicable to the relevant CRR allocation period. After an auction is cleared and the auction prices and awards are available, the credit requirement ($) for each CRR Holder will be computed. Because there is a need for prices to evaluate allocation CRRs of future periods, the most current auction prices available for the applicable periods will be used. For instance, if the 2009 annual auction is cleared in November of 2008 and disregarding any monthly processes, then the credit requirement will require daily auction clearing prices for:

- Remaining 2008 seasonal Auction CRRs
- Remaining 2008 seasonal Allocation CRRs using prices derived from the 2008 seasonal auctioned CRRs
- 2009 seasonal Auction CRRs
- 2009 seasonal Allocation CRRs using prices derived from the 2009 seasonal auctioned CRRs
- 2009 Long Term Allocation CRRs using prices derived from the 2009 seasonal auctioned CRRs

2.3 Numerical Examples

This section provides four examples. Example 1 demonstrates how the auction price in the credit requirement formula is calculated. Examples 2-4 illustrate calculations for the calculation of credit requirements and credit holding requirements under various scenarios. The examples are developed based on credit requirement and credit holding requirement formulas in the attachment H 2.2. Two formulas are copied below for your reference:

Credit requirement calculation for $CRR_{i,p}$:

$$Credit\,Requirement_{i,p} = \sum_{m=1}^{M_{i,p}} \left(\sum_{d=1}^{D_{i,m,p}} \left(-\min\left(AucPrice_{i,d,m,p}, HistExpValue_{i,d,m,p} \right) \times MW_{i,d,m,p} \right) \right) + \frac{\sum_{m=1}^{M_{i,p}} \left(\sum_{d=1}^{D_{i,m,p}} \left(Credit\,Margin_{i,d,m,p}^{Daily} \times MW_{i,d,m,p} \right) \right)}{\sqrt{\sum_{m=1}^{M_{i,p}} D_{i,m,p}}}$$

- ***i, d, p*** and ***m*** apply to CRR, day, TOU and month, respectively
- M_{ip} – remaining months in the term of CRR ***i*** for TOU period ***p***
- $D_{i,m,p}$ – remaining number of days CRR ***i*** has in month ***m*** and TOU period ***p***
- $MW_{i,d,m,p}$ – volume (MW) of CRR ***i*** on day ***d*** in month ***m*** and TOU period ***p***
- $Credit\,Margin_{i,d,m,p}^{Daily}$ -- daily credit margin ($/MW-Day) for CRR ***i*** on day ***d*** in month ***m*** and TOU ***p***

  - Daily prices are the daily average of the respective annual and monthly auction prices. The most current auction price available for the relevant period will be used to derive the daily price.

- ***AucPrice*$_{i,d,m,p}$** – daily auction clearing price ($/MW-Day) of CRR ***i*** on day ***d*** in month ***m*** and TOU period ***p***
- ***HistExpValue*$_{i,d,m,p}$** – daily historical expected values ($/MW-Day) of CRR ***i*** on day ***d*** in month ***m*** and TOU period ***p***

Credit Holding Requirement for a market participant:

Credit Holding Requirement (Part of CRR EAL) =

max (0, LT1+LT2+LT3+ST Allocation)+max(0, ST Auction)+max(0, Financial)

2.3.1 Example 1: auction price calculation

The general formula to determine the daily auction clearing price (***AucPrice*$_{i,d,m,p}$**) used in the credit requirement calculation formula for a CRR is the daily Source MCP minus daily Sink MCP in the most recent auction market. The daily source and sink MCP are derived from the monthly/annual auction price posted on the OASIS[19].

The daily auction clearing price for a source/sink in a specific month equals its corresponding monthly/seasonal auction clearing price divided by the total number of days in the month/season for the respective TOU for the CRR being evaluated. For example, the total number of days in December 2022 off-peak is 31 days while on-peak is 26 days (Sundays and holidays are excluded); the total number of days in 2023 season 1 off-peak is 90 while on-peak is 76 (Sundays and holidays are excluded).

Assuming we are in December 2022 and 2023 January monthly auction market has not cleared/posted yet. The following examples demonstrate how source/sink MCP, which is used in the CRR credit requirement calculation, are determined for different types of CRRs:

ST Auction:

- For Monthly CRRs effective in Dec 2022, the daily auction clearing price for a source/sink equals to:
  - TOU=OFF: AUC_MN_2022_M12_TC[20]/31
  - TOU=ON: AUC_MN_2022_M12_TC/26

[19] Monthly/annual auction clearing prices are posted on OASIS: http://oasis.caiso.com/mrioasis/logon.do

[20] "AUC_MN_2022_M12_TC" is the monthly auction market name. In this section, it represents auction clearing price for a source/sink in the market. The naming convention for a monthly market is "AUC_MN_yyyy_Mxx_TC". The naming convention for an annual market is "AUC_AN_yyyy_S01_TC", "AUC_AN_yyyy_S02_TC", "AUC_AN_yyyy_S03_TC", "AUC_AN_yyyy_S04_TC".

- For annual/seasonal CRRs effective in 2023 season 2, the daily auction clearing price for a source/sink equals to:
    - TOU=OFF: AUC_AN_2023_S02_TC/91
    - TOU=ON: AUC_AN_2023_S02_TC/77

ST Allocation:

- For monthly CRRs effective in Jan 2023, the daily auction clearing price for a source/sink equals to:
    - TOU=OFF: AUC_AN_2023_S01_TC/90
    - TOU=ON: AUC_AN_2023_S01_TC/76

***Note**: After the 2023 January monthly auction market is posted, the monthly CRR for Jan 2023 will start using the monthly auction prices which are derived from TOU=OFF: AUC_MN_2023_M01_TC/31 and TOU=ON: AUC_MN_2023_M01_TC/25.*

- For annual/seasonal CRRs effective in 2023 season 1, the daily auction clearing price for a source/sink equals to:
    - TOU=OFF: AUC_AN_2023_S01_TC/90
    - TOU=ON: AUC_AN_2023_S01_TC/76

***Note**: After the 2023 January monthly auction market is posted, the 2023 season 1 CRR for Jan 2023 will start using the monthly auction prices which are derived from TOU=OFF: AUC_MN_2023_M01_TC/31 and TOU=ON: AUC_MN_2023_M01_TC/25. In the meantime, for Feb and March 2023 portions, the auction prices are still derived from AUC_AN_2023_S01_TC (TOU=OFF: 90 and TOU=ON: 76 for 2023 season 1) and no changes to the denominator for the daily auction price calculation.*

LT CRRs:

- For LT CRRs effective in 2024 (use season 2 as an example here) , the daily auction clearing price for a source/sink equals to:
    - TOU=OFF: AUC_AN_2023_S02_TC/91
    - TOU=ON: AUC_AN_2023_S02_TC/77

2.3.2 Example 2

The customer MP2 only holds one CRR, named MP2_CRR1, from source A to sink B 10 MW (TOU=ON) obtained from the 2022 November monthly auction market. The credit holding requirement for MP2 is calculated on the 8th of November, 2022. As per the credit requirement formula in the attachment H 2.2,

- $i = 1$ since MP2 only have one CRR, MP2_CRR1
- $p = ON$
- $M_{i,p} = 1$ since the remaining months of MP2_CRR1 is only November, 2022

- $D_{i,m,p}$ = *19* is the remaining number of days for MP2_CRR1 in November 2022 on-peak after excluding three Sundays and one holiday

Detailed calculations are demonstrated below:

MP2_CRR1	Source A	Sink B	$MW_{i,d,m,p}$	$Credit\,Margin^{Daily}_{i,d,m,p}$ 2220
Daily auction clearing price[21] ($)	500	-50	10	ON-PEAK = 5
Daily historical expected value[22] ($)	-10	-50		

In this example, MP2_CRR1 is a monthly CRR and the daily auction clearing price for the source A and the sink B equals to their 2022 November monthly auction clearing prices over the total number of days in November 2022 for the on-peak TOU which is 25 days.

