Business Practice Manual for

Market Instruments

Version 19~~8~~

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Revision History

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19	02-17-2012	PRR 520 to Clarify the CRN report definition. Change made to section 10.1
18	12-08-2011	PRR 486 for Changes to support generated bids and outage reporting for NRS RA resources. Changes made to sections 8.2.1.3 and B.2.3. Added new attachment I. PRR 494 for Changes in support of Flexible Ramping Constraint initiative. Changes made to sections 10.1 and 12.1.
17	10-28-2011	PRR 472 for New OASIS reports - contingency run. Changes made to sections 12.1 and 12.4. PRR 478 for changes to support the 72 hr RUC initiative. Changes made to sections 2.1.3 and 2.1.4. PRR 481 for changes to support the grouping constraints initiative. Change made to section B.2.1. Added new section B.3.
16	09-19-2011	PRR 455 for Changes in support of RDRR initiative. Tariff effective 4/1/12. Changes made to sections 3.2, 5, 5.1.1, 5.1.3, 5.1.4, 5.1.5, 7.1, and Appendix Attachment B sections B.2.2, B.2.5, and B.2.7
15	06-13-2011	PRR 425 for changes to RUC Availability Bids for RA resources. Changes made to sections 3.3 and 7.1 PRR 427 for changes associated with the Ramping Flexibility Nomogram initiative. Change made to section 12.1.
14	05-18-2011	PRR 384 for changes to Open/Isolated Intertie Handling. Inserted new section 8.2.2 and renumbered existing sections 8.2.2 and 8.2.3. Appended new fields to tables described in Attachment B sections B.2.2 and B.2.4. PRR 412 for changes to Bidding and Mitigation of Commitment

Version	Date	Description
		Costs. Changes made to sections 4.1, 5.1.1.1.1, 5.1.1.1.2, 8.2.1.3, and attachment D section D.5.4. Appended new fields to the table described in attachment B section B.2.1.
13	04-07-2011	PRR285 for changes to Attachment C detailing the use and timing of the Gas Price Index for Default Energy Bids.
		PRR381 for changes to Attachment G related to an update in the gas delivery points. Replaced SoCal Border with City Gate.
12	01-28-2011	PRR 341 for changes associated with the Convergence Bidding Initiative.
11	01-05-2011	PRR 357 for changes Attachment G, Section G.2. Updated language associated with the gas transportation rate for SCE and SDG&E.
10	12-06-2010	PRR 278 for changes associated with the Multi-Stage Generation initiative.
		PRR 309 for changes associated with the Transition Components of the Multi-Stage Generation initiative. Attachment H added to BPM for this functionality.
		Miscellaneous changes as defined in PRR 278 attachments.
		PRR 308 for changes to section 5.1.1.1.4 (formerly, this was section 5.1.1.1.3)
9	10-06-2010	PRR 306 Language/Link changes in Sections 10., 11.4, and 12
8	09-14-2010	PRR 282 Clarification Language for Wheeling Through Transactions (Section 3.4.1)
7	08-10-2010	PRR 161 entries for PDR
6	07-14-2010	PRR 217 for Phase 1 Data Release – Transmission Constraints
		Section 12.1 Prices, Section 10.2 added for Transmission Reports in CMRI, Section D1 correction of language for non RMR DEB calculation.
5	03-31-2010	PRR 172 AS HASP Tariff changes, misc terminology reference clean up.)
		PRR for 169 Emergency change Use of the Gas Price Index in Default Energy Bid/ SIBR generated bid and Start Up/ Minimum Load calculations.
4	01-15-2010	Startup/MinLoad revisions based off new Tariff language. Main body for reference to 30 days vs. 6 month, Att. E, and Att. G.(PRR 133)
3	12-31-2009	Standard Capacity Product (SCP) and Day-Ahead AS Must Offer Obligation changes, 2 new OASIS reports, some minor

Version	Date	Description
		edits. (PRR 88)
2	08-11-2009	Master File Update for Appendix B for UI / API interface PRR 38; Replaced MRTU term with California ISO Nodal Market; misc reference (hyperlink) / Rules cleanup. (PRR 38)
1.0	03-27-2009	Initial Posting

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1.   Introduction

Welcome to the CAISO *BPM for Market Instruments*. In this Introduction you will find the following information:

The purpose of the CAISO BPMs

What you can expect from this CAISO BPM

Other CAISO BPMs or documents that provide related or additional information

1.1   Purpose of CAISO Business Practice Manuals

The Business Practice Manuals (BPMs) developed by CAISO are intended to contain implementation detail, consistent with and supported by the CAISO Tariff, including: instructions, rules, procedures, examples, and guidelines for the administration, operation, planning, and accounting requirements of CAISO and the markets. Exhibit 1-1 lists CAISO BPMs.

Exhibit 1-1: CAISO BPMs

Title
BPM for Candidate CRR Holder Registration
BPM for Change Management
BPM for Compliance Monitoring
BPM for Congestion Revenue Rights
BPM for Credit Management
BPM for Definitions & Acronyms
BPM for Managing Full Network Model
BPM for Market Instruments
BPM for Market Operations
BPM for Metering
BPM for Outage Management
BPM for Reliability Requirements
BPM for Rules of Conduct
BPM for Scheduling Coordinator Certification and Termination
BPM for Settlements and Billing
BPM for Transmission Planning Process

1.2   Purpose of this Business Practice Manual

The CAISO *BPM for Market Instruments* describes how Scheduling Coordinators (SCs) submit Bids, including Self-Schedules and Inter-SC Trades to CAISO, the process CAISO uses to validate Bids, including Self-Schedules and Inter-SC Trades, and how SCs access data on accepted Bids, Self-Schedules Inter-SC Trades, and prices.

Although this BPM is primarily concerned with market instruments, there is some overlap with other BPMs. Where appropriate; the reader is directed to the other BPMs for additional information.

The provisions of this BPM are intended to be consistent with the CAISO Tariff. If the provisions of this BPM nevertheless conflict with the CAISO Tariff, the CAISO is bound to operate in accordance with the CAISO Tariff. Any provision of the CAISO Tariff that may have been summarized or repeated in this BPM is only to aid understanding. Even though every effort will be made by CAISO 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 CAISO Tariff.

A reference in this BPM to the CAISO Tariff, a given agreement, any other BPM or instrument, is intended to refer to the CAISO 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   References

Other reference information related to this BPM includes:

 ➢ Other CAISO BPMs
 ➢ CAISO Tariff
 ➢ SIBR Tutorial
Interface Specification for Market Results Services

1.4   Acronyms & Specialized Terms

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

2.   Markets & Market Processes

Welcome to the *Markets & Market Processes* section of the CAISO *BPM for Market Instruments*. In this section you will find the following information:

A high level description of the Day-Ahead and Real-Time Markets

A description of the products and services traded through CAISO

Market bidding timelines and primary activities of CAISO

2.1   Day-Ahead Market Processes

The Day-Ahead Market (DAM) for both virtual and physical Bids closes at 1000 hours on the day before the Trading Day and consists of a sequence of processes that determine the hourly locational marginal prices (LMPs) for Energy and AS, as well as the incremental procurement in Residual Unit Commitment (RUC) while also determining Reliability Must Run (RMR) dispatch levels and mitigating Bids that may be in excess of Local Market Power Mitigation limits. These processes are co-optimized to produce a Day-Ahead Schedule at least cost while meeting local reliability needs.

The LMPs resulting from these processes are used for the Day-Ahead Settlement. The following subsections present an overview of these processes for the Trading Day.

2.1.1   Market Power Mitigation & Reliability Requirements Determination

The Market Power Mitigation and Reliability Requirements Determination (MPM-RRD) function consists of two processes. The MPM is to determine the Bids that are subject to Local Market Power Mitigation based on specified criteria. If the test fails, the MPM mitigates the affected Bids for the relevant Trading Hours of the Trading Day. The RRD function determines the minimal and most efficient schedule of Reliability Must-Run Generation to address local reliability in meeting CAISO Forecast of CAISO Demand for the next Trading Day. The MPM and RRD functions are performed simultaneously prior to the Integrated Forward Market process.

The details of Market Power Mitigation are provided in CAISO Tariff Section 31.2 and its subsections and are described in more detail in the *BPM for Market Operations.*

2.1.2   Integrated Forward Market

The Integrated Forward Market (IFM) is a market for trading Energy and Ancillary Services (AS) for each Trading Hour of the Trading Day. The IFM uses Clean Bids for Energy and AS from

SIBR, (those Bids that have passed the Bid validation and processing procedures), RMR Proxy Bids, and the mitigated Bids to the extent necessary following the MPM and RRD process in order to clear the Supply and Demand Bids and to procure Ancillary Services to meet CAISO's AS requirements at least Bid Costs over the Trading Day.

2.1.3   Residual Unit Commitment

The Residual Unit Commitment (RUC) process is a reliability function for committing resources and procuring RUC capacity not reflected in the Day-Ahead Schedule following the IFM (as Energy or AS capacity), in order to meet the difference between the CAISO Forecast of CAISO Demand (including locational differences) and the Demand reflected in the Day-Ahead Schedules for each Trading Hour of the Trading Day.

Short, Fast, and Medium Start Units in general do not receive a binding commitment instruction in RUC. Units are notified at the end of the DAM if they are selected for RUC. Such resource commitment decisions are determined in the Real Time Market. Commitment instructions are issued closer to the Real-Time Dispatch, based on the unit's Start-Up Time. Long Start Units can receive a binding commitment instruction in RUC. Non-binding commitment instructions for Extremely Long-Start Resources are produced through RUC and are reviewed by the CAISO Operator through the Extremely Long-Start Unit Commitment process. The CAISO Operator will manually confirm and communicate any binding commitment instructions.

2.1.4   Extremely Long-Start Unit Commitment

The commitment of resources that require a start up time of greater than 18 hours or notification earlier than the publication of the Day-Ahead Schedule will be considered in the RUC and the Extremely Long-Start Commitment process. This process will be executed after the completion of the DAM. Bids for ELS units are used for both the current Trading Day and Trading Day D+1. Extra Long Start (ELS) units will receive binding commitment instruction in the Extra Long Commitment (ELC) process. The ELC process is detailed in the *BPM for Market Operations Section 6.8.1*.

It should be noted that current SIBR Rules associated for RA For Long Start Units (that are registered in the Masterfile as Must Offer Obligation) will create bids as necessary for these resources in the DAM.

While the Must-Offer Obligation resource is not obligated to bid, the CAISO inserting bids does not commit or dispatch the long - start resource for RT because as a long start the commitment time would follow outside of the RTM horizon. However, if the resource has self-committed in the Real-Time, then the CAISO believes that having an RA obligation to offer its RA capacity is consistent with RA policy in similar way as how short-start resources are treated because the resource is physically capable of providing its RA capacity.

2.2 Real-Time Processes

The Real-Time Market closes 75 minutes before the beginning of each Trading Hour (which in turn begins at the top of each hour). A sequence of processes determines the LMPs for each Trading Hour. The LMPs resulting from these processes are used for the Real-Time Market settlement.

The following subsections present an overview of these processes for the Trading Hour.

2.2.1 Market Power Mitigation & Reliability Requirements Determination

The MPM-RRD functions for the RTM are analogous to the same functions that are performed for the DAM. For the Real-Time Market the MPM-RRD functions cover the Trading Hour and the resultant mitigated Bids are then used by the remaining Real-Time Market processes.

Mitigation in the DAM is a separate process from RTM mitigation. A Bid mitigated in the DAM is either cleared in the IFM or not. If the mitigated Bid does not clear the IFM, then the pre-IFM Bid Mitigation is not used for any downstream consideration (including RTM).

If an SC wants to submit Bids for Energy into the RTM the SC must submit new Bids to the RTM. The Real-Time mitigation process applies to these new Bids.

2.2.2 Hour-Ahead Scheduling Process

The Hour-Ahead Scheduling Process (HASP) is a process for trading Energy and Ancillary Services based on the Bids submitted into the RTM from Scheduling Points.

HASP is performed immediately after the Real-Time MPM and RRD process. HASP produces: (1) Advisory Schedules for internal Pricing Nodes (PNodes), (2) final and financially binding HASP Intertie Schedules for all Scheduling Points, and (3) HASP AS Awards. HASP Intertie Schedules and HASP AS Awards for the Trading Hour are published approximately 45 minutes before the start of each Trading Hour.

The primary goal of the RTM is to identify supplies to meet the system Demand Forecast and export Schedules. HASP determines HASP Intertie Schedules for hourly pre-dispatched System Resources for the Trading Hour (i.e., between T and T+60 minutes) on an hourly basis instead of on a 15-minute basis. This is accomplished by enforcing constraints that ensure that the HASP Intertie Schedules for the 15-minute intervals are equal. The LMP used to settle these schedules is computed as the average of the four LMPs of the four 15-minute intervals of the Trading Hour.

2.2.3   Short-Term Unit Commitment

The Short-Term Unit Commitment (STUC) is a reliability function for committing Fast and Medium Start Units to meet the CAISO Forecast of CAISO Demand. The STUC function is performed hourly, in conjunction with Real-Time Unit Commitment (RTUC) and looks ahead three hours beyond the Trading Hour, at 15-minute intervals.

2.2.4   Real-Time Unit Commitment

The Real-Time Unit Commitment (RTUC) is a market process for committing Fast and Short Start Units and awarding additional Ancillary Services at 15-minute intervals. The RTUC function runs every 15 minutes and looks ahead in 15-minute intervals spanning the current Trading Hour and next Trading Hour.