The $AucPrice_{i,d,m,p}$ and $HistExpValue_{i,d,m,p}$ for CRR MP2_CRR1 in the credit requirement formula are calculated below:

$$AucPrice_{MP2\_CRR1,d,m(Nov),ON} = Source\ A\ Auction\ Price - Sink\ B\ Auction\ price = \$550$$

$$HisExpValue_{MP2\_CRR1,d,m(Nov),ON} = Sink\ B\ HistExpValue - Source\ A\ HistExpValue = -\$40$$

The credit requirement for MP2_CRR1 is

$$Credit\ Requirement_{MP2\_CRR1,ON} = \sum_{m=1}^{1}\sum_{d=1}^{19}(-\min(550,-40)\times 10)) + \frac{\sum_{m=1}^{1}\sum_{d=1}^{19}(5\times 10)}{\sqrt{\sum_{m=1}^{1}19}}$$
$$= 7817.9$$

The credit holding requirement for MP2 is :

$$Credit\ Holding\ Requirement_{MP2} = max\,(0,0) + max(0,7817.9) + max(0,0) = 7817.9$$

2.3.3 Example 3

The customer MP3 only has one CRR, named MP3_CRR1, from source A to sink B 50 MW (TOU=OFF) obtained from the 2022 November monthly auction market. The credit

[21] Monthly auction clearing prices are posted on OASIS: http://oasis.caiso.com/mrioasis/logon.do
[22] Both historical expected values and credit margin values are posted on http://www.caiso.com/market/Pages/ProductsServices/CongestionRevenueRights/Default.aspx

holding requirement for MP3 is calculated on the 8th of November, 2022. Detailed calculations are demonstrated below:

- *i = 1* since MP3 only have one CRR, MP3_CRR1
- *p = OFF*
- $M_{i,p}$ = *1* since the remaining months of MP3_CRR1 is only November, 2022
- $D_{i,m,p}$ = *23* is the remaining number of days for MP3_CRR1 in November 2022 off-peak

MP3_CRR1	Source A	Sink B	$MW_{i,d,m,p}$	$Credit\,Margin^{Daily}_{i,d,m,p}$
Daily auction clearing price ($)	10	1	50	OFF-PEAK = 5 OFF24 = 10
Daily historical expected value ($)	-100	-5		

In this example, MP3_CRR1 is a monthly CRR and the daily auction clearing price for the source A and the sink B equals to their 2022 November monthly auction clearing prices over the total number of days in November 2022 for the off-peak TOU which is 30 days.

The credit margins have three time-of-use categories, on-peak, off-peak and Sunday (OFF24). When calculating credit requirement for a CRR with on-peak time of use, ON-PEAK credit margin is used for all dates during the time that the CRR covers except Sundays and holidays. When calculating credit requirement for a CRR with off-peak time of use, OFF-PEAK credit margin is used for all dates during the time that the CRR covers except for Sundays and holidays. For Sundays and holidays, Sunday (OFF24) credit margin is used. In this example, since the TOU for CRR MP3_CRR1 is off-peak, both OFF-PEAK and Sunday (OFF24) credit margins are listed. There are three Sundays and one holiday from November 8th to November 30th, 2022.

The $AucPrice_{i,d,m,p}$ and $HistExpValue_{i,d,m,p}$ for CRR MP3_CRR1 in the credit requirement formula are calculated below:

$$AucPrice_{MP3\_CRR1,d,m,OFF} = Source\ A\ Auction\ Price - Sink\ B\ Auction\ price = \$9$$

$$HisExpValue_{MP3\_CRR1,d,m,OFF} = Sink\ B\ HistExpValue - Source\ A\ HistExpValue = \$95$$

The credit requirement for MP3_CRR1 is

$$Credit\ Requirement_{MP3\_CRR_1,OFF} = \sum_{m=1}^{1}\sum_{d=1}^{23}(-\min(9,95)\times 50)) + \frac{\sum_{m=1}^{1}(\sum_{d=1}^{19}(5\times 50)+\sum_{d=1}^{4}(10\times 50))}{\sqrt{\sum_{m=1}^{1}23}} = -8942.5$$

The credit holding requirement for MP3 is

$$Credit\ Holding\ Requirement_{MP3} = max\ (0,0) + max(0, -8942.5) + max(0,0) = 0$$

2.3.4 Example 4

The customer MP4 has two CRR. One is MP4_CRR1, from source A to sink B 5 MW (TOU=OFF) obtained from the 2022 November monthly allocation market. The other one is MP4_CRR2, from source C to sink D 20 MW (TOU=ON) obtained from annual allocation market. The credit holding requirement for MP4 is calculated on the 9th of November, 2022. Detailed calculations are demonstrated below.

- *i = 2* since MP4 has two CRRs
- *p = OFF for CRR* MP4_CRR1 and ON for MP4_CRR2

Credit requirement for MP4_CRR1:

- $M_{1,OFF} = 1$ since the remaining months of MP4_CRR1 is only November,2022
- $D_{1,m,OFF} = 22$ is the remaining number of days for MP4_CRR1 in November 2022 off-peak

MP4_CRR1	Source A	Sink B	$MW_{i,d,m,p}$	$Credit\ Margin_{i,d,m,p}^{Daily}$
Daily auction clearing price ($)	10	-10	5	OFF-PEAK = 5 OFF24 = 15
Daily historical expected value ($)	-30	-5		

In this example, MP4_CRR1 is a monthly CRR and the daily auction clearing price for the source A and the sink B equals to their 2022 November monthly auction clearing prices over the total number of days in November 2022 for the off-peak TOU which is 30 days.

The $AucPrice_{i,d,m,p}$ and $HistExpValue_{i,d,m,p}$ for CRR MP4_CRR1 in the credit requirement formula are calculated below:

$$AucPrice_{MP4\_CRR1,d,m(Nov),OFF} = Source\ A\ Auction\ Price - Sink\ B\ Auction\ price = \$20$$

$$HisExpValue_{MP4\_CRR1,d,m(Nov),OFF} = Sink\ B\ HistExpValue - Source\ A\ HistExpValue = \$25$$

Since there are three Sundays and one holiday from 9th to 31st, November, 2022, Sunday credit margin value(OFF24) is used in the calculation for 4 days while off-peak credit margin are used for the rest(22-4=18). The credit requirement for CRR MP4_CRR1 is

$$Credit\ Requirement_{MP4\_CRR1,OFF} = \sum_{m=1}^{1}\sum_{d=1}^{22}(-\min(20,25)\times 5)) + \frac{\sum_{m=1}^{1}(\sum_{d=1}^{18}(5\times 5)+\sum_{d=1}^{4}(15\times 5))}{\sqrt{\sum_{m=1}^{1}22}} = -2040.1$$

Credit requirement for MP4_CRR2:

- *$M_{2,ON}$ = 3 since remaining months of MP4_CRR2 is Oct., Nov. and Dec. 2023*
- *$D_{2,Oct,ON}$ = 26* is the remaining number of days for MP4_CRR2 in Oct. 2023 on-peak
- *$D_{2,Nov,ON}$ = 25* is the remaining number of days for MP4_CRR2 in Nov. 2023 on -peak
- *$D_{2,Dec,ON}$ = 25* is the remaining number of days for MP4_CRR2 in Dec. 2023 on -peak

MP4_CRR2	*Effective Month*	$D_{i,m,p}$	Source C	Sink D	$MW_{i,d,m,p}$	$Credit\ Margin^{Daily}_{i,d,m,p}$
Daily auction clearing price ($)	Oct-2023	26	10	-10	20	ON-PEAK = 25
	Nov-2023	25	10	-10		ON-PEAK = 10
	Dec-2023	25	10	-10		ON-PEAK = 20
Daily historical expected value ($)	Oct-2023	26	-60	-25		ON-PEAK = 25
	Nov-2023	25	-30	-5		ON-PEAK = 10
	Dec-2023	25	-90	5		ON-PEAK = 20

In this example, MP4_CRR2 is a seasonal CRR which was cleared in the 2023 annual CRR market. The daily auction clearing price for the source A and the sink B equals to their 2023 annual season 4 auction market clearing prices over the total number of days in 2023 season 4 for on-peak TOU which is 76 days (92 days for the off-peak TOU).

The *$AucPrice_{i,d,m,p}$* and *$HistExpValue_{i,d,m,p}$* for CRR MP4_CRR2 in the credit requirement formula are calculated below:

$$AucPrice_{MP4\_CRR2,d,m(Oct),ON} = Source\ C\ Auction\ Price - Sink\ D\ Auction\ price = \$20$$

$$HisExpValue_{MP4\_CRR2,d,m(Oct),ON} = Sink\ D\ HistExpValue - Source\ C\ HistExpValue = \$35$$

$$AucPrice_{MP4\_CRR2,d,m(Nov),ON} = Source\ C\ Auction\ Price - Sink\ D\ Auction\ price = \$20$$

$$HisExpValue_{MP4\_CRR2,d,m(Nov),ON} = Sink\ D\ HistExpValue - Source\ C\ HistExpValue = \$25$$

$$AucPrice_{MP4\_CRR2,d,m(Dec),ON} = Source\ C\ Auction\ Price - Sink\ D\ Auction\ price = \$20$$

$$HisExpValue_{MP4\_CRR2,d,m(Dec),ON} = Sink\ D\ HistExpValue - Source\ C\ HistExpValue = \$95$$

The credit requirement for CRR MP4_CRR2 is

$$\begin{aligned} &Credit\ Requirement_{MP4\_CRR2,ON} \\ &= \left(\sum_{m=1}^{1-Oct}\sum_{d=1}^{26}(-\min(20,35)\times 20)\right) + \sum_{m=1}^{1-Nov}\sum_{d=1}^{25}(-\min(20,25)\times 20)) \\ &+ \sum_{m=1}^{1-Dec}\sum_{d=1}^{25}(-\min(20,95)\times 20)) \\ &+ \frac{\sum_{m=1}^{1-Oct}\sum_{d=1}^{26}(25\times 20) + \sum_{m=1}^{1-Nov}\sum_{d=1}^{25}(10\times 20) + \sum_{m=1}^{1-Dec}\sum_{d=1}^{25}(20\times 20)}{\sqrt{26+25+25}} \\ &= -27188.2 \end{aligned}$$

The credit holding requirement for MP4:

$$\begin{aligned} &Credit\ Holding\ Requirement_{MP4} = max\,(0,(-2040.1) + (-27188.2)) + max(0,0) + max(0,0) \\ &= 0 \end{aligned}$$

2.4 SRS Trades and Credit Requirement Calculation

The credit calculation requirements will not be determined at the time a trade occurs via the SRS. Rather, they will go into a 'Pending' status and will be evaluated, in the order of occurrence, with the next run of the credit requirement calculator and consistent with the methodology described above in the 'Post Auction Credit Requirements' section. Upon completion of the evaluation, the status will be changed to 'rejected' if sufficient collateral does not exist or accepted if sufficient collateral exists. In addition, a private message will be generated notifying of the status of the evaluation.