2.2.5   Real-Time Economic Dispatch

The Real-Time Economic Dispatch (RTED) is a process that dispatches Imbalance Energy and dispatches Energy from AS and normally runs automatically every five minutes to produce Dispatch Instructions. The following two alternative modes to RTED are invoked under abnormal conditions:

  ➢ Real-Time Contingency Dispatch (RTCD)
     Real-Time Manual Dispatch (RTMD)

2.2.6   Real-Time Contingency Dispatch

The RTCD function executes upon CAISO Operator action, usually following a Generation or transmission system contingency. The RTCD execution is for a single 10-minute interval and includes all Contingency Only Operating Reserves in the optimization process.

2.2.7   Real-Time Manual Dispatch

The RTMD function executes upon CAISO Operator action, usually when RTED and RTCD fail to provide a feasible solution. The RTMD execution has a periodicity of five minutes for a Time Horizon of five minutes.

2.3   Products & Services

This subsection describes the types of products and services that are traded in CAISO Markets.

2.3.1   Energy

Energy can be supplied from the following resources into CAISO Markets:

> ➢ Generating Units
> ➢ System Units
> ➢ Physical Scheduling Plants
> ➢ Participating Loads

System Resources

Virtual Supply and Virtual Demand locations

Energy can be purchased through CAISO Markets only by Scheduling Coordinators to serve:

> ➢ Demand within CAISO Balancing Authority Area

Exports from CAISO Balancing Authority Area

2.3.2   Ancillary Services

The following types of Ancillary Services are traded in CAISO Markets:

Regulation Up, must be synchronized and able to receive AGC signals

Regulation Down, must be synchronized and able to receive AGC signals

Spinning Reserve (must be synchronized, be available in 10 minutes, and be maintainable for two hours) [1]

Non-Spinning Reserve (must be able to deliver the AS Award within 10 minutes and be maintainable for two hours)

2.3.3   Residual Unit Commitment Capacity

Residual Unit Commitment (RUC) Capacity is the positive difference between the RUC Schedule and the greater of the Day-Ahead Schedule and the Minimum Load level of a resource. The price and availability of this type of capacity depends on the RUC Availability Bids and the optimized RUC Awards.

The RUC Schedule is the total MW per hour amount of capacity committed through the RUC process, including the MW per hour amount committed in the Day-Ahead Schedule.

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[1] The two-hour requirement is specified in CAISO Tariff Section 8.4.3(a), Ancillary Service Capability Standards.

2.3.4   Congestion Revenue Rights

Congestion Revenue Rights (CRRs) are financial instruments that may be used by their holders to offset the possible Congestion Charges that may arise in the Day-Ahead Markets for Energy. CRRs are obligations, which may also require their holders to pay Congestion Charges. CRRs are settled based on the Marginal Cost of Congestion component of LMPs derived through IFM.

The *BPM for Congestion Revenue Rights* describes these rights in greater detail.

2.4   Market Interfaces

CAISO's portal provides a framework in which to deploy the User Interfaces (UIs) of CAISO's business applications. The portal allows SCs to access multiple CAISO business applications using a single point of entry and a single digital certificate.

The following CAISO business applications are accessible through the portal:

> ➢ SIBR
> ➢ CMRI
> ➢ CRR
> ➢ BAPI
> ➢ SLIC

OASIS (Available but does not require a digital certificate, public information)

SCs interact with CAISO Markets through market interfaces. These market interfaces are described in more detail below.

2.4.1   SIBR

The Scheduling Infrastructure and Business Rules (SIBR) system performs the following tasks:

Provides an SC interface to submit Bids and Inter-SC Trades (IST)

Accepts Bids and IST for Energy, Ancillary Services, and other Energy related products and services (e.g., IFM Load Uplift Obligation) from SCs that are certified to interact with CAISO

Applies business rules to validate and process submitted Bids and IST to ensure that those Bids and IST are valid and modifies Bids for correctness where necessary

Applies business rules to generate DAM and RTM Bids for resources under the Resource Adequacy requirements and RTM Bids for resources with Day-Ahead Ancillary Services or RUC

Awards, if these resources do not have valid Bids and RTM Bids used in the STUC process in RTM for the extended time horizon. Refer to section 7.7 of the Market Operations BPM.

Provides SCs information about their Bid and IST validation, modification, and Bid generation

Forwards the final Clean Bids and IST to the relevant CAISO Market

Provides short-term data storage and reports

The details of submitting Bids into SIBR are describe in Section 5 (Energy Bids), Section 6 (Ancillary Services Bids), and Section 7 (RUC Availability Bids).

2.4.2   CAISO Market Results Interface

The CAISO Market Results Interface (CMRI) is accessible through the CAISO portal and is the screen through which SCs retrieve proprietary market results, such as DAM Energy Schedules, AS Awards, and RUC Awards. The CMRI supports various reporting functions to facilitate this data retrieval. The details of the reports available through the CMRI are described in detail in Section 10 (Reporting Information).

2.4.3   Master File

The Master File (MF) database is used by CAISO to store the necessary business information and operational data of CAISO's Market Participants.

MF data includes common information necessary to process scheduling and settlement transactions with the Market Participants and is shared among the CAISO's business systems.

2.4.4   Automated Dispatch System (Not accessed through Portal)

Automated Dispatch System (ADS) communicates Real-Time commitment and Dispatch Instructions, and Real-Time AS Awards to SCs. The details of the reports provided by ADS are described in detail in Section 11 (Dispatch Information).

2.4.5   Scheduling & Logging of Outages

The SLIC application is the primary method of communicating Outage Management related requests, information updates, approvals, rejections, etc. The SLIC application provides an automated mechanism for MPs and CAISO to communicate the information required for all aspects of Outage Management from submittal of requests under the Long Range Plan process timing, to requesting and receiving an extension to an Approved Maintenance Outage.

Using SLIC, a Participating TO or Participating Generator or others can perform the following functions:

Submit a request for a new Outage

Receive confirmation of receipt of request from CAISO Outage Coordination Office

Obtain status of an Outage request

Enter Outage Cause Codes (NERC GADS, reason for Outage)

Update an Outage

Change PMin and Ramp Rates

Unit Substitution request

Search database of completed, scheduled or active Outages. This function allows the MP to review only their data and not the data of other MPs.

The details of SLIC operation are provided in the CAISO *BPM for Outage Management*.

2.4.6   Open Access Same Time Information System

The Open Access Same time Information System (OASIS) provides a web interface for Market Participants to retrieve Public Market Information, such as CAISO Forecast of CAISO Demand, AS requirements, aggregate Schedules, transmission Intertie limits and flows, LMPs, ASMPs (by AS Region), etc. The details of OASIS are provided in Section 12 (Public Market Information).

2.4.7   Business Associate Portal Interface

Business Associate Portal Interface (BAPI) allows access to settlement transaction data including statements, invoices, charge type configurations and historical settlement data through this interface. The details of this process are covered in detail in the CAISO *BPM for Settlements and Billing*.

2.4.8   Congestion Revenue Rights Auction System & Secondary Registration System

The details of the Congestion Revenue Rights Auction system and Secondary Registration System are provided in the CAISO *BPM for Congestion Revenue Rights*.

3.   Overview of Market Instruments

Welcome to the *Overview of Market Instruments* section of the CAISO *BPM for Market Instruments*. In this section you will find the following information:

Definition of market instruments

A brief overview of the types of market instruments available in CAISO Markets. The details of the market instruments, and how they operate are provided in the following sections

Market instruments include Bids, Self-Schedules and Inter-SC Trades (ISTs). A Bid is, in essence, an offer to buy or sell Energy (for Virtual Supply and Virtual Demand Bids, Energy is the only product that is applicable), RUC Availability or Ancillary Services, including Self-Schedules, submitted by Scheduling Coordinators. A Bid in CAISO SIBR system contains all Bid products, services, and Bid components being offered to a specified CAISO Market from a resource. An IST is a transaction between two SCs that is facilitated in CAISO settlement process.

Economic Bids specify prices for MWh amounts of Energy offered. Self-Schedules do not have any prices associated with MWh.

Another market instrument available through CAISO Markets is the CRR. Details about the CRR allocation, auction, and settlement provisions are covered in detail in the CAISO *BPM for Congestion Revenue Rights*.

3.1   Energy Bids

In order to participate in CAISO Energy Markets, SCs must submit Energy Bids. Energy Bids comprise both Economic Bids and Self-Schedules. These Bids can be either Supply Bids or Demand Bids.

There are two categories of Bid components – daily components that are constant across the Trading Day and hourly components that can vary by Trading Hour. The details of these Bid components are described in Section 4 (Bid Requirements).

SCs may submit Bids to the DAM beginning seven days prior to the Trading Day and up until 1000 hours the day prior to the Trading Day. SCs may submit Real-Time Market Bids beginning when the Day-Ahead Schedules are published at 1300 hours the day prior to the Trading Day and up until 75 minutes prior to the start of the relevant Trading Hour.

Bids submitted to the DAM apply to the 24 hours of the next Trading Day and are used in both the IFM and the RUC process. Bids submitted to the RTM apply to a single Trading Hour and are used in both the HASP and the RTM. SCs who wish to participate in the HASP submit those eligible Bid components as part of their RTM Bids. [2]

The bidding rules for both the DAM and the RTM are described in detail in Section 5 (Energy Bids).

3.1.2   Virtual Bids

Virtual Energy Bids are Economic Bids and do not include Self-Schedules. These Bids can be at any Eligible PNode, or Eligible Aggregated PNode location and be a Virtual Supply Bid and/or Virtual Demand Bid at that location.

Virtual Bids exist in the DAM only, SCs may submit Virtual Demand or Virtual Supply Bids to the DAM beginning seven days prior to the Trading Day and up until 1000 hours the day prior to the Trading Day, this is the same process established for the physical Bids.

3.2   Ancillary Services Bids

Four types of Ancillary Services are used by CAISO in its markets – Regulation Up, Regulation Down, Spinning Reserve, and Non-Spinning Reserve. For Metered Sub-Systems (MSS) Load Following Up/Down is also handled through submission of Bids for Ancillary Service. Participating Generators and Dynamic System Resources are eligible to provide all Ancillary Services for which they are certified. Certified Non-Dynamic System Resources are eligible to provide Operating Reserves (Spinning Reserves and Non-Spinning Reserves) only[3]. Registered Proxy Demand Resources and Certified Participating Loads are only eligible to provide Non-Spinning Reserve. Reliability Demand Response Resources are not eligible to provide Ancillary Services.

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[2] CAISO does not accept bids for the next Trading Day between the time of Market Close at 1000 hours and the publication of the DAM results at 1300 hours.

[3] Dynamic Resource-Specific System Resources are identified generating resources located outside of the CAISO Balancing Authority Area that can be dynamically controlled to maintain the frequency and net Interchange of the CAISO Balancing Authority Area. These Dynamic Resource Specific System Resources may be certified to supply Regulation Up and Regulation Down to the CAISO. A Non-Dynamic Resource-Specific System Resource is an identified generating resource located outside of the CAISO Balancing Authority Area that cannot be dynamically controlled. Dynamic and Non-Dynamic System Resources are System Resources which are not tied to specific generating resources, and which are subject to dynamic control (Dynamic System Resources) or not subject to dynamic control (Non-Dynamic System Resources).

SCs that wish to provide Ancillary Services to CAISO may either submit Ancillary Services Bids or Self-Provide Ancillary Services. A Bid to supply Ancillary Services specifies prices for MW amounts of each Ancillary Service to be supplied. A Submission to Self-Provide Ancillary Services is not a Bid. CAISO's acceptance of Self-Provided Ancillary Services occur prior to Ancillary Service Bid evaluation in the relevant market.

SCs submit Bids for AS in both the DAM and the RTM. Bids for AS in the RTM are submitted incrementally from any DAM AS Awards. DAM AS Awards are binding commitments and cannot be reduced in RTM (with the exception of a reduction in available capacity as notified through SLIC).

Any Self-Provided AS are used to reduce the AS Obligation for the SC that Self-Provided those AS. Details of this are provided in the *BPM for Settlements and Billing*.

Any Self-provided AS in excess of an SC's Obligation are credited at the user rate for the respective AS. The *BPM for Market Operations* specifies how the market prices for AS is determined.

The bidding rules for Ancillary Services are described in detail in Section 6 (Ancillary Services Bids).

3.3   Residual Unit Commitment Availability Bids

SCs may submit RUC Availability Bids on behalf of eligible capacity that is not subject to a RUC obligation. See section 6.7.2.6 of the BPM for Market Operations. SCs with eligible capacity that is subject to a RUC obligation have no bidding requirement as the RUC obligated capacity will be optimized automatically using a $0/MW per hour RUC Availability Bid.

Upon publication of the DAM results, the CAISO notifies SCs of any RUC Awards (through CMRI). RUC Availability payments are based on RUC selection, irrespective of whether the Generating Unit is required to Start-Up or not. A Generating Unit receives a Start-Up instruction at the appropriate time. If the CAISO instructs a Generating Unit subject to a RUC Award to Start-Up, the unit is eligible for RUC Cost Compensation, which includes Start-Up and Minimum Load Cost compensation, and Bid Cost Recovery, in addition to the RUC Availability payment. For RUC Availability Bids details see Section 7 (Residual Unit Commitment Availability Bids) and attachment A (Bid Validation Rules).

The RUC Award is the portion of the RUC Capacity that is not subject to an RMR Dispatch and is not RA Capacity. RUC Capacity is the portion of the RUC Schedule excluding the minimum load and any DA Energy Schedule. RUC Capacity that is subject to an RMR Dispatch and RA Capacity are not entitled to RUC Availability payments. RUC Award is entitled to RUC

Availability payment regardless of its Start-up time. In other words, RUC Awards from Short Start or Fast Start units are entitled to RUC Availability payment. This is based on CAISO Tariff Section 31.5.6, Eligibility for RUC Compensation.