2.5 Re-Evaluation of Credit Requirements under Extraordinary Circumstances

Extraordinary circumstances such as an extended transmission outage or other abnormal grid conditions could dramatically increase (or decrease) the payment obligations for a CRR. Although, over time, the ISO 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. Although this methodology is one predefined approach to re-evaluate credit requirements when CRR values change, ISO has the tariff authority to request additional Financial Security at any time as a result of a change in CRR value that is not related to an adjustment due to the monthly CRR Auction Price or an adjustment related to Historical Expected Value pursuant to tariff section 12.6.3.1(c). If it uses an alternative methodology, the ISO will provide a written explanation at the time of the request for additional Financial Security.

2.5.1 Extraordinary Events:

Given the complexity to define a priori what events can be defined as extraordinary, ISO will communicate to market participants when an event is deemed to be extraordinary. ISO will produce a report within 30 calendar days containing the details of the reevaluation of credit requirements, which, among other things, will include the new set of prices used in the reevaluation process. ISO plans to develop the proposed methodology that will be used for outages of either transmission or generation facilities that may be systematically modeled. 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 and are based on the congestion component of LMPs from the Day-Ahead Market (DAM) only. The LMP congestion component reflects the value of scarce transmission. Therefore, congestion revenues will be affected by changes on the system congestion in the IFM market. Congestion is primarily driven by economic 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, changes of flow patterns, such as flow reversal on Path 15 during winter time may not be considered a trigger for the reevaluation of credit. CRRs already accommodate seasonality. Nor would typical de-rates or outages on transmission elements due to scheduled or forced 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.

Unexpected but time limited events that do not impact the IFM outcome will not trigger the re-evaluation of credit. 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 would have already run on July 12th, and indeed the IFM for TD of July 14th would have already run by 1300hrs on July 13th. Hence, such an outage would not be reflected in either IFM for TD of July 13th or 14th, even though it was an extraordinary event and impacted the system. This outage, however, will be accommodated in the RTM of July 13th. Consequently, such an 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.

For already-known extraordinary events that can be modeled by means of transmission outages the CRR team will rely on outage information. ISO will model such outages with the set-up of the most current monthly auction available to determine the change of credit requirement under such conditions, if any. 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 ISO 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. However, if an outage reported under the 30-day rule is classified also as an extraordinary event, it will be automatically accommodated in the standard evaluation of credit requirements once the auction prices become available in the CRR system.

2.5.2 Reevaluation of Credit Requirements:

With the extraordinary event identified and characterized as an outage, the most current available monthly CRR auction will be rerun with the outage now included. It is important to mention that the modeling of the outage will be the sole modification that will be done to the setup of the auction. All other set-ups such as bids from participants, de-rate factors, and fixed CRRs will remain unchanged. The clearing of the auction will provide a new set of auction prices. These prices will be converted into hourly prices in the same fashion the prices for the standard evaluation are computed.

Such hourly prices will be used to compute the credit requirements for each CRR holder. Notice that the new hourly prices for all CRRs will be used only for the period of days, Δ,

in which the extraordinary event occurs. For any other day outside this period, the original auction price and/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:

$$\overline{CR_{i,p}^{H}} = -\sum_{m=1}^{M_{i,p}} \sum_{d=1}^{D_{i,m,p}} \min(\Omega_{i,d,m,p}, HistExpValue_{i,d,m,p}) \times MW_{i,d,m,p}^{H}) + \frac{\sum_{m=1}^{M_{i,p}} \sum_{d=1}^{D_{i,m,p}} Credit\ M\arg in_{i,d,m,p}^{Daily} \times MW_{i,d,m,p}^{H}}{\sqrt{\sum_{m=1}^{M_{i,p}} D_{i,m,p}^{H}}}$$

(1)

where

$$\Omega_{i,d,m,p} = \begin{cases} Adjusted\ Auction\Pr ice_{i,d,m,p} & if\ d \in \Delta \\ Original\ Auction\ \Pr ice_{i,d,m,p} & if\ d \notin \Delta \end{cases}$$

(2)

And the Index H stands for CRR holders.

This computation is equivalent to re-evaluating the credit requirement only for the period of time in which the extra-ordinary event occurs. Notice that his formula is similar to the formula used in the standard evaluation of credit requirements as shown above in this Appendix

When the credit requirements exceed the current posted collateral there may be a need to call for more collateral; however, it may actually decrease credit requirements as well. Under either scenario the credit CRR holding requirement for each CRR holder is then defined as:

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

where $\overline{CR}^{H}$ is the most recent re-evaluation of credit requirements due to extraordinary circumstances as defined in Expression 3. Depending on the duration of the extra-ordinary event, the reevaluation of credit requirements may be run more than once (potentially up to having a daily reevaluation) in order to account for the changing profile of CRR holdings.

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 to any reevaluation as it is one indicator of the evolution over time of the financial position of CRR holders.

Attachment I

CRR Settlement Rule

I. CRR Settlement Rule

The following attachment presents further details in support of the CAISO Tariff section *11.2.4.6.*

I.1 Overview

The following "flow-based" approach was designed to provide a targeted way of limiting CRR payments to entities that are also Convergence Bidding Entities when Virtual Awards may increase their CRR payments. It has the following general features:

- Allows netting of results across all hours of each day corresponding to the entity's CRRs. Specifically, for peak period CRRs, results will be netted across hours 7 to 22, while results will be netted across hours 1 to 6 and 23 to 24 for off-peak CRRs.
- For each congested constraint that is found to be affected by the entity's Virtual Awards, the methodology will consider the aggregate (net) impact of this congestion on all of the entity's CRRs during each hour.
-
- Specific treatment for "counter flow" CRRs (i.e., CRRs in the opposite direction of congestion that require the CRR Holder to pay congestion costs).

Section 0 describes the CRR Settlement Rule.

I.2 CRR Settlement Rule

In the following CRR settlement rules, the term of "entity" is referring to the CRR Holders that are also Convergence Bidding Entities.

Step 1. Calculate combined impact of entity's portfolio of Virtual Awards on flows of constraint for each Trading Hour

Start by considering a constraint, *k*, which was binding in the Integrated Forward Market (IFM), the relevant Real-Time Market, or both.[23] Also consider an entity**,** *i*, who owns a portfolio of time period, *p*, CRRs ($\{C\}_{p,i}$). The time period, *p*, specifies whether the CRR, $c \in \{C\}_{p,i}$, is for the peak or off-peak set of hours. The first step in determining the

[23] Constraints that are binding in the Real-Time Market but not in the IFM must be considered in order to adjust payments from/to holders of CRRs who may use Virtual Bids to profit from the elimination of Congestion on a constraint in the IFM.

CRR settlement rule payment adjustment for entity, *i*, with respect to constraint, *k*, over period, *p*, is to calculate the combined impact of the entity *i*'s portfolio of Virtual Awards on the IFM flows of constraint, *k*, for each hour, *t*, in the time period, *p*. The total megawatt (MW) flow contribution from all the Virtual Awards of the entity CRR Holder to the total MW flow on constraint, *k*, is calculated as follows:

$$F_{DA,k,t,i} = \sum_{j \in \{J\}_{i,t}} S_{DA,k,j,t} VB_{j,t,i}$$

Where:

$S_{DA,k,j,t}$ is the IFM shift factor of constraint *k* with respect to Virtual Awards at node *j* during hour *t*,

$\{J\}_{i,t}$ is the set of all nodes at which entity, *i*, has Virtual Awards for the hour *t*, and

$VB_{j,t,i}$ is the volume (MW) of Virtual Awards of the entity at node *j*. $VB_{j,t,i}$ Virtual Supply Awards are represented as *positive* values of $VB_{j,t,i}$ while Virtual Demand Awards are represented as *negative* values of $VB_{j,t,i}$. All the shift factors are based on the default slack (load distributed slack).