3.4   Import & Export Bids

An Import Bid is a Supply Bid at a Scheduling Point. An Export Bid is a Demand Bid at a Scheduling Point. Both Import Bids and Export Bids must be submitted with positive MW values. As in the case of all Bids, Import and Export Bids must include a Resource Location. The resource Location is the resource ID for a Generating Unit, System Unit, Participating Load or System Resource registered in the Master File. The CAISO will assign separate Resource IDs to SCs for submitting Import Bids and Export Bids at specific Scheduling Points. These Import and Export resource IDs will be maintained in the Master File. SCs must request the CAISO to assign unique Resource Ids which will be used to nominate: Scheduling Point, Energy type, and direction of flow (e.g., Import and Export). In addition, if the SC desires separate Settlement treatment for each transaction submitted at the same Scheduling Point, the SC must use a separate resource ID. Accordingly, each SC must request sufficient resource IDs to meet its business needs. Import Bids and Supply Bids are in all other respects subject to the bidding requirements set forth in Sections 4, 5, 6, and 7 of this BPM.

3.4.1   Wheeling Through Transactions

A Wheeling Through transaction consists of an Export Bid and an Import Bid submitted as either Self-Schedules or Economic Bids and which utilizes the same Wheeling reference. The Wheeling reference is a unique Wheeling identifier registered in the Master File.

If a Wheeling Through transaction does not have a matching Wheeling reference that links the Import Bid to the Export Bid by the time the DA Market closes, SIBR will remove the Wheeling Bid Component that includes the Wheeling reference and all other hourly Bid Components for that Trading Hour such as any Self Schedule (ETC/TOR/PT/LPT) or Energy. This will make the bid invalid for the DA Market. For RTM Bids the same conditions apply.

SIBR will accept Wheeling Through transactions that do not have a matching MW quantity in the Export Bid and Import Bid. The balancing of Wheeling MW quantities is managed by the IFM or RTM during optimization. Please refer to the Market Operations BPM for information concerning how the IFM and RTM treat unbalanced MW quantities of a Wheeling Through transaction.

Wheeling Through transactions submitted in the DAM result, if accepted, in a Day Ahead Schedule.   In order to preserve the wheel, the Wheel Through transaction must be resubmitted in the RTM as a wheel. (Section 6. Day Ahead Market Processes and Section 7. Real-Time Market Processes.)

The CAISO business rule validations that apply to Wheeling Through transactions are summarized in section 8.2.

3.4.2   IBAA Imports Marginal Losses Adjustment Eligibility

For import schedules to the CAISO Balancing Authority Area that use the southern terminus of the California-Oregon Transmission Project (COTP) at the Tracy substation and pay the Western Area Power Administration (Western) or Transmission Agency of Northern California (TANC) for line losses, the CAISO will replace the marginal cost of losses of the applicable default LMP that applies to such IBAA transactions. Scheduling Coordinators (SCs) need to establish system resource IDs to submit bids, including self-schedules, to establish schedules that are eligible for this loss adjustment consistent with the CAISO Tariff. Prior to obtaining these system resource IDs, SCs need to certify to use these IDs for bids, including self-schedules, that only originate from transactions that use the COTP and pay Western or TANC for losses. A self-certification form is available on the CAISO website: http://www.caiso.com/docs/2005/10/05/2005100520241822328.html.   By actually using such system resource IDs, the SC represents that covered transactions use the COTP and pay Western or TANC for line losses. Schedules and dispatches settled under such resource IDs shall be subject to a default IBAA LMP for imports that accounts for the marginal cost of losses as if an actual physical generation facility exists at the southern terminus of COTP at the 500 kV Tracy scheduling point rather than the marginal cost of losses specified in CAISO Tariff Section 27.5.3.

3.5   Inter-SC Trades

CAISO facilitates Inter-SC Trades (ISTs) of Energy, Ancillary Services, and IFM Load Uplift Obligation through the settlement process. ISTs do not have any impact on the scheduling or dispatch of resources. They affect only the financial settlement process. Only trades that SCs want to settle through CAISO are submitted in the IST process. All other trades are settled bilaterally between individual SCs. There is no limit on the number of ISTs each SC may participate in.

ISTs for the Day-Ahead Market may be submitted beginning seven days prior to the Trading Day up to 12:00 hours (HE 12) the day prior to the Trading Day. ISTs for the Real-Time Market may be submitted beginning at 00:00 hours the day prior to the Trading Hour up to 45 minute prior to the Trading Hour.

Inter-SC Trades in the RTM are submitted incrementally to the DAM Inter-SC Trades.

3.5.1   Inter-SC Trades of Energy

The role of Inter-SC Trades (IST) of Energy is to facilitate contractual deliver and settlement of bilateral power purchase contracts. Inter-SC Trades are a settlement service that the CAISO offers to parties of bilateral contracts as a means to offset CAISO settlements charges against the bilateral contractual payment responsibilities. CAISO facilitates Inter-SC Trades of Energy through the settlement process. An IST of Energy consists of a quantity in MWs traded between two SCs for a specific Trading Hour at a specific location. There are two types of ISTs:

Physical Trades (PHY) – where the Inter-SC Trade is backed by a physical resource (applies to Generating Units only). There is no limit on the number of PHY ISTs in which an SC can participate. The SC for the physical resource that supports the PHY can submit a Bid, including a Self-Schedule Bid into the relevant market. In the event that sufficient Generation is not scheduled to meet the quantity of the PHY IST, the difference is converted to a Converted Physical Trade (CPT) and settled at the relevant Trading Hub price.

ISTs at Aggregated Pricing Nodes that are also defined Trading Hubs or LAPs (APN) – where the IST is not backed by a physical resource. SC's may participate in one APN IST per SC counterparty at each APN Location, that is either a defined Trading Hub or LAP, per Trading Hour. For example, there can only be one IST per hour between SC1 and SC 2 at the Existing Generation Zone Trading Hub NP15. The CAISO will facilitate ISTs (APN) only at Existing Zone Generation Trading Hubs and Default LAPs.

3.5.2   Inter-SC Trades of Ancillary Services

CAISO also facilitates ISTs of Ancillary Services obligation, i.e., the obligation to pay AS Charges for the amount of Demand represented by the SC. There are four types of AS that SCs can trade:

> ➢ Regulation Up
> ➢ Regulation Down
> ➢ Spinning Reserve

Non-Spinning Reserve

An IST of AS consists of a quantity in MWs traded between two SCs for a specific Trading Hour and for a specific Ancillary Service type[4]. The IST of AS is a trade of the obligation to pay CAISO charges for Ancillary Services. CAISO settles with the two parties to the trade based on the quantity of the AS Obligation traded times the user rate for the AS Inter-SC Trades for the specific Trading Hour. Once the SC responsible for the Demand has traded its AS obligation,

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[4] Since CAISO charges a single system wide tariff for each AS, specification of a location for AS ISTs is not required.

the SC to which the obligation has been traded may meet that obligation with Self-Provided AS or purchasing AS from CAISO.

Since CAISO charges a single user rate for each AS per hour, separate ISTs for AS are not required for both the DAM and the RTM. Hence, SCs may submit ISTs for Ancillary Services only in RTM beginning 0000 hours of the day prior to the Trading Day and up to 45 minutes prior to the Trading Hour. This is based on CAISO Tariff Sections 28.2.3, 28.2.2 and 6.5.4.1.2.

3.5.3   Inter-SC Trades of IFM Load Uplift Obligation

CAISO facilitates ISTs of the IFM Load Uplift Obligation[5] between SCs. Inter-SC Trades of IFM Load Uplift Obligation enable a SC to transfer any amount of the IFM Load Uplift Obligation (MW) to another SC. An IST of IFM Load Uplift Obligation consists of a quantity in MWs traded between two SCs for a specific Trading Hour of the IFM.

Since CAISO charges a single user rate for IFM Load Uplift Obligation per hour, separate ISTs for IFM Load Uplift Obligation are not required for both the DAM and the RTM. Hence, SCs submit ISTs only in the RTM for IFM Load Uplift Obligation beginning 0000 hours of the day prior to the Trading Day, up to 45 minutes prior to the Trading Hour. Trades of IFM Load Uplift Obligation are not location specific, since CAISO calculates a system-wide user rate for this charge. This is based on CAISO Tariff Sections 28.2.3, 28.2.2 and 6.5.4.1.2.

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[5] IFM Load Uplift Obligation is calculated net of the cost of AS.

4.   Bid Requirements

Welcome to the *Bid Requirements* section of the CAISO *BPM for Market Instruments.* In this section you will find the following information:

A list of the Bid components that are constant across a Trading Day

A list of the Bid components that can change hourly

Day-Ahead Bids and Self-Schedules include information on each of the 24 Trading Hours in the Trading Day. Some Bid components are constant for the Trading Day, while other components can vary from hour to hour. Exhibit 4-1 shows which Bid components are constant across the Trading Day – referred to in the exhibit as Daily Requirements – and those that can change hourly – Hourly Requirements.

4.1   Daily & Hourly Bid Components

This section is based on CAISO Tariff Section 30.4 Election for Start-Up and Minimum Load Costs and Section 39.6.1.6. (Start-Up and Minimum Load Costs are not applicable to Virtual Bids).

Bid components are divided into two categories:

Daily Bid components – These Bid components are constant across all Trading Hours in a Trading Day and do not change for that Trading Day.

Hourly Bid components – These Bid components can vary in each Trading Hour of the Trading Day.

With the exception of three Bid components (Start-Up, Minimum Load and Transition Costs), all Bid components can vary each day, and are submitted by SCs as part of their DAM and RTM Bids. For Start-Up and Minimum Load Bid components, the SC selects one of two alternatives: Registered Cost or Proxy Cost. The elections are independent; that is, a Scheduling Coordinator electing either the Proxy Cost option or Registered Cost option for Start-Up Costs may make a different election for Minimum Load Costs. The Start-Up and Minimum Load Bid components are constant for each Trading Day for the period submitted.

If Registered Cost is selected for Start-Up and/ or Minimum Load, the SC submits information for Start-Up and/ or Minimum Load respectively to CAISO for entry into the Master File. Subject

to the applicable cap, these values can be updated every 30 days through the Master File Update process that is described in Attachment B. Start-Up and Minimum Load Costs under the Registered Cost Option may not exceed 200 percent of the unit's Projected Proxy Cost for Start-Up and Minimum Load Costs. If the SC selects the Registered Cost Option, the values will be fixed for 30 days unless the resources costs, as calculated pursuant to the Proxy Cost option, exceed the Registered Cost option, in which case the SC may switch to the Proxy Cost option for the balance of the 30 day period. (see Attachment G for details).

If the Proxy Cost option is selected, the Start-Up and Minimum Load Bid components are calculated daily for each Generating Unit based on the daily gas price and includes, in addition, auxiliary power costs (for Start-Up) and O&M costs (Minimum Load adder $2 or $4, depending on the resource; the adder is a value registered in the Master File). The process that CAISO uses to calculate the daily gas price is shown in Attachment C, and there is an example in section 8.2.1.2 for a Generated Bid. The SC is also allowed to submit a Start-Up and/or Minimum Load Cost Bid as part of a generator's Bid in the Day-Ahead Market (DAM) as long as the SC elected the Proxy Cost option for them and the submitted Bid is not negative and is less than or equal to the proxy cost calculated using the daily Gas Price Index.

Transition Cost will be calculated as the product of the Transition Fuel and the Daily Gas Price Index associated with the resource. This will be the same for all Multi-Stage Generating Resources regardless of the resource's elected Cost option.

The details of the Bid components are described in subsequent sections.

Exhibit 4-1: Daily & Hourly Bid Components

	Daily Components	**Hourly Components**	**Submitted through SIBR**	**Comment**
Start-Up	✔		**Yes, only if proxy cost option is currently effective for Start-Up Cost in Master File.**	If the resource has elected to use Registered Cost, the Start-Up cost used is that registered in the Master File. If the resource has elected the Proxy Cost option, the SC can submit a Start-Up Cost through SIBR. SIBR would use the submitted Start-up cost if it is not negative and is less than or equal to the Start-Up Cost calculated based

	Daily Components	Hourly Components	Submitted through SIBR	Comment
				on daily gas prices.
Minimum Load	✔		**Yes, only if Proxy Cost option is currently effective for Minimum Load Cost in Master File.**	If the resource has elected to use Registered Cost, the Minimum Load cost used is that registered in the Master File. If the resource has elected the Proxy Cost option, the SC can submit a Minimum Load Cost through SIBR. SIBR would use the submitted Minimum Load Cost if it is not negative and is less than or equal to the Minimum Load is calculated based on gas daily prices.
Transition Costs	✔		**No, these values are calculated using Transition Fuel and Daily Gas Price Index.**	For a Multi-Stage Generating Resources, the dollar cost per feasible transition associated with moving from one online configuration to another. The calculation is the same for all MSG regardless of the Cost option.
Energy Bid Curve		✔	✔	
Self-Schedule		✔	✔	
Ancillary Services				Bid cannot contain more than certified quantities for each service.
Regulation Down		✔	✔	
Regulation Up		✔	✔	
Spinning Reserve		✔	✔	
Non-Spinning Reserve		✔	✔	
Ramp Rate	✔		✔	Bid by SC, within limits of the minimum and maximum Ramp Rates

	Daily Components	Hourly Components	Submitted through SIBR	Comment
				in the Master File.
Operational Ramp Rate	✔		✔	
Operating Reserve Ramp Rate	✔		✔	
Regulation Ramp Rate	✔		✔	
Contingency Dispatch Indicator	✔		✔	Must be selected if any AS is part of the Bid/Schedule.
Intertie Minimum Hourly Block		✔	✔	If no Minimum Hourly Block is set, it defaults to 1.
Pump Shut-Down Cost		✔	✔	
Pumping Cost		✔	✔	
Energy Limit (Maximum and Minimum Daily)	✔		✔	
RUC		✔	✔	
Capacity Limit Indicator		✔	✔	Indicator for IFM/RUC to limit Capacity to RUC
Distribution Factors		✔	✔	These apply to Generating Units only. Generation Distribution Factors are provided on a per-unit basis. SC may submit through SIBR. If none are provided through SIBR, CAISO will use Generation Distribution Factors (GDF) from the GDF Library based on historical generation pattern.