If the constraint is binding in the RTM, but not in the IFM, then the average over the hour of the real-time shift factors for a node will be used in place of the day-ahead shift factors.

Virtual awards may be explicit cleared virtual bids, or, pursuant to CAISO Tariff section 11.2.4.6, implicit virtual bids, which are the result of a reduction in a transmission schedule between the DAM schedule and the RTM schedule.

In the case of the reduction of the schedule in FMM, the CAISO uses the following logic to determine if such a reduction constitutes an implicit virtual award:

- If a scheduling coordinator rebids its import into the RTM at a price less than or equal to the DA LMP, then the market would only reduce the import schedule if system conditions have changed from the DAM. This reduction in import schedule is not considered an implicit virtual bid, and its CRR revenue would not be evaluated for potential resettlement.
- If a scheduling coordinator rebids its import into the RTM at a price higher than the DA LMP, potentially resulting in a reduction in its DAM schedule, then the corresponding portion of the import schedule is considered an implicit virtual bid, and its CRR revenue will be evaluated for potential resettlement.
- If a scheduling coordinator rebids its export into the RTM at a price greater than or equal to the DA LMP, then the market would only reduce the export schedule if system conditions have changed from the DAM. This reduction in export schedule is not considered an implicit virtual bid, and its CRR revenue would not be evaluated for potential resettlement.

- If a scheduling coordinator rebids its export into the RTM at a price less than the DA LMP, potentially resulting in a reduction in its DAM schedule, then the corresponding portion of the export schedule is considered an implicit virtual bid, and its CRR revenue will be evaluated for potential resettlement.
- If the quantity of the import/export economic bid plus self-schedule in FMM is less than the DA schedule, then the difference shall still be considered a virtual bid, and its CRR revenue will be evaluated for potential resettlement.

Step 2. Determine hours where entity's portfolio of Virtual Awards significantly impacted constraint

The next step is to compare the net impact of the entity's portfolio of Virtual Supply and Demand Awards ($F_{DA,k,t,i}$) to the total flow on the constraint for each Trading Hour. A threshold percentage (*L,)* of the constraint's flow limit (*K*) is used to determine if congestion on the constraint may have been significantly impacted by the CRR Holder's Virtual Awards over Trading Hour, *t*. Specifically, the constraint's impact on the value of the entity's portfolio of CRR holdings will be considered in Step 3 for hours, *t*, where $F_{DA,k,t,i}$ passes two criteria:

A) Is $F_{DA,k,t,i}$ in the direction that would increase the value of the entity's CRR portfolio?

The general statement of the criteria for a Trading Hour passing this Step 2A, is if $F_{DA,k,t,i}$ is in the same direction as $F_{DA,k,t}$ (whether direction of flow is identified by sign or by a flag in a separate column), then $\left(F_{DA,k,t,i} * F_{DA,k,t}\right)$ is positive, and if $F_{DA,k,t,i}$ is in the opposite direction of $F_{DA,k,t}$, then $\left(F_{DA,k,t,i} * F_{DA,k,t}\right)$ is negative. With this general definition, the equation $\left(F_{DA,k,t,i} * F_{DA,k,t}\right)\left(\sum_{c\in\{C\}_{p,i}} Q_{c,t,i} * \Delta_{RT,k,c,t}\right) > 0$ (terms defined in step 3 below) will identify that the entity's portfolio of Virtual Awards were in the direction to increase the value of the entity's CRR portfolio at hour, t. If *k* is binding in the IFM but not in any interval of the appropriate RTM, (that is, if $\Delta_{RT,k,c,t} = 0$) then the direction of flow test will be if $\left(F_{DA,k,t,i} * F_{DA,k,t}\right)\left(\sum_{c\in\{C\}_{p,i}} Q_{c,t,i} * \Delta_{DA,k,c,t}\right) > 0$. If the direction of flow on the constraint changes between DAM and RTM, then similar equations will determine if the Entity's Virtual Awards were in the direction to increase the value of the CRR portfolio. **B) Is** $\left|F_{DA,k,t,i}\right| > \left(K * L\right) + \left(K - \left|F_{DA,k,t}\right|\right)$

Where $F_{DA,k,t}$ is the total IFM flow on constraint, *k*, during Trading Hour, *t*.

If the flow impact of the entity's Virtual Award is in the direction to increase the value of the entity's CRR portfolio (Step 2A), then Step 2B identifies if the magnitude of that flow impact was sufficiently large. *L* is a parameter set to .10 (10 percent) for all constraints as specified in Tariff section 11.2.4.6(b). Based on actual operating experience and off-line studies of the potential price impacts resulting from different levels of Virtual Awards, the threshold *L* may be adjusted for some or all constraints.

The result of Step 2 is the definition of the set $\{T\}_{k,p,i}$ as the set of hours, *t*, in time period, *p*, that pass Step 2A and Step 2B. Step 2 identifies the hours where the entity's Virtual Award may have significantly impacted the shadow price of constraint, *k*; the Virtual Award, therefore, may have had a significant positive impact on the value of the entity's CRR portfolio.

Step 3. Compare constraint's impact on day-ahead value of entity's CRR portfolio to the constraint's impact on real-time value of entity's CRR portfolio

In order to determine the CRR settlement rule payment adjustment for entity, *i*, and constraint, *k*, for the time period, *p*, start by determining the constraint's contribution to the difference between the day-ahead value and real-time value of one of the entity's CRR holdings for one Trading Hour, *t*, that passed Step 2:

$$d_{k,c,t,i} = Q_{c,t,i} * \left(\Delta_{DA,k,c,t} - \Delta_{RT,k,c,t}\right)$$

Where:

$$\Delta_{DA,k,c,t} = \left(\left(-S_{DA,k,Sink_c,t}\right)\left(\lambda_{DA,k,t}\right) - \left(-S_{DA,k,Source_c,t}\right)\left(\lambda_{DA,k,t}\right)\right)$$

$$\Delta_{RT,k,c,t} = \left(\frac{\sum_{h_{\sin k}}^{H_{\sin k}} \left[\left(-S_{RT,k,Sink_c,t,h_{\sin k}}\right)\left(\lambda_{RT,k,t,h_{\sin k}}\right)\right]}{H_{\sin k}} - \frac{\sum_{h_{source}}^{H_{source}} \left(-S_{RT,k,Source_c,t,h_{source}}\right)\left(\lambda_{RT,k,t,h_{source}}\right)}{H_{source}} \right)$$

$Q_{c,t,i}$ is the MW quantity of CRR, *c*, owned by the entity for Trading Hour, *t*.

$S_{DA,k,Sink_c,t}$ is the IFM shift factor of constraint *k* with respect to the sink node of *c*.

$\lambda_{DA,k,t}$ is the shadow price of the constraint *k* in the IFM for Trade Hour, *t*.

h designates the 15-minute interval during each Trading Hour, thus *H=4* intervals for each Trading Hour. $\Delta_{DA,k,c,t}$ is the constraint *k*'s contribution to the CRR's per MW "day-ahead" value for hour, *t*, and $\Delta_{RT,k,c,t}$ is the constraint *k*'s contribution to the CRR's per MW "real-time" value for hour, *t*.

Finally, in order to determine the constraint's impact on the value of an entity's CRR portfolio for the time period, *p*, add its impact on each CRR, $c \in \{C\}_{p,i}$, for all Trading Hours $t \in \{T\}_{k,p,i}$. Specifically, the constraint's impact on the value of an entity's CRR portfolio for the time period, *p*, is:

$$\Gamma_{k,p,i} = \sum_{t \in \{T\}_{k,p,i}} \sum_{c \in \{C\}_{p,i}} d_{k,c,t,i}$$

Step 4. Apply CRR payment adjustment

If over the Trading Day, the constraint contributed to the day-ahead value of the entity's CRR portfolio's exceeding the real-time value of the entity's CRR portfolio ($\Gamma_{k,p,i} > 0$),entity *i*'s CRR payment will be charged $\Gamma_{k,p,i}$. If $\Gamma_{k,p,i} < 0$, there will not be a CRR settlement rule payment adjustment for entity, *i*, with respect to constraint, *k*, for period, *p*. A payment adjustment will be calculated for an entity for each constraint, time period, and day. Specifically, the CRR settlement rule will calculate the following daily payment adjustments for CRR Holders:

$$PA_{k,p,i} = \max\left(\Gamma_{k,p,i}, 0\right)$$

If the entity has more than one SCID that is used for CRRs, the payment adjustment will have to be distributed amongst them. The following algorithm will be used to distribute the total payment adjustment for *i*, $PA_{k,p,i}$, amongst the entity's various CRR-mapped SCIDs.

1. Perform all Step 3 and Step 4 calculations by SCID. Let OPA_{k,p,i_s} denote the payment adjustment for SCID, i_s's, CRR portfolio according to the Step 3 and 4 calculations.