5. Energy Bids

Welcome to the Energy Bids section of the CAISO BPM for Market Instruments. In this section you will find the following information:

A general description of the Energy Bid components

A description of the Bid requirements for Supply Bids

A description of the Bid requirements for Demand Bids

For physical Bids SCs submit Energy Bids to participate in CAISO Markets for Energy. Bids are submitted by SCs for each market (DAM and RTM) for the resources associated with each SC. SCs submit Bids for each resource. A single Energy Bid can include both Economic Bid components and Self-Schedule components, as shown in Exhibit 5-1, as well as operational information that applies to the entire range of Economic Bid components and Self-Schedule components. Exhibit 5-1 shows a Bid that contains a Self-Schedule of 20 MW, and an Economic Bid of 80MW.

For Virtual Bids at a location SCs must submit in the DAM with an Energy Bid which will only contain the Economic Bid Components.

Exhibit 5-1: Example of Energy Bid with Self-Schedule & Economic Bid Components
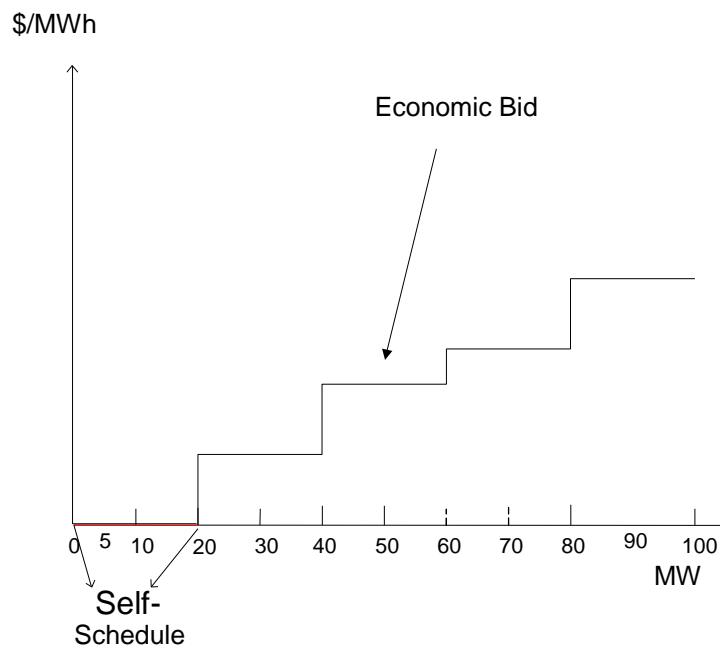
SCs submit Energy Bids for the following types of resources:

Generating Unit – Bids for certain types of Generating Units have additional Bid validation requirements. These include: Physical Scheduling Plant, a Pumped-Storage Hydro Unit, a System Unit, a Generating Unit fueled by natural gas a Fast-Start Unit, and Multi-Stage Generating Resources (MSG). In addition there are resources that are modeled like a Generating Unit (i.e. Inter-Tie Generators or Dynamic Resource-Specific Generating Resources, Proxy Demand Resources, and Reliability Demand Response Resources) that are also subject to the bidding rules associated to Generating Units.

Export Resource – Demand at a Scheduling Point.

System Resource (an Import Resource) – can be registered as firm, non-firm, wheeling, a Dynamic System Resource, or unit contingent.

Participating Load – Load that has executed a Participating Load Agreement, including Pumping Load.

Non-Participating Load – Load that has not executed a Participating Load Agreement, internal to the CAISO Balancing Authority Area and cannot submit Bids for Ancillary Services.

Multi-Stage Generating Resources - Consistent with the rules in the CAISO Tariff, Generating Units and Dynamic Resource-Specific System Resources can be modeled and participate in the CAISO Markets as MSGs.

Virtual Resources—Virtual Supply or Virtual Demand Bids at a given Eligible PNode or Eligible Aggregated PNode.

The following sections describe the details associated with different components of the Energy Bids.

5.1   Supply Bids

(The content of this section is based on CAISO Tariff Section 30.5.2, Supply Bids)

Physical Supply Bids can be both Economic Bids for Supply and Self-Schedule Bids for Supply. The same resource can submit both Economic and Self-Schedule Bids for Supply for the same Trading Hour. Virtual Supply Bids will be Economic Bids only. Supply Bids can be submitted in the IFM for one or more Trading Hours of the Trading Day and may be submitted no earlier than seven days prior to the Trading Day and no later than 1000 hours on the day preceding the Trading Day. Scheduling Coordinators submitting these Bid components for a Multi-Stage Generating Resource must do so at the registered MSG Configuration level and not at the Generating Unit or Dynamic Resource-Specific System Resources. Scheduling Coordinators must utilize the MSG Configuration ID for this purpose.

Scheduling Coordinators may register the number of Multi-Stage Generating Resource configurations as are reasonably appropriate for the unit based on the operating characteristics of the unit, which may not, however, exceed a total of ten configurations and cannot be fewer than two configurations.

There may be multiple MSG Configurations in a single bid, but each MSG Configuration must be submitted under the single MSG Configuration ID.

Each Energy Supply Bid is uniquely identified by:

Scheduling Coordinator ID – This is the identification of the SC that submits the Bid. (For Virtual Bids the Scheduling Coordinator must be associated to a single Convergence Bidding Entity)

Market Type – Either DAM or RTM. (DAM only for Virtual Supply Bids)

Bid period – Identifies the specific CAISO Market for which the Bid applies. For a DAM Bid, the Bid period is the specific Trading Day. The Bid in the DAM is considered to be for a 24 hour period but any Bid component that is designated as hourly can differ for each hour. For a RTM Bid, the Bid is for a specific Trading Hour.

Resource ID – Identifies the resource. It must be a valid resource associated with the SC specified in the Bid. In order to participate in CAISO Markets, the resource must be certified. This is described in more detail in the *BPM for Scheduling Coordinator Certification and Decertification.*

Configuration ID (MSG resources only) - and Multi-Stage Generating Resource configuration ID as applicable.

Location - Eligible PNode or Eligible Aggregated PNode for Virtual Supply Bids.

5.1.1   Day-Ahead Economic Bids for Supply

Day-Ahead Economic Bids for Supply must include two types of information that the SCs submit to CAISO:

> ➢ Financial Information (detailed in Section 5.1.1.1 below)
> Operating Information (detailed in Section 5.1.1.2 below)

5.1.1.1   Financial Information

Financial information includes the cost components of Bids, and any associated operating limitations.

5.1.1.1.1 Start-Up Component

This Bid component applies only to Generating Units (and to Dynamic and Non-Dynamic Resource-Specific System Resources, Proxy Demand Resources, and Reliability Demand Response Resources, which are modeled in the same way as Generating Units). Start-Up component contains:

Start-Up Time – The Start-Up Time is a staircase curve with up to three segments reflecting the conditions for Start-Up (Warm, Intermediate and Cold). The Start-Up Time (expressed in minutes) is expressed as a function of Cooling Time (expressed in minutes) and can range from zero to infinity. **(CAISO inserts registered Master File Data).**

Start-Up Cost – The Start-Up Cost is a staircase curve with up to three segments reflecting the conditions for Start-Up (Warm, Intermediate and Cold). Start-Up Cost is expressed in $, as a function of Cooling Time (in minutes) and can range from zero to infinity.[6] The value used for Start-Up Cost is determined as follows:

> If the SC has elected the Registered Cost option for Start-Up Cost and the SC submits registered value, CAISO overwrites any submitted Bid component with the Start-Up Cost data from the Master File. Under this option, the registered value can be changed every 30 days through the Master File change process.

> If the SC has elected the Proxy Cost option for the Start-Up Cost, the CAISO calculates this value daily using the daily Gas Price Index.   In addition, SCs may include   Start-Up Cost Bids into their DAM Bid submissions as long as the Start-Up Cost value is not negative and is less than or equal to the Start-Up Cost value calculated using the daily Gas Price Index . If the SC does not submit a Start-Up Cost Bid or when the submitted Start-Up Cost Bid is greater than the calculated Start-Up Cost, the CAISO uses the Start-Up Cost calculated using the daily Gas Price Index. The process used by CAISO to calculate the daily Gas Price Index is described in Attachment C.

Example of Start-Up Bid Component

	Cooling Time (Minutes)	Start-Up Time (Minutes)	Start-Up Cost ($)
Warm	0	600	6,500
Intermediate	240	1390	9,800
Cold	480	1400	12,000

The Start-Up Cost component is a daily Bid component so a single set of values are used for the entire Trading Day in both the DAM and the RTM.

If the SC has selected Registered Cost option for the Start-Up Cost, this value can be changed every 30 days through the Master File change process. The process used by CAISO to calculate the daily Gas Price Index is described in Attachment C. Whenever the Start-Up Cost submitted by the SC is overwritten, the CAISO notifies the SC that the daily Bid Start-Up Cost has been overwritten by the default values when the Bid confirmation is provided to the SC.

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[6]If a value is submitted in the Bid for the Start-Up Cost it will be overwritten by the Master File value. If no value for Start-Up Cost is submitted in the Bid, CAISO will insert the Master File value for the Start-Up Cost into the bid.

5.1.1.1.2   Minimum Load Cost Component

This Bid cost component applies to Generating Units and Proxy Demand Resources. . The Minimum Load Cost component contains:

The hourly cost of operating the Generating Unit at Minimum Load, expressed in $/hr.[7]

The Minimum Load Cost is constant for the entire Trading Day in both the DAM and the RTM.

If the SC has elected the Registered Cost option for Minimum Load Cost, and the SC submits data for this component, CAISO overwrites the Bid component with the data from the Master File. If the SC selected Registered Cost Minimum Load Cost, this value can be changed every 30 days through the Master File.

If the SC has elected the Proxy Cost option for Minimum Load Cost, CAISO calculates this value daily based on the daily Gas Price Index. In addition, SCs may include Minimum Load Cost Bids into their DAM Bid as long as the value is not negative and is less than or equal to the Minimum Load Cost value calculated using the daily Gas Price Index. If the SC does not submit a Minimum Load Cost Bid or when the submitted Minimum Load Cost Bid is greater than the calculated Minimum Load Cost, the CAISO uses the Minimum Load Cost calculated using the daily Gas Price Index. The process used by CAISO to calculate the daily Gas Price Index is described in Attachment C.

The CAISO notifies the SC that the Minimum Load Cost component has been overwritten by the default values when the Bid confirmation is provided to the SC.

5.1.1.1.3   Transition Component

This Bid component applies only to Multi-Stage Generating Resources only and contains the transition related requirements for an MSG's movement between MSG Configurations. The transition component contains:

Transition Time – The Transition Time The notification time for completing a MSG State Transition between MSG Configurations.   **(CAISO inserts registered Master File Data if none is entered).**

Transition Cost – The Transition Cost is the operating cost incurred for a MSG State Transition between MSG Configuration. **(CAISO calculates based on Master File Data)**

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[7] If a value is submitted in the Bid for the Minimum Load Cost it will be overwritten by the Master File value. If no value for Minimum Load Cost is submitted in the Bid, CAISO will insert the Master File value for the Minimum Load Cost into the bid.

Transition Definition – The Transition Definition is Transition data composed of **Initial and Final Online Generating Resource States** (the From Configuration and the To Configuration)

5.1.1.1.4 Energy Bid Curve

Energy Bid Curve is required to be submitted on behalf of a resource providing RA Capacity that has an obligation to offer Energy into the DAM, as described in the BPM for Reliability Requirements, unless a Bid on behalf of the unit is submitted as a Self-Schedule. For all other resources, the Energy Bid Curve component is optional. Specific requirements for submitting Energy Bid Curves are detailed in Attachment F.

 The Energy Bid Curve component contains:

An Energy Bid Curve of up to 10 segments (defined by 11 pairs) of Energy offer price ($/MWh) and operating level (MW) for each of the 10 segments. The Energy Bid Curve begins at the Minimum Load level or the sum of its Self-Schedules, whichever is greater, of the Generating Unit.

Example of Energy Bid Curve Component for a Generating Unit with a PMin of 70MW and a PMax of 500 MW

Segment	Operating Level (MW)	Energy Price $/MWh
1	70	25
2	150	30
3	200	35
4	250	40
5	300	45
6	340	50
7	375	55
8	400	60
9	450	65
10	475	75
	500	75

Segment 1 is from 70.01 MW to 150.00 MW at an Energy price of $25/MWh; Segment 2 is from 150.01 MW to 200.00 MW, at an Energy price of $30/MWh etc.

The Energy Bid Curve must be monotonically increasing. Separate Energy Bid Curves are submitted for each Trading Hour of the Trading Day.

Non-discrete Reliability Demand Response Resources can submit single or multi-segment energy bid curves in the day-ahead, similar to other generation resources. Discrete Reliability Demand Response Resources cannot.

5.1.1.2   Operating Information

Energy Supply Bids also contain operating information components that specify constraints on the operation of a Generating Unit or Participating Load.

5.1.1.2.1   Ramp Rate Component

SCs can submit three different types of Ramp Rate information:

Operational Ramp Rate (Required if submitting Economic Bid for Supply) – The Operational Ramp Rate of resources limits the Energy schedule changes from one time period to the next in the SCUC. The Operational Ramp Rate is used for scheduling and dispatch when the Generating Unit is not providing Regulation. The Ramp Rate function allows the SCs to declare the Ramp Rate at different operating levels. The Operational Ramp Rate component is a staircase curve of up to four segments (in addition to the Ramp Rate segments needed for modeling Forbidden Operating Regions, which are entered in the Master File[8]) comprising the Ramp Rate, expressed in MW/minute and associated operating levels, expressed in MW.

Example of Operational Ramp Rate for a Generating Unit with a PMin of 70 MW and a PMax of 500 MW with no Forbidden Operating Regions

MW	MW/Min
70	5
150	8
300	7
400	8
500	8

Example of Operational Ramp Rate for a Generating Unit with a PMin of 100 MW and a PMax of 600 MW with Forbidden Operating Regions

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[8] Ramp Rates and Forbidden Regions are merged to create a single Clean Bid.

The resource has four Forbidden Operating Regions stored in the Master File:

> ➢ 160 – 200 MW effective Ramp Rate 2 MW/Min
> ➢ 280 – 300 MW effective Ramp Rate 3 MW/Min
> ➢ 400 – 410 MW effective Ramp Rate 4 MW/Min

490 – 500 MW effective Ramp Rate 5 MW/Min

SC submits a four segment Ramp Rate with no Forbidden Operating Regions in its Bid:

MW	MW/Min
100	6
200	7
300	8
400	9
600	9

The final composition of the Ramp Rate after the IFM pulls in the Forbidden Operating Regions from the Master File is:

MW	MW/Min
100	6
160	2
200	7
280	3
300	8
400	4
410	9
490	5
500	9
600	9

Operating Reserve Ramp Rate (Required if submitting Bid for Operating Reserve) The Operating Reserve Ramp Rate is a single value included in Ancillary Services Bids for Spinning Reserves and Non-Spinning Reserves that represents the Ramp Rate of a resource used in the procurement of Operating Reserve capacity. Further details of this Bid component are described in Section 6 (Ancillary Services Bids).

Regulation Ramp Rate (Required if submitting Bid for Regulation Up or Regulation Down)[9] The Regulation Ramp Rate is a single value included in Ancillary Services Bids for Regulation Up and Regulation Down that represents the Ramp Rate of a resource used in the procurement and dispatch of Regulation Up or Regulation Down capacity. Further details of this Bid component are described in Section 6 (Ancillary Services Bids).

All three Ramp Rate components are constant across the Trading Day.

5.1.1.2.2 Energy Limit Bid Component

SC is not required to submit this Bid component, for resources that do not have Energy Limits.

Energy Limit constraints apply to a prescribed list of Use-Limited Resources (designated in the Master File) that can generate limited amounts of Energy for a given period of time due to hydro conditions, emission allowances or other regulatory or design considerations. Use-Limited Resources may indicate an Energy Limit in their DAM Bids that applies to their schedule and dispatch throughout the Trading Day. The Energy Limit Bid component contains:

> ➢ Maximum Daily Energy Limit (MWh)
> Minimum Daily Energy Limit (MWh). This value must not be greater than zero.

In Generation mode the Minimum value would be 0, in the pumping mode it would be a negative number.

The Energy Limit component is fixed for the entire Trading Day and is submitted only in the DAM.

5.1.1.2.3 Distribution Curve Bid Component

The Distribution Curve Bid component contains, for each resource contained in a Physical Scheduling Plant, System Unit, Multi-Stage Generating Resource, or Proxy Demand Resource (excluding Reliability Demand Response Resources), the following information:

Distribution Location – Defined as the Connectivity Node (CNode) associated with the resource

Distribution Factor – Generation Distribution Factor for the resource located at the Distribution Location. Distribution Factors are non-negative numbers that sum to one (1) for the Aggregated Generating Resource or Proxy Demand Resource.

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[9] The Regulation Ramp Rate cannot be greater than any segment of the Operational Ramp Rate that is in the Bid.

Note: For a Multi-State Generating Resource, each Configuration can specify the Distribution Location and Factor.

5.1.1.2.4   Pump Mode of Pumped-Storage Hydro Units & Participating Load[10]

(Required for Pumped-Storage Hydro Units and Pumping Load resources)

Pumped-Storage Hydro Units and Pumping Load can operate in the mode of Generating Unit or Participating Load and can submit Bid components for both modes. Participating Load is treated in the same manner as the pumping component of the Pumped-Storage Hydro Units. [11]In addition to the Start-Up Cost component and the Minimum Load Cost component (associated with operating in generating mode), Pumped-Storage Hydro Units submit the following three Bid components:

Pump Shut-Down Cost, expressed in $

A Pumping Level, expressed in MW (positive value)

Pumping Cost – The hourly cost of pumping, expressed in $/Hr, if the resource is registered as a Pumped-Storage Hydro Unit

Exhibit 5-2: Pumped-Storage Hydro Unit Bid Component with both Generation and Demand

Pumped-Storage Hydro in Pump Mode Bid Components	*Compared to*	Pumped-Storage Hydro in Generator Mode Bid Components
Shut-Down Cost –		Generator's Start Up Cost
Pumping Level		MW Operating Point
Pumping Cost		Energy Bid component

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[10] See Section 5.2.1.1 for a complete discussion of bidding rules, including for Energy Bids, for Aggregated Participating Load.

[11] While Participating Load is treated as negative generation in the IFM, SCs enter a positive value in the Bid.
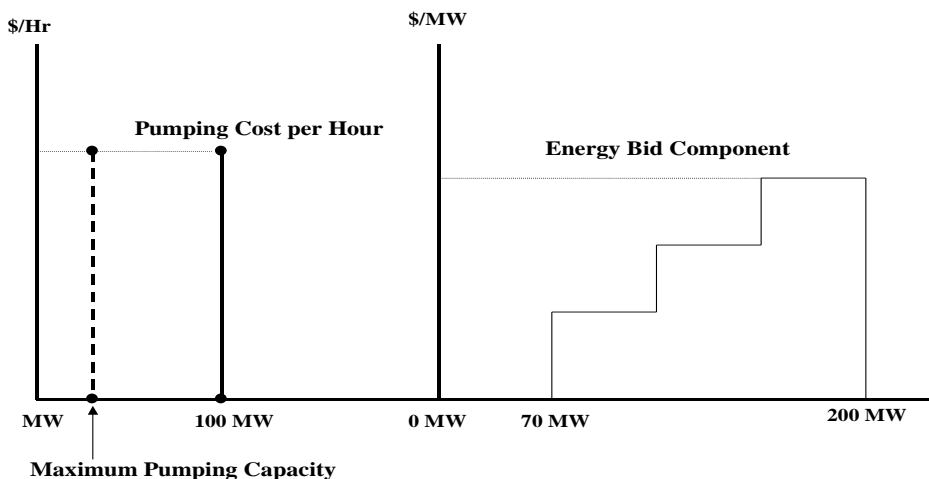
Exhibit 5-2 shows a Bid for a Pumped-Storage Hydro Unit that contains both Generation and Demand components for the same Trading Hour. In the above example, the Generation PMin is 70MW and the PMax is 200 MW. The unit submits a pumping bid of 100 MW.

5.1.1.3 Multi-Stage Generating Resources

A Scheduling Coordinator cannot submit a Bid to the CAISO Markets for a MSG Configuration into which the Multi-Stage Generating Resource cannot transition due to lack of Bids for the specific Multi-Stage Generating Resource in other MSG Configurations that are required for the requisite MSG Transition.

In order for Multi-Stage Generating Resource to meet any Resource Adequacy must-offer obligations, the responsible Scheduling Coordinator must submit either an Economic Bid or Self-Schedule for at least one MSG Configuration into the Day-Ahead Market and Real-Time Market that is capable of fulfilling that Resource Adequacy obligation, as feasible.

In order for Multi-Stage Generating Resource to meet any Resource Adequacy must-offer obligations, the responsible Scheduling Coordinator must submit either an Economic Bid or Self-Schedule for at least one MSG Configuration into the Day-Ahead Market and Real-Time Market that is capable of fulfilling that Resource Adequacy obligation, as feasible.

5.1.2   Day-Ahead Economic Virtual Bids for Supply

Day-Ahead Economic Virtual Bids for Supply are limited to the Energy Curve defined in the Bid. For Virtual Bids this is required and the Resource Type selected must be Virtual Supply. Virtual Supply Bids must start at zero (0) MW. The construction of the Energy Bid Curve can be seen in the example below.

Example of Energy Bid Curve Component for a Virtual Supply Bid

Segment	Operating Level (MW)	Energy Price $/MWh
1	0	25
2	150	30
3	200	35
4	250	40
5	300	45
6	340	50
7	375	55
8	400	60
9	450	65
10	475	75
	500	75

The Energy Bid Curve must be monotonically increasing.

5.1.3   Day-Ahead Self-Schedule Bids for Supply

This section is based on the CAISO Tariff Section 31.4, Uneconomic Adjustments in the IFM

Generating Units may submit a Self-Schedule Bid for Supply for each Trading Hour of the Trading Day. Proxy Demand Resources are limited to Self-Schedules only up to the Minimum Load for the resource. Reliability Demand Response Resources are not allowed to submit a Self-Schedule Bid. A Self-Schedule Bid component indicates self-commitment by the Generating Unit – i.e., the IFM does not economically commit or decommit a resource in a Self-Scheduled resource. SCs can submit different types of Self-Schedule Bids that receive different

scheduling priorities in the IFM, consistent with registration in the Master File. The list in decreasing order of priority is:

Reliability Must-Run (RMR) Unit (manually dispatched prior to the DAM or committed through the MPM-RRD process)

Transmission Ownership Right (TOR)

Existing Transmission Contract (ETC) *Note: Converted Rights (CVR) will be submitted into SIBR using the "Self Schedule ETC" Product Type (DAM only) and have the same priority as ETC.

Regulatory Must-Run and Regulatory Must-Take (RMT) Generation

Price Taker (PT)

5.1.3.1   Utilizing Self-Schedule Priorities

The following sections describe the types of Self-Schedule components an SC can submit, in decreasing order of priority.

It is important to note that a TOR, ETC or Wheel that is submitted in the DAM result, if awarded translates into a RT Self-Schedule if no bid or schedule is submitted. In order to preserve the priority of an ETC, TOR, or Wheel the ETC, TOR, or Wheel must be resubmitted in the RTM.

Converted Right (CVR) contracts do not have priority in the RTM.

5.1.3.1.1   Transmission Ownership Right Self-Schedule Bid Component

(Required for TORs)

This is based on CAISO Tariff Section 17, Transmission Ownership Rights ("TOR").

A TOR Self-Schedule Bid component contains:

> ➢ TOR Self-Schedule Identifier – TOR
> ➢ TOR Contract Reference Number (CRN)
>   TOR Self-Schedule capacity, expressed in MW

TOR Self-Schedules must be submitted balanced between source and sink, and must be within the ownership rights for that TOR, as specified in the Transmission Rights and Curtailment Instructions (TRTC) provided in advance to the CAISO. Sources and sinks must use the same TOR Contract Reference Number. The Contract Reference Number must be registered in the Master File prior to the TOR Self-Schedule taking place. (CAISO Tariff Section 17.3.1, Validation of TOR Self-Schedules).

5.1.3.1.2   Existing Transmission Contract Self-Schedule Bid Component

(Required for ETCs and CVRs)

An ETC Self-Schedule Bid component contains:

➢ ETC Self-Schedule Identifier – ETC
➢ ETC/CVR Contract Reference Number (CRN) *Note: CVRs are also defined by the CRN.
   ETC/CVR Self-Schedule capacity, expressed in MW

ETC/CVR Self-Schedules must be submitted balanced between source and sink, and must not exceed the MW amount for the ETC referenced in the Bid, as specified in the TRTC provided in advance to the CAISO. Sources and sinks must use the same ETC/CVR Contract Reference Number. The Contract Reference Number must be registered in the Master File prior to the ETC/CVR Self-Schedule taking place. (See CAISO Tariff Section 16.6.1, Validation of ETC/CVR Self-Schedules).

5.1.3.1.3   Regulatory Must-Run/-Take Self-Schedule Bid Component

(Required for RMTs)

A RMT Self-Schedule Bid component contains:

➢ Self-Schedule Identifier – RMT
➢ RMT Reference
   Self-Schedule capacity, expressed in MW

5.1.3.1.4   Price Taker Self-Schedule Bid Component

(Optional for all SCs)

The PT Self-Schedule Bid component contains:

➢ Self-Schedule capacity, expressed in MW
   Self-Schedule Identifier – PT

Supporting Resource (Exports only)

5.1.3.1.5 Lower Price Taker Self-Schedule Bid Component

(Optional for all SCs, used for Exports Only)

The LPT Self-Schedule Bid component contains:

> ➢ Self-Schedule capacity, expressed in MW
> Self-Schedule Identifier – L PT

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5.1.4   Real-Time Economic Bids for Supply

Real-Time Economic Bids for Supply are similar to Day-Ahead Economic Bids for Supply with the major difference that Real-Time Bids are for one Trading Hour, while Day-Ahead Bids are for each Trading Hour in the Trading Day. As with Day-Ahead Economic Bids for Supply, Real-Time Economic Bids for Supply consist of daily and hourly components. If the SC submits daily components for a resource in the Day-Ahead Bid, it is not necessary to submit the components again in the RTM.