2. If $OPA_{k,p,i_s} = 0 \Rightarrow FPA_{k,p,i_s} = 0$ where FPA_{k,p,i_s} denotes the "final" payment adjustment charged to SCID i_s

3. if $OPA_{k,p,i_s} > 0 \Rightarrow i_s \in \{S\}$ where{S} is the set of SCIDs, *i*'s SCIDs that would get a charge (as opposed to a credit) under Step 3.

4. Let $G = \sum_{i_s \in \{S\}} OPA_{k,p,i_s}$

5. $R_{i_s} = \dfrac{OPA_{k,p,i_s}}{G}$

6. $\forall i_s \in \{S\}, FPA_{k,p,i_s} = R_{i_s} * PA_{k,p,i}$

I.3 CMRI Data Publications

Market SCs can review data contributing to the CRR Settlement Rule on CMRI via three reports. Please refer to the Market Instruments BPM, Section 10 for details on these reports.

I.4 CRR Settlement Rule for Circular Schedule

The following presents further details in support of CAISO Tariff section *11.2.4.7.*

The following approach was designed to provide a targeted way of limiting CRR payments to entities that may increase their CRR payments or reduce their CRR obligations through circular schedules.

The process flow for the CRR Settlement for circular schedules in the IFM market is described below:

- Identify circular schedules subject to settlement rule in section 11.33 of the CAISO Tariff that have scheduled MW in IFM market.
- The data used for CRR Settlement Calculation:
    a. Positive Power Transfer Distribution Factor (PTDF) Data from EDR Production
    b. Shadow Price Data from EDR Production
    c. Circular Schedule MW.
- Start by considering constraint I, which was binding in the IFM market. Also consider an entity, k who owns a CRR portfolio of time period t. The first step in determining the CRR Settlement rule is to calculate the impact of the entity k's circular schedules on the IFM flows of constraint I, for each hour in the time period t.
- Determine whether CRR holder is receiving payment or faces obligations from CRRs for the constraint I. If CRR holder is receiving payment or would face reduced obligations from CRRs for the congested constraint I, then CRR Settlement would apply.
- The total MW flow contribution from the segments of circular schedules of the entity CRR holder to the total MW flow on constraint I is calculated as follows:

$$F_{IFM,i,t,k} = \sum_{j \in \{J\}_{k,t}} \max(SF_{IFM,i,j,t}, 0) * \min(MW_{j,t,k}, CRR\_Inj)$$

Where $SF_{IFM,i,j,t}$ is the positive PTDF of constraint I at node j during time t in the direction of CRRs,

$MW_{j,t,k}$ Is the circular schedule of entity k during time t

- The Settlement rule for circular schedules in dollars would be calculated as:

$$CBA_{IFM,i,t,k} = \sum_{j \in \{J\}_{k,t}} F_{IFM,i,t,k} \lambda_{IFM,t}$$

Where $CBA_{IFM,i,t,k}$ is the Settlement amount for circular schedules for constraint I for time period t,

$\lambda_{IFM,t}$ is the shadow price in IFM of the congested element for time period t.

Attachment J

CRR Partial Funding Calculation

J. CRR Partial Funding Calculation

The following attachment presents information about how the Congestion Revenue Rights (CRRs) partial funding calculation will be determined under CAISO Tariff section *11.2.4.6.* The following "flow-based" approach was designed to address cases where the CRR flows on a particular binding constraint in the DAM are greater than the DAM flows on the same constraint. This "flow-based" approach provides a targeted way of limiting CRR payments to entities to ensure all congestion revenue collected in the DAM on a specific binding constraint is equitably distributed to CRR holders with flows on that binding constraint.

J.1 Summary of CRR Auction Efficiency Track 1B - Computations

This appendix is prepared to illustrate the computation requirement needed when calculating any possible CRR payment reductions.

At a high level, when there is a shortfall in the congestion revenue on a particular constraint(IFM congestion rent collected is less than the CRR payout, in other words, IFM flow is less than the CRR flow on a particular constraint), the impacted CRRs are discounted and the CRR payment is reduced from its nominal value.

When there is a surplus (IFM flow is higher than the CRR flow), the CRR MW/payment will remain unchanged, and any surplus amount will go to a separate account for settlement purposes, which is subsequently distributed to measured demand.

These discount and surplus calculations are considered on a constraint-by-constraint basis.

J.1.0 Input + Preprocessing:

J.1.1 Shift factor inputs and preprocessing:

- Shift factors are received from the IFM run of the Day-Ahead Market for all binding constraints, except as detailed further.
- Shift factors are created for ITC and ISL constraints. A shift factor value of 1 (or -1 for exports) is associated to SP-Tie nodes associated with those constraints.
- If a Pnode is disconnected in the network model, a shift factor correction process replaces the shift factors associated with the Pnode with the shift factors associated with the closest electrically connected Pnode, to replicate the market process for setting the LMP at those locations. A similar process is performed for APnodes for which all the constituent Pnodes are disconnected.
- For nodes where the LMP is affected by a binding DC scheduling constraint, the shift factors at that location (other than for binding ITC constraints) are replaced with the shift factors at the opposite pole. The reason for this is that the HVDC 'constraint' shadow price does not reflect a traditional flow-based AC transmission constraint, but instead a modeling artifact allowing the modeling of a DC line in an AC network. Replacing these shift factors does not affect the notional revenue calculation for the CRR.

J.1.2 Special preprocessing for option CRRs:

- The nature of option CRRs requires them to be paid for notional revenue when the source and sink is aligned in the prevailing direction of congestion (i.e. the CRR flow is in the same direction as the congestion) but never charged in the counterflow direction. Special pre-processing is required to ensure

these rules hold on an hourly basis. For each hour the marginal cost of congestion (MCC) at an option CRR's sink location is compared with the MCC at the source location. If the value sink MCC – source MCC is positive then the option CRR shall be included in the calculations for that hour. If the value is zero or negative, then the CRR shall not be included.

- There is an option CRR type which is denoted 'MT_TOR'. For this type of CRR, special preprocessing is needed to de-rate the CRRs prior to the calculation. The CRR award is de-rated by a factor equal to the ratio of the OTC/TTC values from the matching tie constraint. In other words,

MT TOR award used in the calculation = CRR award x OTC/TTC

J.1.3 Other inputs and preprocessing

- IFM resource awards (Hourly), both physical and virtual should be considered.
- IFM Shadow prices, for flowgates, ITCs, ISLs, nomograms, and nodal group constraints (Hourly)
- IFM binding constraint cleared value, for flowgates, ITCs, ISLs, nomograms, and nodal group constraints (Hourly). Referred to as ClearedMW in the equations.
- CRR ownership (TOU)[24]
- Prorated CRRS Clawback Revenue (Hourly data by CRR ID by constraint/constraint case)
- CRRS Clawback MW (Hourly data by CRR ID by constraint)[25]
- Hourly Circular scheduling revenue (this is a user manually entered field. The required information are CRR ID, constraint name, contingency case name, trade hour and circular revenue number in dollars). User is expected to enter a positive amount only.
- Hourly Circular scheduling MW (revenue/shadow price)

J.2.0 Calculation:

J.2.1 Begin by calculating the market flow vs. CRR flow per constraint, contingency, and interval. This term is defined as Market Constraint Flow Difference ($CFD_{k,m,t}$)

J.2.1.1 IFM flow by constraint by contingency case by interval is denoted:

$$\sum_{n=1}^{N} SF_{n,k,m,t} * IFMMW_{n,t}$$

Where $IFMMW_{n,t}$ is the total nodal injection MW from all physical and virtual resource schedules at financial PNode n and interval t, and $SF_{n,k,m,t}$ is the shift factor from that PNode to constraint k under contingency m.

J.2.1.2 CRR flow by constraint by contingency case[26][27] by interval:

[24] There is a CRR type which is denoted 'MT_TOR', for this type of CRR, preprocessing is needed to derate the CRRs prior to populating the calculation. The derate factor is OTC/TTC from the matching tie constraint.

[25] CRR Clawback revenue/MW may not exist for each CRR. If no Clawback revenue exists, it should be assumed to be 0 for the rest of the calculation for the CRR. Clawback MW is pro-rated Clawback Revenue/Shadow Price.

[26] CRR Ownership is related to the TOU level for each trading day. The TOU must be associated with the right trade interval.

[27] If only the source or sink has SF to the constraint, the other leg sink or source which does not has SF to the constraint, the shift factor for this other leg should be treated as 0.

$$\sum_{q=1}^{Q}\left[(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}) * CRRMW_q - CRRClawbackMW_{q,k,m,t} - CRR\ CircularSchedulingMW_{q,k,m,t}\right]$$

J.2.1.3 $CFD_{k,m,t}$ is calculated as:

$$CFD_{k,m,t} = \sum_{n=0}^{N} SF_{n,k,m,t} * IFMMW_{n,t} - \sum_{q=0}^{Q} CFD\_FLAG_{q,k,m,t} * \left[(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}) * CRRMW_q - CRRClawbackMW_{q,k,m,t} - CRR\ CircularSchedulingMW_{q,k,m,t}\right]$$

where

If hedge_type = 'Obligation'

$$CFD\_Flag_{q,k,m,t} = 1$$

If hedge_type = 'Option' and

$(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}) * CRRMW_q * ClearedMW_{k,m,t} > 0$

$$then\ \ CFD\_Flag_{q,k,m,t} = 1$$

If hedge_type = 'Option' and

$(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}) * CRRMW_q * ClearedMW_{k,m,t} < 0$

$$then\ \ CFD\_Flag_{q,k,m,t} = 0$$

J.2.2 Portion of congestion revenue right settled flow by constraint, constraint case, and interval.