5.1.4.1   Financial Information

The following sections define the financial information that SCs submit for the RTM Economic Bids for Supply.

5.1.4.1.1 Start-Up Component

This Bid component applies only to Generating Units, and Proxy Demand Resources. The Start-Up component contains:

Start-Up Time – The Start-Up Time is a staircase curve with up to three segments reflecting the conditions for Start-Up (Warm, Intermediate and Cold). The Start-Up Time (expressed in minutes) is expressed as a function of Cooling Time (expressed in minutes) and can range from zero to infinity. **(CAISO inserts registered Master File Data).**

Start-Up Cost – The Start-Up Cost component is a staircase curve with up to three segments reflecting the conditions for Start-Up (Warm, Intermediate and Cold). Start-Up Cost is expressed in $, as a function of Cooling Time (in minutes) and can range from zero to infinity.

The actual value used for each Generating Unit is limited by values submitted to the Master File, or calculated using daily gas prices. [12] **(Not entered by SC through SIBR).**

Example of Start-up Bid Component

	Cooling Time (Minutes)	Start-Up Time (Minutes)	Start-Up Cost ($)
Warm	0	600	6,500
Intermediate	240	1390	9,800
Cold	480	1400	12,000

SCs are not required to enter Start-Up Cost into their RTM Bid. If the SC does submit data for this component, CAISO overwrites the Bid component with the data from the Master File (except for the Start-Up Time, as described above). If the SC has selected Registered Cost for the Start-Up Cost, this value can be changed every 30 days through the Master File. If the SC has selected Proxy Cost for the Start-Up Cost, CAISO calculates this value daily based on the daily gas price. The process used by CAISO to calculate the daily gas price is described in Attachment C, and there is an example in section 8.2.1.2.

The Start-Up Cost is constant for the entire Trading Day. If a Start-Up Bid component is used in the DAM, the same value is used in the RTM. CAISO notifies the SC that the Start-Up cost has been overwritten by the default values when the Bid confirmation is provided to the SC.

5.1.4.1.2   Minimum Load Cost Component

This Bid component applies only to Generating Units and Proxy Demand Resources. The Minimum Load Cost component contains:

The hourly cost of operating the Generating Unit at Minimum Load, expressed in $/hr[13] **(Not entered by SC).**

SCs are not required to enter Minimum Load Cost into their RTM Bid. If the SC does submit data for this component, CAISO overwrites the Bid component with the data from the Master File. If the SC has selected Registered Cost for the Minimum Load Cost, this value can be

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[12]If a value is submitted in the Bid for the Start-Up Cost it will be overwritten by the Master File value. If no value for Start-Up Cost is submitted in the Bid, CAISO will insert the Master File value for the Start-Up Cost into the bid.

[13] If a value is submitted in the Bid for the Minimum Load Cost it will be overwritten by the Master File value. If no value for Minimum Load Cost is submitted in the Bid, CAISO will insert the Master File value for the Minimum Load Cost into the bid.

changed every 30 days through the Master File. If the SC has selected Proxy Cost for the Minimum Load Cost, CAISO calculates this value daily based on the daily gas price. The process used by CAISO to calculate the daily gas price is described in Attachment C.

The Minimum Load Cost is constant for the entire Trading Day. If the SC submits a Minimum Load Cost component in the DAM, it is not necessary to re-submit a value for the RTM. CAISO notifies the SC that the Minimum Load Cost is overwritten by the default values when the Bid confirmation is provided to the SC.

5.1.4.1.3   Transition Component

This Bid component applies only to Multi-Stage Generating Units. The transition process of a MSG resource between Generating Resource States. Transition component contains:

Transition Time – The Transition Time The notification time for completing a MSG State Transition between Online Generating Resource States. **(CAISO inserts registered Master File Data if none is entered).**

Transition Cost – The Transition Cost is the operating cost incurred for a MSG State Transition between Online Generating Resource States. **(CAISO calculates using registered Master File Data)**

Transition Definition – The Transition Definition is Transition data composed of **Initial and Final Online Generating Resource States** (the From Configuration and the To Configuration)

5.1.4.1.4   Energy Curve Bid Component

Energy Bid Curve is required to be submitted on behalf of a Generating Unit or Dynamic System Resource providing RA Capacity that has an obligation to offer Energy into the RTM, as described in the BPM for Reliability Requirements unless a Bid on behalf of the unit is submitted as a Self-Schedule. For all other Generating Units, the Energy Bid Curve component is optional. Specific requirements for submitting Energy Bid Curves are referenced in Attachment A of this BPM.

The Energy Curve Bid component contains:

An Energy Bid Curve of up to 10 segments (defined by 11 pairs) of Energy price ($/MWh) and operating level (MW) for each of the 10 segments. The Energy Bid Curve begins at the Generating Unit's Minimum Load level or the Self-Schedule.

Example of Energy Bid Component for a Generating Unit with a PMin of 70 MW and a PMax of 500 MW

Segment	Operating Level (MW)	Energy Price $/MWh
1	70	25
2	150	30
3	200	35
4	250	40
5	300	45
6	340	50
7	375	55
8	400	60
9	450	65
10	475	75
	500	75

The Energy Bid Curve must be monotonically increasing.

When submitting energy bids in real-time, Reliability Demand Response Resources must select Energy offer prices that are between 95%-100% of the maximum Energy Bid price stated in the CAISO Tariff.

Reliability Demand Response Resources selecting the discrete dispatch option may only submit a single segment (defined by 2 pairs) Energy Bid Curve in real-time. Reliability Demand Response Resources that have not selected the discrete option can still submit multiple bid segments in real-time.

5.1.4.1.5   Pumped-Storage Hydro Units

(Required for Pumped-Storage Hydro Units)

In addition to the Start-Up Cost component and the Minimum Load Cost component, Pump-Storage Hydro Units submit the following three Bid components:

Pump Shut-Down Cost – If the resource is registered as a Pumped-Storage Hydro Unit. The Pump Shut-Down Cost is expressed in $/hr

A Pumping Level (expressed in MW) – If the resource is registered as a Pumped-Storage Hydro Unit.

Pumping Cost – The hourly cost of pumping, expressed in $/hr, if the Generating Unit is registered as a Pumped-Storage Hydro Unit.

5.1.4.2   Operating Information

 Supply Bids on behalf of Generating Units also contain operating information components that specify constraints on the operation of a Generating Unit.

5.1.4.2.1   Ramp Rate Component

The Operational Ramp Rate of resources reflects the limitations of the resources' abilities to alter output from one time period to the next and is honored in the SCUC. The Operational Ramp Rate constraints are determined by the Operational Ramp Rate function, or the Regulation Ramp Rate (if the Generating Unit provides Regulation) multiplied by a time interval, (e.g., 60 minutes). The Operational Ramp Rate is used for scheduling and dispatch when the Generating Unit is not providing Regulation. The Ramp Rate function allows the SCs to declare the Ramp Rate at different operating levels. This Bid component contains:

Operational Ramp Rate (Required) –The Operational Ramp Rate component is a staircase curve of up to four segments comprising the Ramp Rate, expressed in MW/minute and associated operating levels, expressed in MW.

MW	MW/Min
70	5
150	8
300	7
400	8
500	8

Operating Reserve Ramp Rate (Required if SC is submitting Bid for Operating Reserve) – The Operating Reserve Ramp Rate is a single number included in Ancillary Services Bids for Spinning Reserves and Non-Spinning Reserves that represents the Ramp Rate of a resource used in the procurement of Operating Reserve capacity. Further details of this Bid component are described in Section 6 (Ancillary Services Bids).

Regulation Ramp Rate (Required if SC is submitting Bid for Regulation Up or Down) –
The Regulation Ramp Rate is a single number included in Ancillary Services Bids for Regulation
Up and Regulation Down that represents the Ramp Rate of a resource used in the procurement
and dispatch of Regulation Up or Regulation Down capacity. Further details of this Bid
component are described in Section 6 (Ancillary Services Bids).

All three Ramp Rate components are constant across the Trading Day. If the SC has submitted
an Operational Ramp Rate for a previous Trading Hour, it is not necessary to resubmit the
information for the current Trading Hour.

5.1.4.2.2   Distribution Bid Component

The Distribution Curve component contains, for each Physical Scheduling Plant, System Unit or
Proxy Demand Resource (excluding Reliability Demand Response Resources), the following
information:

Distribution Location – Defined as the Connectivity Node (CNode) associated with the
Generating Unit.

Distribution Factor – Generation Distribution Factor for the Generating Unit located at the
Distribution Location. Distribution Factors are non-negative numbers that sum to one (1) for the
Aggregated Generating Resource or Proxy Demand Resource.

5.1.3.3 Multi-Stage Generating Resources

For Multi-Stage Generating Resources that receive a Day-Ahead Schedule, are awarded a RUC
Schedule, or receive an Ancillary Services Award the Scheduling Coordinator must submit an
Energy Bid, which may consist of a Self- Schedule, in the Real-Time Market for the same
Trading Hour(s) for either the same MSG Configuration scheduled or awarded in the Integrated
Forward Market or committed in RUC. In addition, the Scheduling Coordinator for such Multi-
Stage Generating Resources may also submit Bids into the Real-Time Market for three other
MSG Configurations provided that the MSG Transitions between the MSG Configurations bid
into the Real-Time Market are feasible and the transition from the previous Trading Hour are
also feasible. For the Trading Hours that Multi-Stage Generating Resources do not have a
CAISO Schedule or award from a prior CAISO Market run, the Scheduling Coordinator can
submit up to three MSG Configurations into the RTM.

A Scheduling Coordinator cannot submit a Bid to the CAISO Markets for a MSG Configuration
into which the Multi-Stage Generating Resource cannot transition due to lack of Bids for the
specific Multi-Stage Generating Resource in other MSG Configurations that are required for the
requisite MSG Transition.

In order for Multi-Stage Generating Resource to meet any Resource Adequacy must-offer obligations, the responsible Scheduling Coordinator must submit either an Economic Bid or Self-Schedule for at least one MSG Configuration into the Day-Ahead Market and Real-Time Market that is capable of fulfilling that Resource Adequacy obligation, as feasible.

If in any given Trading Hour the Multi-Stage Generating Resource was awarded Regulation or Operating Reserves in the IFM, any Self-Schedules or Submissions to Self-Provide Ancillary Services the Scheduling Coordinator submits for that Multi-Stage Generating Resource in the RTM must be for the same MSG Configuration for which Regulation or Operating Reserve is Awarded in IFM for that Multi-Stage Generating Resource in that given Trading Hour.

If a Multi-Stage Generating Resource has received a binding RUC Start-Up Instruction as provided in Section 31, any Self-Schedule or Submission to Self-Provide Ancillary Services in the RTM must be in the same MSG Configuration committed in RUC.

5.1.5   Real-Time Self-Schedule Bids for Supply

Real-Time Self-Schedule Bids for Supply contain information on nominated Self-Schedule quantities, and operational information. The operational information to be included with a Real-Time Self-Schedule is the same as that which is submitted with an Economic Bid for Supply.

5.1.5.1   Self-Schedule Quantities

A Real-Time Energy Bid can contain Self-Schedule quantities. Self-Schedule quantities contain the capacity the SC wants to include in the Self-Schedule Bid and the type of Self-Schedule. Real-Time Market Self-Schedule quantities are for a single Trading Hour. The following sections describe the types of Self-Schedule components an SC can submit, in decreasing order of priority.

Reliability Demand Response Resources are not allowed to submit a Self-Schedule Bid in Real-Time. Any Day Ahead awards for the resource will automatically become a self-schedule for the applicable Real-Time hour.

It is important to note that a TOR/ETC/Wheel that is submitted in the DAM result, if accepted, in a Day Ahead Schedule. In order to preserve an ETC/TOR/Wheel the ETC/TOR/Wheel must be resubmitted in the RTM.

5.1.5.1.1   Transmission Ownership Right Self-Schedule Bid Component

(Required for TORs)

A Transmission Ownership Right (TOR) Self-Schedule Bid component contains:

> ➢ TOR Self-Schedule Identifier – TOR
> ➢ TOR Contract Reference Number (CRN)

TOR Self-Schedule capacity, expressed in MW

TOR Self-Schedules must be submitted balanced between source and sink, and must be within the allotted ownership rights for that TOR, as specified in the TRTC provided in advance to the CAISO. Sources and sinks must use the same TOR Contract Reference Number. The Contract Reference Number must be registered in the Master File prior to the TOR Self-Schedule taking place. (CAISO Tariff Section 17.3.1, Validation of TOR Self-Schedules).

5.1.5.1.2 Existing Transmission Contract Self-Schedule Bid Component

(Required for ETCs)

An Existing Transmission Contract (ETC) Self-Schedule Bid component contains:

> ➢ ETC Self-Schedule Identifier – ETC
> ➢ ETC Contract Reference Number (CRN)

ETC Self-Schedule capacity, expressed in MW

ETC Self-Schedules must be submitted balanced between source and sink, and must not exceed the MW amount for the ETC referenced in the Bid, as specified in the TRTC provided in advance to the CAISO. Sources and sinks must use the same ETC Contract Reference Number. The Contract Reference Number must be registered in the Master File prior to the ETC Self-Schedule taking place. (See CAISO Tariff Section 16.6.1, Validation of ETC Self-Schedules).

5.1.5.1.3 Regulatory Must-Run/-Take Generation Self-Schedule Bid Component

(Required for RMTs)

A Regulatory Must-Take/Regulatory Must-Run (RMT) Generation Bid component contains:

> ➢ Self-Schedule Identifier – RMT
> ➢ RMT Generation Reference – These are registered in the Master File

Self-Schedule capacity, expressed in MW

5.1.5.1.4 Price Taker Self-Schedule Bid Component

The PT Self-Schedule Bid component contains:

➢ Self-Schedule capacity, expressed in MW

Self-Schedule Identifier – PT

5.1.4.1.5   Multi-Stage Generating Resources

For any given Trading Hour, a Scheduling Coordinator may submit Self-Schedules and/or Submissions to Self-Provide Ancillary Services in only one MSG Configuration for each Generating Unit or Dynamic Resource-Specific System Resource.

For Multi-Stage Generating resources, any Self-Schedules or Submissions to Self-Provide Ancillary Services the Scheduling Coordinator submits for that Multi-Stage Generating Resource in the RTM must be for the same configuration for which Regulation or Operating Reserve is awarded in IFM for that Multi-Stage Generating Resource in that given Trading Hour.

In any given Trading Hour in which a Scheduling Coordinator has submitted a Self-Schedule for a Multi-Stage Generating Resource, the Scheduling Coordinator may also submit Bids for other MSG Configurations provided that they concurrently submit Bids that enable the applicable CAISO Market to transition the Multi-Stage Generating Resource to other MSG Configurations.

If in any given Trading Hour the Multi-Stage Generating Resource is scheduled for Energy in the IFM, any Self-Schedules the Scheduling Coordinator submits for that Multi-Stage Generating Resource in the RTM must be for the same MSG Configuration for which Energy is scheduled in IFM for that Multi-Stage Generating Resource in that given Trading Hour.

5.1.5.2   Operating Information

The operating information submitted with a RTM Self-Schedule Bid component is the same as that required for a Real-Time Economic Bid.

5.2   CAISO Demand Bids

SCs representing Loads (including exports) submit Demand Bids indicating the hourly quantity of Energy in MWh that it intends to purchase in the IFM for each Trading Hour of the Trading Day. Convergence Bidding Entities that are registered must have at least one Scheduling Coordinator ID that is authorized to submit Virtual Demand Bids. Scheduling Coordinators submitting Demand Bid components submit both common information and information that is specific to the type of Demand Bid. The common information included in the Demand Bids is as follows:

➢ Scheduling Coordinator ID Code

Location Code for the LAP, PNode or APNode, as applicable (also for Virtual Bids)

For Virtual Bids at a location the Resource Type must be "Virtual Demand"

The specific information associated with different types of Demand Bids is described in the following sections.

5.2.1　　Day-Ahead Economic Bids for Demand

SCs may submit Day-Ahead Economic Bids for Demand of the following types:

> ➤ Participating Load Bids

Non-Participating Load Bids

5.2.1.1　　Participating Load Demand Bids

Participating Load Bids can be submitted only for those resources that are registered as Pumped-Storage Hydro Units or Pumping Load resources. In addition to the common information contained in all Bids, Participating Load Demand Bids contain the following information:

> ➤ Pumping Level, expressed in MWh
> ➤ Pumping Cost, expressed in $/Hr
> ➤ Ramp Rate, expressed in MW/min, for Pumped-Storage Hydro Units

Shut-Down Cost, expressed in $

The Pumping Load (individual or aggregated) will be registered in the Master File as a Participating Load.

5.2.1.1.1　　Aggregated Participating Load

An Aggregated Participating Load will be modeled and will participate in the CAISO's markets as both a Non-Participating Load (NPL) and a Generator.   The Aggregated Participating Load will not be able to participate in the CAISO's markets directly as a Participating Load in Release 1.

The Scheduling Coordinator on behalf of the Aggregated Pumping Load may submit two Bids for the same Trading Day: (1) as a Non-Participating Load, a Day-Ahead Self-Schedule with an Energy Bid Curve with a maximum 10 segments; and (2) as a Generator representing the demand reduction capacity of the Aggregated Participating Load, a submission to Self-Provide

Non-Spinning Reserve or a Bid to provide Non-Spinning Reserve. The CAISO will assign two Resource IDs: one for Non-Participating Load Bids and one for Generator Bids (either a Resource ID for a Generating Unit or a Physical Scheduling Plant). Both Resource IDs will be in the Master File on behalf of the Aggregated Participating Load. The Aggregated Participating Load will be treated as a Participating Load for settlement and compliance purposes except that Aggregated Participating Load will be scheduled and settled at Custom LAP rather than an individual PNode. Future software releases will allow Aggregated Participating Load resources to participate directly as Participating Load.

In the DAM when the SC submits the Non-Spinning Reserve Self-Provision or the Non-Spinning Reserve Bid, the SC must ensure that the total Non-Spinning Reserve (including Self-Provided or any Ancillary Services Awards in the market) is available in Real-Time for dispatch. For the Aggregated Participating Load, this means the Demand must be there in real-time for reduction. For example, if the associated Non-Participating Load does not clear the DAM at a load level that is greater than the total Non-Spinning Awards, the market participant must ensure the pumps will be pumping in Real-Time in order to provide the Non-Spinning Reserve; otherwise the payment for Non-Spinning Reserve will be rescinded by No-Pay.

In the DAM when the SC submits the Non-Spinning Reserve Self-Provision and the Non-Spinning Reserve Bid, the SC must indicate that the Non-Spinning Reserve Self-Provision and Non-Spinning Reserve Bid are contingent; the SC must not submit an Energy Bid curve on behalf of the Aggregated Pumping Load as a Generator or the resource may be dispatched for Energy.

The following table provides guidance to Scheduling Coordinators submitting Bids on behalf of Aggregated Participating Load.

Generator Bid Components And Attributes	Corresponding Aggregated Participating Load Attributes
Start-Up Cost	Demand curtailment cost, *e.g.* Pump Shut Down Cost ($/curtailment event)
Start-Up Time	Demand curtailment time
Minimum Load	Must be **zero** to prevent unit commitment in the DAM
Minimum Load Cost	Set to **zero** since Minimum Load is set to zero
Maximum Capacity	Certified Non-Spinning Reserve capacity
Best/Worst Operating Reserve Ramp Rate	Certified Non-Spinning Reserve Ramp Rate
Best/Worst Operational Ramp Rate	Best/worst Demand curtailment rate (Note: Since Generating Units do not have different Ramp Rates for Ramping up and down, the Demand pickup rate is ignored.)
Minimum Run Time	Minimum Demand curtailment time
Minimum Down Time	Must be **zero** (Note: Minimum Base Load time is not used because doing so would require the IFM/RTM to link the Generator resource with the Non-Participating Load resource.)
Maximum Daily Start-Ups	Maximum number of daily curtailments
Energy Bid Curve	Must not submit in the DAM or the resource may be dispatched for Energy in the IFM (Bid submitted in the RTM represents offer to curtail Demand associated with the Non-Spinning Reserve ($/MWh).)

5.2.1.2   Non-Participating Load Demand Bids

Non-Participating Load Demand Bids contains the following:

Demand Bid Curve – A staircase curve with up to ten segments, monotonically decreasing, defined by 11 pairs of a MW quantity and price, expressed in $/MWh.

Example of Demand Bid Curve Component for Non-Participating Load

Segment	Operating Level (MW)	Energy Price $/MWh
1	70	75

Segment	Operating Level (MW)	Energy Price $/MWh
2	150	65
3	200	60
4	250	55
5	300	50
6	340	45
7	375	40
8	400	35
9	450	30
10	475	25
	500	25

Demand up to the MW defined by the first segment (i.e., the starting point of the Demand Bid Curve) is treated as a Self-Schedule.

Separate Demand Bid curves can be submitted for each Trading Hour of the Trading Day.

5.2.2   Day-Ahead Economic Virtual Bids for Demand

Day-Ahead Economic Virtual Bids for Demand are limited to the Energy Curve defined in the bid. For Virtual Demand Bids this is required and the Resource Type selected must be "Virtual Demand". The construction of the Energy Bid Curve can be seen in the example below. Virtual Bids must start at 0 MW.

Example of Virtual Demand Bid Curve Component

Segment	Operating Level (MW)	Energy Price $/MWh
1	0	75
2	150	65
3	200	60
4	250	55
5	300	50
6	340	45

Segment	Operating Level (MW)	Energy Price $/MWh
7	375	40
8	400	35
9	450	30
10	475	25
	500	25

5.2.3   Day-Ahead Self-Schedule Bids for Demand

In addition to Economic Bids for Demand, SCs submit Self-Schedule Bids for Demand. With the exception of ETCs and TORs, SCs may only submit Self-Schedules for Demand in the DAM.

SCs can submit Export Self-Schedules in the RTM. (see section 5.2.4)

5.2.3.1   Transmission Ownership Right Self-Schedule Bid Component

In addition to the common Demand Bid information listed in Section 5.2, a Day-Ahead TOR Self-Schedule Demand Bid contains the following:

> ➢ TOR Contract Reference Number

TOR Self-Schedule Demand quantity – expressed in MW

TOR Self-Schedules must be submitted balanced between source and sink, and must be within the allotted ownership rights for that TOR, as specified in the TRTC provided in advance to the CAISO. Sources and sinks must use the same TOR Contract Reference Number. The Contract Reference Number must be registered in the Master File prior to the TOR Self-Schedule taking place. (CAISO Tariff Section 17.3.1, Validation of TOR Self-Schedules).

5.2.3.2   Existing Transmission Contract Self-Schedule Bid Component (also applies to CVRs)

In addition to the common Demand Bid information listed in Section 5.2, a Day-Ahead ETC Self-Schedule Demand Bid contains the following: *Note: Converted Rights (CVR) will be submitted into SIBR using the "Self Schedule ETC" Product Type (DAM only).

> ➢ ETC/CVR Contract Reference Number *Note: CVRs are also defined by the CRN.

ETC Self-Schedule Demand quantity – expressed in MW

ETC/CVR Self-Schedules must be submitted balanced between source and sink, and must not exceed the MW amount for the ETC/CVR referenced in the Bid, as specified in the TRTC

provided in advance to the CAISO. Sources and sinks must use the same ETC/CVR Contract Reference Number. The Contract Reference Number must be registered in the Master File prior to the ETC Self-Schedule taking place. (CAISO Tariff Section 16.6.1, Validation of ETC Self-Schedules)

5.2.3.3   Price Taker Self-Schedule Bid Component

In addition to the common Demand Bid information listed in Section 5.2, a Day-Ahead PT Self-Schedule Demand Bid contains the following:

PT Self-Schedule Demand Quantity – expressed in MW

The Demand Bid component of a Price Taker Self-Schedule does not have to be balanced with a Supply Bid component.

For PT Self-Schedules from Export Resources in addition to the above information the PT Self-Schedule must also contain:

> ➤ Supporting Resource that will be a Generating Unit.

5.2.3.4   Process for Exports to obtain PT Status

For Export Resources that are not RA Resources to be treated as a PT, the SC must designate a Generating Unit that is non-RA/non-RUC as the supporting resource for the PT Self-Schedule for the Trading Hour. The identified Generating Unit may or may not be in the same SC's portfolio of the Export Resource. Different Generating Units may support the PT Self-Schedules of an Export Resource in different Trading Hours and the same Generating Unit may be identified by several Export Resources to support their PT Self-Schedules in a Trading Hour.

The CAISO will validate according to the SIBR rules that the designated supporting resource for the PT Self-Schedule has available capacity that is greater than or equal to the sum of the relevant PT Export Self-Schedules that claim that same resource multiplied by a configurable Export Capacity factor (such as 100%). If the available capacity is less than the calculated value, SIBR shall convert the PT Export Self-Schedules to LPT Export Self-Schedules in their entirety according to the SIBR Business Rules.

Export Resources that are identified as RA Resources in DAM and RTM may submit PT Self-Schedules up to the registered "RA Capacity" without designating a supporting resource.

SCs may submit Lower Price Taker (LPT) Self-Schedules for Export Resources that are not explicitly supported by a non-RA/non-RUC Generating Unit.

5.2.3.5   Lower Price Taker Self-Schedule Bid Component

In addition to the common Demand Bid information listed in Section 5.2, a Day-Ahead LPT Self-Schedule Demand Bid contains the following:

LPT Self-Schedule Demand Quantity – expressed in MW

The Demand Bid component of a Lower Price Taker Self-Schedule does not have to be balanced with a Supply Bid component.

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5.2.3.6   Aggregate Resource Load Bids

Load Distribution Factors (LDFs) for allowed customized aggregation come from the LDF library maintained by CAISO. The LDF Library contains the following:

Distribution Location – the Connectivity Node (CNode) associated with the Custom Load Aggregation Resource

Distribution Factor – Load Distribution Factor for the Custom Load Aggregation Resource located at the Distribution Location

5.2.4   Real-time Economic Bids for Demand

The following resources may submit Demand Bids in the RTM:

Participating Loads

Exports may submit Bid or Self-Schedules in the RTM. However, to the extent an Export is Self-Scheduled and seeks to have the same priority as CAISO Forecast of CAISO Demand, the Export must be supported by non-RA or non-RUC capacity.

   The process for both will be submitted using the process described in section 5.2.1.1 and 5.2.2.4.

5.2.5   Real-Time Self-Schedule Demand Bids

SCs can submit Export Self-Schedules in the RTM.

In DAM, an Export Self-Schedule explicitly and adequately supported by the non-RA capacity in the Energy Bid of a Generator or Import resource, that is also not associated with Self-Provided upward A/S capacity, has the same Self-Schedule priority as CAISO Demand. Otherwise, an Export Self-Schedule has a lower Self-Schedule priority than CAISO Demand

In HASP and RTM, Export Self-Schedule already cleared in the IFM or explicitly and adequately supported by the energy bid capacity that is in excess of the RUC Schedule and not occupied by DA upward AS awards and RT upward AS self-provisions of a generator or import resource has the same Self-Schedule priority as CAISO demand forecast. Otherwise, Export Self-Schedule has lower Self-Schedule priority than CAISO demand

The process for Export Resources to obtain PT status is explained in section 5.2.2.4.