This value is a non-negative ratio. For option CRRs, the ratio is $\alpha_{q,k,m,t}^{(opt)}$, whereas for obligation CRRs, the ratio is $\alpha_{p,k,m,t}^{(obl)}$.

We define binary variables for each CRR option by constraint, constraint case, and interval as follows:

$$\eta_{q,k,m,t}^{(opt)} = \begin{cases} 0 & \text{if } \left((SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}) * CRRMW_q - CRRClawbackMW_{q,k,m,t} - CRRCircularSchedulingMW_{q,k,m,t}\right) * ClearedMW_{k,m,t} \le 0 \\ 1 & \text{otherwise} \end{cases}$$

$$\forall q \in S_p^{(opt)}$$

We define binary variables for the CRR obligations by CRR owner by constraint, constraint case, and interval as follows:

$$\eta_{p,k,m,t}^{(obl)} = \left\{ \begin{matrix} 0 & \text{if} \sum_{q \in S_p^{(obl)}} \left(\begin{matrix} \left(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}\right) * CRRMW_q - \\ CRRClawbackMW_{q,k,m,t} - \\ CRRCircularSchedulingMW_{q,k,m,t} \end{matrix} \right) * ClearedMW_{k,m,t} \leq 0 \\ 1 & \text{otherwise} \end{matrix} \right\}$$

$$\forall p$$

For option CRRs:

$$\alpha_{q,k,m,t}^{(opt)} = \frac{\eta_{q,k,m,t}^{(opt)} * \left(\begin{matrix} \left(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}\right) * CRRMW_q - \\ CRRClawbackMW_{q,k,m,t} - \\ CRRCircularSchedulingMW_{q,k,m,t} \end{matrix} \right)}{\left(\begin{matrix} \sum_{p=1}^{P} \sum_{q \in S_p^{(opt)}} \eta_{q,k,m,t}^{(opt)} * \left(\begin{matrix} \left(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}\right) * CRRMW_q - \\ CRRClawbackMW_{q,k,m,t} - \\ CRRCircularSchedulingMW_{q,k,m,t} \end{matrix} \right) + \\ \sum_{p=1}^{P} \eta_{p,k,m,t}^{(obl)} \sum_{q \in S_p^{(obl)}} \left(\begin{matrix} \left(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}\right) * CRRMW_q - \\ CRRClawbackMW_{q,k,m,t} - \\ CRRCircularSchedulingMW_{q,k,m,t} \end{matrix} \right) \end{matrix} \right)}$$

And

$$CRRNotionalMW_{q,k,m,t} = \left(\begin{matrix} \left(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}\right) * CRRMW_q \\ \end{matrix} \right)$$

For obligation CRRs:

$$\alpha_{p,k,m,t}^{(obl)} = \frac{\eta_{p,k,m,t}^{(obl)} \sum_{q \epsilon S_p^{(obl)}} \begin{pmatrix} \left(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}\right) * CRRMW_q - \\ CRRClawbackMW_{q,k,m,t} - \\ CRRCircularSchedulingMW_{q,k,m,t} \end{pmatrix}}{\begin{pmatrix} \sum_{p=1}^{P} \sum_{q \epsilon S_p^{(opt)}} \eta_{q,k,m,t}^{(opt)} * \begin{pmatrix} \left(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}\right) * CRRMW_q - \\ CRRClawbackMW_{q,k,m,t} - \\ CRRCircularSchedulingMW_{q,k,m,t} \end{pmatrix} + \\ \sum_{p=1}^{P} \eta_{p,k,m,t}^{(obl)} \sum_{q \epsilon S_p^{(obl)}} \begin{pmatrix} \left(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}\right) * CRRMW_q - \\ CRRClawbackMW_{q,k,m,t} - \\ CRRCircularSchedulingMW_{q,k,m,t} \end{pmatrix} \end{pmatrix}}$$

And

$$CRRNotionalMW_{p,k,m,t} = \sum_{q \epsilon S_p^{(obl)}} \begin{pmatrix} \left(SF_{q,k,m,t}^{source} - SF_{q,k,m,t}^{sink}\right) * CRRMW_q \\ \end{pmatrix}$$

J.2.3 Offset MW for each option CRR by constraint, by contingency case, by interval is as follows:

$$OffsetMW_{q,k,m,t} = \alpha_{q,k,m,t}^{(opt)} * CFD_{k,m,t}$$

Offset MW for the obligation CRRs for each CRR Owner by constraint, by contingency case, by interval is as follows:

$$OffsetMW_{p,k,m,t} = \alpha_{p,k,m,t}^{(obl)} * CFD_{k,m,t}$$

J.3.0 Output

- Interval CRR Offset Revenue: offset revenue for option or obligation CRRs by constraint, by contingency case, by interval. For obligation CRRs, the value is by CRR Owner.

  Option CRRs:
  $$OffsetRev_{q,k,m,t} = OffsetMW_{q,k,m,t} * \mu_{k,m,t}$$

  Obligation CRRs:
  $$OffsetRev_{p,k,m,t} = OffsetMW_{p,k,m,t} * \mu_{k,m,t}$$

- Interval CRR Notional Revenue: notional value for option or obligation CRRs by constraint, by contingency case, by interval. For obligation CRRs, the value is by CRR Owner.

  Option CRRs:
  $$IntervalCRRNotional\ Revenue_{q,k,m,t} = CRRNotionalMW_{q,k,m,t} * \mu_{k,m,t}$$

Obligation CRRs:
$IntervalCRRNotionalRevenue_{p,k,m,t} = CRRNotionalMW_{p,k,m,t} * \mu_{k,m,t}$

- Interval CRR Clawback Revenue: the amount which has been prorated

  Option CRRs:
  $IntervalCRRClawbackRevenue_{q,k,m,t} = CRRClawbackRevenue_{q,k,m,t}$

  Obligation CRRs
  $IntervalCRRClawbackRevenue_{p,k,m,t} = \sum_{q \in S_{p,obl}} CRRClawbackRevenue_{q,k,m,t}$

- Interval Circular Scheduling Revenue: circular schedule revenue for option or obligation CRRs

  Option CRRs:

  $IntervalCRRCircularSchedulingRevenue_{q,k,m,t} = CRRCircularSchedulingRevenue_{q,k,m,t}$

  Obligation CRRs
  $IntervalCRRClawbackRevenue_{p,k,m,t} = \sum_{q \in S_{p,obl}} CRRCircularSchedulingRevenue_{q,k,m,t}$

- Daily Offset Revenue

  Option CRRs:
  $DailyOffsetRevenue_{q,k,m,d} = \sum_{t=1}^{T} OffsetRev_{q,k,m,t}$

  Obligation CRRs:
  $DailyOffsetRevenue_{p,k,m,d} = \sum_{t=1}^{T} OffsetRev_{p,k,m,t}$

- Daily CRR Clawback Revenue

  Option CRRs:
  $DailyCRRClawbackRevenue_{q,k,m,d} = \sum_{t=1}^{T} Interval\ CRR\ Clawback\ Revenue_{q,k,m,t}$
  Obligation CRRs:

$$DailyCRRClawbackRevenue_{p,k,m,d} = \sum_{t=1}^{T} Interval\ CRR\ Clawback\ Revenue_{p,k,m,t}$$

- Daily Circular Scheduling Revenue

  Option CRRs:
  $$DailyCRRCircularSchedulingRevenue_{q,k,m,t} = \sum_{t=1}^{T} IntervalCircularSchedulingRevenue_{q,k,m,t}$$
  Obligation CRRs:
  $$DailyCRRCircularSchedulingRevenue_{p,k,m,t} = \sum_{t=1}^{T} IntervalCircularSchedulingRevenue_{p,k,m,t}$$

- Daily Notional Revenue

  Option CRRs:

  $$DailyCRRNotionalRevenue_{q,k,m,t} = \sum_{t=1}^{T} IntervalNotionalRevenue_{q,k,m,t}$$
  Obligation CRRs:
  $$DailyCRRNotionalRevenue_{p,k,m,t} = \sum_{t=1}^{T} IntervalNotionalRevenue_{p,k,m,t}$$

Notation:

N: number of nodes on the system indexed by n
T: numbers of IFM intervals indexed by t
K: number of binding constraints in IFM indexed by k
M: number of preventive contingencies indexed by m
Q: number of CRRs indexed by q
P: number of CRR owners indexed by p
$S_p^{(obl)}$: Set of obligation (Hedge Type) CRRs (q) owned by owner p
$S_p^{(opt)}$: Set of option (Hedge Type) CRRs (q) owned by owner p
$\mu_{k,m,t}$: shadow price for constraint k in contingency case m at interval t

J.4 – Normalizing Clawback Data Example

Time interval	CRR ID (q')	Potential Clawback amount	Adjustment factor	Revised $$ amount to be used in 1B (C) x (D)	Shadow Price for constraint per time interval	Clawback MW to be used in 1B (E) / (F)
(A)	(B)	(C)	(D)	(E)	(F)	(G)
1:00	1	$100	0.625	$62.50	$10.00	6.25
1:00	2	-$100	0	$0.00	$10.00	0
1:00	3	$200	0.625	$125.00	$10.00	12.5
2:00	1	-$200	0	$0.00		0
2:00	2	$300	0	$0.00		0
2:00	3	-$200	0	$0.00		0
3:00	1	$200	0.625	$125.00	$12.50	10
3:00	2	-$100	0	$0.00	$12.50	0
3:00	3	$300	0.625	$187.50	$12.50	15

J.5 - Offset Value Greater Than Notional Value

Under certain conditions it is possible for an offset value to be greater than the notional value. These conditions occur rarely, and when they do they are usually on constraints where the total revenue is small.

Normally the calculated IFM value and cleared IFM value are similar, but can be significantly different when:

- The effect of distributed load on the constraint is not captured in the DLAP price, i.e. when the effective DLAP shift factor is less than 2%. This can occur in local areas where the constraint limit is a small value.
- EIM-related flows have a significant effect on the cleared IFM value, for example flowgates located close to a CAISO-EIM entity interface. However, EIM

resources are not settled in the IFM, thus these flows are not captured in the calculated IFM flow.

From a calculation standpoint, this can happen when:

- The calculated IFM value is opposite in sign to the cleared IFM value, indicating that the IFM participants are to be paid, on a net basis. Normally they should be charged.
- The calculated IFM value is either opposite in sign or a greater magnitude than the CRR flow. This indicates that there is not enough revenue from the counterflow CRRs to pay both the IFM participants and the CRRs in the prevailing direction.

For example, use the data below:

IFM cleared Value = 43 MW

Total IFM calculated value = -65.9 MW

Total CRR flow = 16.89

Shadow Price = -7.34

CFD = -82.79

The offset MW for the constraint is the difference between the IFM calculated flow and CRR flow.

This offset MW for the constraint is then multiplied by a factor alpha (different for each SC) and this offset MW for the constraint is distributed amongst all SCs.

In this example, the calculated alpha value is 0.0707. The offset MW for the constraint for the SC would be alpha * Offset MW for the constraint = 0.0707*-82.79 = -5.85 MW

Hence this scenario shows that position flips for the SC for this constraint due to the presence of the base schedule flows in DA market after the introduction of expanded Full network model.

J.5 Example

Following is an illustrative example depicting the hourly level calculation to be done in the new process.

Contingency Case:	1									
FLOWGATE_NAME:	30050_LOSBANOS_500_30055_GATES1 _500_BR_1 _1									
Contingency Case:	Base Case									
shadow price	68									
CRRs										
CRR Owner	**CRR ID**	**SOURCE**	**SINK**	**TOU**	**CRR MW**	**CRR Type**	**Hourly CRR Clawback revenue**	**CRR FLOW**	**CFD_Flag**	
A	**1**	PALOVRDE_ASR-APN	DLAP_PGE-APND	OFF	30	Obligation	$5.00	5.926470588	1	
A	**2**	SUMMIT_ASR-APND	TH_NP15-APND	OFF	300	Obligation	$1.00	-$30.01	1	
A	**3**	MALIN_5_N101	ROUNDMT_2_N101	OFF	200	Option	$0.00	40	1	
A	**4**	ROUNDMT_2_N101	MALIN_5_N101	OFF	200	Option	$0.00	-40	0	
B	**5**	SUMMIT_ASR-APND	DLAP_PGE-APND	OFF	2500	Obligation	$0.00	750	1	
						CRR Flow	765.9117647			
CRR dominate CRRs flow MW										
CRR Owner	**HEDGE TYPE**	**CRR ID**	**CRR Notional MW**	η	α	**OFFSET MW**	**INTERVAL OFFSET REVENUE**	**INTERVAL CRR NOTIONAL REVENUE**	**INTERVAL CLAWBACK REVENUE**	
A	obligation	0	-24.08823529	0	0	0	$0.00	-$1,638.00	$6.00	
A	option	3	40	1	0.050632911	-6.88160834	-$467.95	$2,720.00	$0.00	
A	option	4	-40	0	0	0	$0.00	-$2,720.00	$0.00	
B	obligation	0	750	1	0.949367089	-129.0301564	-$8,774.05	$51,000.00	$0.00	
			CRR PREVAILING FLOW	790		**CRR Payout**	**$42,840.00**			
System Nodes	**NODAL INJECTION**	**shift factors**	**IFM FLOW CONTRIBUTION**	**IFM Congestion RENT**						
PALOVRDE_ASR-APND	500	0.3	150	$10,200.00						
SUMMIT_ASR-APND	700	0.4	280	$19,040.00						
DLAP_PGE-APND	-2700	0.1	-270	-$18,360.00						
TH_NP15-APND	-100	0.5	-50	-$3,400.00						
MALIN_5_N101	1000	0.4	400	$27,200.00						
ROUNDMT_2_N101	600	0.2	120	$8,160.00						
		IFM FLOW	630	$42,840.00						

J.6 – Process to validate CRR Settlements under partial funding approach

Listed below are the steps participants can follow to validate their CRR settlements under the partial funding approach.

The equations below use the following color coding to express which source a CRR holder can use to retrieve the information.

- ***Calculable Value***
- OASIS
- CMRI or Market Modeling Data
- Not Calculable

Notation:
T: numbers of IFM intervals indexed by t
K: number of binding constraints in IFM indexed by k
M: number of preventive contingencies indexed by m
H: CRR Holder
C: Individual CRR

The holder's net CRR flow is the sum of the flows its CRR inventory places on the constraint minus its clawback value on the constraint minus its circular schedule value on the constraint. Netting is not performed across obligations and options so the below calculation will need to be done separately if CRR Holder has both types. In addition CRR options are not netted with other CRR options.

$$NetCRRFlow_{H,k,m,t} = \sum_{c=1}^{CRRInventory_H} [CRRQuantity_c \times (SF^{source}_{c,k,m,t} - SF^{sink}_{c,k,m,t})] - CRRClawback_{H,k,m,t} - CRRCircularSchedules_{H,k,m,t}$$

The holder's net CRR flow can also be calculated using the shadow price:

$$NetCRRFlow_{H,k,m,t} = \frac{Hourly\ Notional\ Revenue - Circular\ Revenue - Clawback\ Revenue}{Shadow\ price}$$

A CRR holder (H) can verify their CRR settlement value per constraint (k,m) per interval (t):

$$CRRSettlementValue_{H,k,m,t} = NetCRRFlow_{H,k,m,t} - Offset_{H,k,m,t}$$

Where the total net flow on the constraint is the total flow placed on the constraint minus the total clawback value on the constraint minus the total circular schedules on the constraint.

If the participant wishes to calculate the notional revenue for a constraint, constraint case, and time interval, they first calculate the notional MW value.

For option CRRs:

$$CRRNotionalMW_{c,k,m,t} = CRRQuantity_c \times (SF^{source}_{c,k,m,t} - SF^{sink}_{c,k,m,t})$$

For obligation CRR portfolios:

$$CRRNotionalMW_{p,k,m,t} = \sum_{c \in S_p^{(obl)}} [CRRQuantity_c \times (SF^{source}_{c,k,m,t} - SF^{sink}_{c,k,m,t})]$$

To convert notional MW to revenue, multiply the MW value by the constraint shadow price. Note, due to signing conventions used in the CAISO software, the final value must be multiplied by -1 for all constraints except for flowgate-type constraints.

If the participant wishes to calculate the offset value for a constraint, constraint case, and time interval, they must first calculate the CFD value for all active CRRs (see section J.2.1.3 for complete formula.) Some of the results of the sub-calculations are provided in OASIS, since the required individual values are not available to the public. Specifically:

- The calculated $\sum_{n=0}^{N} SF_{n,k,m,t} * IFMMW_{n,t}$ is provided as an aggregated value.
- The calculated $\sum_{n=0}^{N} SF_{n,k,m,t} * ClearedMW_{n,t}$ is replaced with the value *Directional Indicator*.
- Clawback MW is provided as an aggregated value.
- Circular Scheduling MW is provided as an aggregated value.

For purposes of shadow settlement, the simplified formula is:

$$CFD_{k,m,t} = IFMMW_{k,m,t} - \sum_{c=0}^{C} CFD\_FLAG_{c,k,m,t} * [(SF^{source}_{c,k,m,t} - SF^{sink}_{c,k,m,t}) * CRRQuantity_c] - CRRClawback_{k,m,t} - CRRCircularSchedules_{k,m,t}$$

where

If hedge_type = 'Obligation'

$$CFD\_Flag_{c,k,m,t} = 1$$

If hedge_type = 'Option' and

$$(SF^{source}_{c,k,m,t} - SF^{sink}_{c,k,m,t}) * CRRQuantity_c * Directional\ Indicator_{k,m,t} > 0$$
$$then\ CFD\_Flag_{c,k,m,t} = 1$$

If hedge_type = 'Option' and

$$(SF^{source}_{c,k,m,t} - SF^{sink}_{c,k,m,t}) * CRRQuantity_c * Directional\ Indicator_{k,m,t} < 0$$
$$then\ CFD\_Flag_{c,k,m,t} = 0$$

Next, they would need to define the binary variables for each option CRR and the aggregate of obligation CRRs by CRR owner (see section J.2.2 for complete formula.) Note, the individual clawback and circular scheduling values are not public data. The equations have been simplified accordingly, with the understanding that in most cases it will not affect the result.

For option CRRs:

$$\eta^{(opt)}_{c,k,m,t} = \begin{Bmatrix} 0 & \text{if } [(SF^{source}_{c,k,m,t} - SF^{sink}_{c,k,m,t}) * CRRQuantity_c] * Directional\ Indicator_{k,m,t} \leq 0 \\ 1 & \text{otherwise} \end{Bmatrix}$$

For obligation CRR portfolios:

$$\eta^{(obl)}_{p,k,m,t} = \begin{Bmatrix} 0 & \text{if } \sum_{c \in S^{(obl)}_p} [(SF^{source}_{c,k,m,t} - SF^{sink}_{c,k,m,t}) * CRRQuantity_c] * Directional\ Indicator_{k,m,t} \leq 0 \\ 1 & \text{otherwise} \end{Bmatrix}$$

Next, they would calculate the alpha value for each of their option CRRs and their portfolio of obligation CRRs (see section J.2.2 for complete formula.) To determine the clawback and circular scheduling MW for each CRR, use the normalization example in section J.4. The individual clawback and circular scheduling MW in the denominator are replaced with the total clawback and circular scheduling MW, available in OASIS.

For option CRRs:

$$\alpha_{c,k,m,t}^{(opt)} = \frac{\eta_{c,k,m,t}^{(opt)} * \begin{pmatrix} \left(SF_{c,k,m,t}^{source} - SF_{c,k,m,t}^{sink}\right) * CRRQuantity_c - \\ CRRClawbackMW_{c,k,m,t} - \\ CRRCircularSchedulingMW_{c,k,m,t} \end{pmatrix}}{\begin{pmatrix} \sum_{p=1}^{P} \sum_{c \epsilon S_p^{(opt)}} \eta_{c,k,m,t}^{(opt)} * \left[\left(SF_{c,k,m,t}^{source} - SF_{c,k,m,t}^{sink}\right) * CRRQuantity_c\right] + \\ \sum_{p=1}^{P} \eta_{p,k,m,t}^{(obl)} \sum_{c \epsilon S_p^{(obl)}} \left[\left(SF_{c,k,m,t}^{source} - SF_{c,k,m,t}^{sink}\right) * CRRQuantity_c\right] \end{pmatrix} - CRRClawback_{k,m,t} - CRRCircularSchedules_{k,m,t}}$$

For obligation CRR portfolios:

$$\alpha_{p,k,m,t}^{(obl)} = \frac{\eta_{p,k,m,t}^{(obl)} \sum_{c \epsilon S_p^{(obl)}} \begin{pmatrix} \left(SF_{c,k,m,t}^{source} - SF_{c,k,m,t}^{sink}\right) * CRRQuantity_c - \\ CRRClawbackMW_{c,k,m,t} - \\ CRRCircularSchedulingMW_{c,k,m,t} \end{pmatrix}}{\begin{pmatrix} \sum_{p=1}^{P} \sum_{c \epsilon S_p^{(opt)}} \eta_{c,k,m,t}^{(opt)} * \left[\left(SF_{c,k,m,t}^{source} - SF_{c,k,m,t}^{sink}\right) * CRRQuantity_c\right] + \\ \sum_{p=1}^{P} \eta_{c,k,m,t}^{(obl)} \sum_{c \epsilon S_p^{(obl)}} \left[\left(SF_{c,k,m,t}^{source} - SF_{c,k,m,t}^{sink}\right) * CRRQuantity_c\right] \end{pmatrix} - CRRClawback_{k,m,t} - CRRCircularSchedules_{k,m,t}}$$

Finally, the offset MW can be calculated from the alpha and CFD values:

For option CRRs:

$$OffsetMW_{c,k,m,t} = \alpha_{c,k,m,t}^{(opt)} * CFD_{k,m,t}$$

For portfolios of obligation CRRs:

$$OffsetMW_{p,k,m,t} = \alpha_{p,k,m,t}^{(obl)} * CFD_{k,m,t}$$

To convert offset MW to revenue, multiply the MW value by the constraint shadow price. Note, due to signing conventions used in the CAISO software, the final value must be multiplied by -1 for all constraints except for flowgate type constraints.

List of data elements needed to validate calculation:

Data Element	Description	Where It Can Be Found
$CRRInventory_H$	CRR Inventory for a CRR Holder	OASIS or CRR MUI
$CRRQuantity_c$	Individual CRR amount for a CRR Holder	OASIS or CRR MUI
$SF_{c,k,m,t}$ For Source	Shift factor at the source location by c,k,m,t	Market Modeling Data

SF $_{c,k,m,t}$ For Sink	Shift factor at the sink location by c,k,m,t	Market Modeling Data
$CRRClawback_{H,k,m,t}$	Clawback adjustment by CRR holder by k,m,t	Calculable from CMRI data
$CRRCircularSchedules_{H,k,m,t}$	Circular adjustment by CRR holder by k,m,t	Calculable from CMRI data
$Offset_{H,k,m,t}$	Adjustment to CRR Holder's Net CRR flow by k,m,t	Calculable from CMRI, OASIS and Market Modeling data
$CRRClawback_{k,m,t}$	Total clawback adjustment for all CRR Holders	OASIS
$CRRCircularSchedules_{k,m,t}$	Total circular schedule adjustments	OASIS
$\alpha_{H,k,m,t}$	CRR Holder's Net CRR flow divided by total Net CRR flow by k,m,t	Calculable from OASIS and Market Modeling Data
$NetCRRFlow_{H,k,m,t}$	Net CRR Flow for a CRR Holder by k,m,t	Calculable from CMRI data
$NetCRRFlow_{k,m,t}$	Net CRR Flow for all CRRs by k,m,t	Calculable from OASIS and Market Modeling Data
$Offset_{k,m,t}$	Adjustment to all CRR Holder's Net CRR flow by k,m,t	Calculable from OASIS and Market Modeling data
Shadow Price	Binding Constraint price	Calculable from OASIS data

Attachment K

Allocation Limit Example Calculations

K. How Annual Sink Upper Bound Limits are Calculated

In the below table we describe the process by which the Sink Upper Bound is determined for the annual allocation process.

ASSET OWNER	MP NAME	SEASON	SINK	TOU	2017 MW	2018 LM MW	2018 LT MW	SINK UPPER BOUND (F - G - H)
1234	CISO	3	DLAP_PGAE-APND	ON	145.715	2.000	0.000	143.715
Tariff Language					Total quantity of Seasonal CRRs allocated to that LSE in the previous annual CRR Allocation; plus the net quantity of load migration CRRs associated with the immediately preceding Seasonal CRR Allocations for the corresponding season, time of use, and CRR sink location	The net MW amount of load migration CRRs valid for each season, time of use period and CRR sink for that year.	Quantity of Long Term CRRs allocated in the immediately preceding Seasonal CRR Allocation for each season, time of use period and CRR Sink	

Method	After all CRRs in the system from the Previous Allocation are cataloged, the CRRs with a market term of "seasonal" or "load migration" and a market name Beginning "LM_AN_" will be the CRRs used to calculate this column. This data contains 3 types of CRRs; LSE_CRRs, LMT_CNT and LSE_LMT. The CRR type LMT_CNT is set to negative. Then Grouping by Season, TOU, Owner_id, source/sink and summed. SLAPs are Summed with the appropriate DLAP.	All cataloged CRRs with the market term of "load migration" with a market term that is effective during the next year are summed by owner, season, TOU and source/sink. SLAPs are summed with the appropriate DLAP	From the initial list of CRRs cataloged the CRRs with a market term of "LT" are with the market name of the Immediately preceeding LT allocation are separated and summed together based on the owner, Season, Source/sink and TOU. SLAPs are summed with the appropriate DLAP	