It is important to note that a TOR/ETC/Wheel that is submitted in the DAM result, if accepted, in a Day Ahead Schedule. In order to preserve an ETC/TOR/Wheel the ETC/TOR/Wheel must be resubmitted in the RTM.

5.2.5.1   Existing Transmission Contract Self-Schedule Bid Component

In addition to the common Demand Bid information listed in Section 5.2, an ETC Self-Schedule Demand Bid contains the following:

> ➢ ETC Contract Reference Number

ETC Self-Schedule Demand quantity, expressed in MW

ETC Self-Schedules must be submitted balanced between source and sink, and must not exceed the MW amount for the ETC referenced in the Bid, as specified in the TRTC provided in advance to the CAISO. Sources and sinks must use the same ETC Contract Reference Number. The Contract Reference Number must be registered in the Master File prior to the ETC Self-Schedule taking place. (CAISO Tariff Section 16.6.1, Validation of ETC Self-Schedules)

5.2.5.2   Transmission Ownership Right Self-Schedule Bid Component

In addition to the common Demand Bid information listed in Section 5.2, a TOR Self-Schedule Demand Bid contains the following:

> ➤ TOR Contract Reference Number

TOR Self-Schedule Demand quantity, expressed in MW.

TOR Self-Schedules must be submitted balanced between source and sink, and must be within the allotted ownership rights for that TOR as specified in the TRTC provided in advance to the CAISO. Sources and sinks must use the same TOR Contract Reference Number. The Contract Reference Number must be registered in the Master File prior to the TOR Self-Schedule taking place. (CAISO Tariff Section 17.3.1, Validation of TOR Self-Schedules)

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5.2.5.3   Price Taker Self-Schedule Bid Component

In addition to the common Demand Bid information listed in Section 5.2, a Real-Time PT Self-Schedule Demand Bid contains the following:

PT Self-Schedule Demand Quantity – expressed in MW

The Demand Bid component of a Price Taker Self-Schedule does not have to be balanced with a Supply Bid component.

5.2.5.4   Lower Price Taker Self-Schedule Bid Component

In reference to the Export Priority for lower self schedule in Section 5.2, a Real-Time LPT Self-Schedule Demand Bid contains the following:

LPT Self-Schedule Demand Quantity – expressed in MW

The Demand Bid component of a Lower Price Taker Self-Schedule does not have to be balanced with a Supply Bid component.

The same process for Export Priority applies in Real-Time as in the Day-Ahead. (see Section 5.2.2.4)

6.   Ancillary Services Bids

Welcome to the *Ancillary Services Bids* section of the CAISO *BPM for Market Instruments*. In this section you will find the following information:

How CAISO procures Ancillary Services

How SCs can self-provide Ancillary Services

A description of the Ancillary Services Bid components

6.1   Procurement of Ancillary Services

This section is based on CAISO Tariff Sections 8.4.7. 2, Bidding and Self-Provision of Ancillary Services and CAISO Tariff Section 30.5.2.6, Ancillary Services Bids (Not applicable for Virtual Bids).

SCs may submit an Economic Bid or a Bid for Self-Provided Ancillary Services (AS) from resources located within the CAISO Balancing Authority Area, submit Bids for AS from resources located outside CAISO Balancing Authority Area, or specify Inter-SC Trades of AS (covered in more detail in Section 9.2). Ancillary Services in the DAM and the RTM are comprised of the following:

Regulation Up, which must be synchronized and able to receive AGC signals

Regulation Down, which must be synchronized and able to receive AGC signals

Spinning Reserve (which must be synchronized, be available in 10 minutes, and be maintainable for two hours)

Non-Spinning Reserve (which must be supplied within 10 minutes and be maintainable for two hours)

In HASP, only Operating Reserves (Spinning and Non-Spinning Reserves) are available.

Certified Participating Generators and Dynamic System Resources are eligible to provide all AS. Certified Non-Dynamic System Resources are eligible to provide Operating Reserves only. Certified Participating Loads and Proxy Demand Resources are eligible to provide Non-Spinning Reserve only.

The same resource capacity may be offered for more than one Ancillary Services into the same CAISO Market at the same time. SCs may submit Bids to provide Spinning Reserve or Non-Spinning Reserve from certified System Resources, including Dynamic System Resources. In the event that an AS Bid is invalid, the SC receives prompt notification of that invalidity.

CAISO operates a competitive DAM, the HASP, and RTM to procure AS. Bids for Regulation Up, Regulation Down, Spinning Reserve, and Non-Spinning Reserve in the DAM must be received no sooner than seven days prior to the Trading Day up to Market Close of the DAM (1000 hours on the day prior to the Trading Day). The Bids contain information for each of the 24 hour Trading Hours of the Trading Day.

Bids for DAM AS in support of Ancillary Services (AS) with Must Offer Obligation (MOO) will be enforced by the SIBR Rules in the DAM. The CAISO will utilize the certified AS capability of those RA Resources that are subject to AS MOO. Use Limited Resources such as hydro generating units and participating load resources will not be subject to AS MOO. The AS MOO is not dependent on whether the RA Capacity is subject to the Standard Capacity Product availability provisions.

In SIBR, if there is no AS Component in a Generating Resource Bid and the Generating Resource or a resource modeled as a Generating Resource specified in that Bid is registered as an RA Resource subject to the AS MOO for the Trading Day,(if the resource is a Multi-Stage Generating Resource the AS capacity is at the MSG Configuration that is bid in and each MSG Configuration has a specific AS Capacity certified to provide AS), an AS Bid Component must be generated with a Capacity equal to the highest available capacity not to exceed the registered Capacity, for that Resource and Trading Day, and with a Price equal to the Default Ancillary Service Bid Price. The Contingency Dispatch Indicator in that Bid will be set to "Yes". It is possible that if an AS component does exist, it may be extended if needed to meet the requirements. (Tariff Sections 40.6.1, 40.46.4, 40.6.4.3.2, 40.6.8)

Bids for AS in the RTM are submitted incrementally from any DAM AS Awards. DAM AS Awards are binding commitments and cannot be reduced in RTM. CAISO requires SCs to honor their DA AS Awards when submitting AS Bids in the RTM.

Bids for all four AS in the RTM processes must be received at least 75 minutes prior to the commencement of the Trading Hour. The Bids include information for only the relevant Trading Hour. Failure to provide information within the stated timeframes results in the Bids being declared invalid by CAISO.

Scheduling Coordinators submitting Ancillary Services Bids for System Resources to be used in the HASP or Real-Time Market must also submit an Energy Bid for the associated Ancillary Services Bid under the same Resource ID in the Real-Time Market, otherwise the bid validation

rules in Section 30.7.6.1 of the CAISO Tariff will apply to cover any portion of the Ancillary Services Bid not accompanied by an Energy Bid. As described in Section 33.7 of the CAISO Tariff, if the resource is a Non-Dynamic Hourly System Resource, the CAISO will only use the Ancillary Services Bid in the HASP optimization and will not use the associated Energy Bid for the same Resource ID to schedule Energy from the Non-Dynamic Hourly System Resource in the HASP.

Scheduling Coordinators must also comply with the bidding rules associated with the must offer requirements for Ancillary Services specified in Section 40.6 of the CAISO Tariff. For Multi-Stage Generating Resources the AS Bids shall be submitted at the MSG Configuration level.

6.2   Self Provided Ancillary Services

This section is based on CAISO Tariff Section 8.6, Obligations for and Self-Provision of Ancillary Services, and CAISO Tariff Section 30.5.2.6, Ancillary Services Bids.

SCs with submissions to self-provide an Ancillary Service supply all the same information as an AS Economic Bid, excluding the capacity price information for each AS offered by the SC.

Scheduling Coordinator must submit an Energy Bid that covers the self-provided capacity prior to the close of the Real-Time Market for the day immediately following the Day-Ahead Market in which the Ancillary Service Bid was submitted.

In addition, resources that have registered with a Metered Subsystem (MSS) that has elected the Load Following option may submit Self-Provision Bids for Load Following Up and Load Following Down.

6.2.1   Load Following Up

The specific Load Following Up Bid components are the following:

Load Following Up capacity, expressed in MW.

6.2.2   Load Following Down

The specific Load Following Down Bid components are the following:

Load Following Down capacity, expressed in MW.

6.3   Ancillary Service Bid Components

This section is based on CAISO Tariff Section 30.5.2.6, Ancillary Services Bids.

The Bids for Ancillary Services contain both common components and components that are specific to each service. The same Bid components are included for both DAM and RTM Bids

for AS, where the DAM includes information for each Trading Hour of the Trading Day and the RTM includes information for just the relevant Trading Hour.

The common components to the AS Bids are described in the Energy Bid component above in Section 5 (Energy Bids).

The following sections describe the specific Bid components for each type of AS.

6.3.1   Regulation Up

The specific Regulation Up Bid components are the following:

> ➢ Regulation Up capacity, expressed in MW
> ➢ Regulation Up price, expressed as $/MW

Regulation Ramp Rate, expressed in MW/Min

6.3.2   Regulation Down

The specific Regulation Down Bid components are the following:

> ➢ Regulation Down capacity, expressed in MW
> ➢ Regulation Down price, expressed as $/MW

Regulation Ramp Rate, expressed in MW/Min

6.3.3   Spinning Reserve Capacity

The specific Spinning Reserve Bid components are the following:

> ➢ Spinning Reserve capacity, expressed in MW
> ➢ Spinning Reserve price, expressed as $/MW
> ➢ Operating Reserve Ramp Rate, expressed in MW/Min

Contingency Dispatch Indicator

6.3.4   Non-Spinning Reserve Capacity

The specific Non-Spinning Reserve Bid components are the following:

> ➢ For Generating Units: (also Proxy Demand Resources)
>   ▪ Non-Spinning Reserve capacity, expressed in MW
>   ▪ Non-Spinning Reserve price, expressed as $/MW
>   ▪ Operating Reserve Ramp Rate, expressed in MW/Min
>   ▪ Contingency Dispatch Indicator

- ➢ For Participating Loads:
  - Non-Spinning Reserve capacity, expressed in MW
  - Non-Spinning Reserve price, expressed as $/MW
  - Operating Reserve Ramp Rate, expressed in MW/Min
  - Contingency Dispatch Indicator

7. Residual Unit Commitment Availability Bids

Welcome to the *Residual Unit Commitment Availability Bids* section of the CAISO *BPM for Market Instruments.* In this section you will find the following information:

The information required to submit a RUC Availability Bid

How CAISO validates the RUC Availability Bids

The Residual Unit Commitment (RUC) process occurs after the DA IFM is completed. RUC is a reliability function for committing resources and procuring RUC capacity included in the Day Ahead Schedule resulting from the IFM (as Energy or AS capacity), in order to meet the difference between the CAISO Forecast of CAISO Demand (including locational differences) and the Demand scheduled in the Day Ahead Schedule resulting from the IFM, for each Trading Hour of the Trading Day. The RUC is the process designed to ensure that sufficient on-line resources are available to meet Real-Time Demand. SCs can submit Bids to provide RUC Availability capacity. These Bids are submitted into the DAM process only. For Multi-Stage Generating Resources the RUC Availability Bids shall be submitted at the MSG Configuration level.

This section is based on CAISO Tariff Sections 30.5.2.7, 31.5 and 40.5.2

7.1 RUC Availability Bid

This section is based on CAISO Tariff Section 31.5, Residual Unit Commitment. Virtual Bids and Reliability Demand Response Resources are not eligible to participate in RUC.

The RUC Availability Bid component differs depending on whether the Generating Unit submitting the Bid is under a Resource Adequacy (RA) obligation or not. If a resource is not under a RA obligation, the RUC Availability Bid that the resource submits is interpreted as an incremental amount of capacity that the resource is willing to provide in the Day-Ahead Market for RUC in addition to its Day-Ahead Market Bids and Self-Schedules. In this case the resource would submit a RUC Availability Bid that includes:

➢ RUC Availability Bid quantity, expressed in MW
➢ RUC Availability Bid price, expressed in $/MW
These two components must exist together for a valid RUC Availability Bid.

The RUC Availability Cost component can vary hourly throughout the Trading Day.

If a resource is under RA obligation, a certain amount of capacity of this resource is registered with CAISO as RA Capacity. Resources providing RA Capacity must participate in the RUC process consistent with RA requirements as described in the BPM for Reliability Requirements, by submitting an Energy bid (could be Self-Schedule) up to the registered RA Capacity.

The SC may submit a non-zero RUC Availability Bid only for that portion of its capacity that is not RA Capacity, assuming the capacity is eligible to participate in RUC. See section 6.7.2.6 of the BPM for Market Operations.

If a resource has a RA obligation, the amount of RA Capacity is registered with CAISO as RA Capacity. RA Capacity that is not a hydroelectric Generating Unit, Pumping Load or exempt Non-Dispatchable Use-Limited Resource pursuant to CAISO Tariff section 40.6.4.3.2, must participate in RUC. The CAISO will automatically optimize all RUC obligated capacity from Generating Units, Imports or System Resources at $0/MW per hour for the full amount of RA Capacity for a given resource.

For Resources that are registered as an RA Resource and are also registered as a Must Offer Obligation (MOO) unit in DAM, SIBR will allow Market Participants to specify a Capacity Limit Indicator to specify whether they want IFM to limit the total capacities committed in IFM to the RA capacity.

If there is no Capacity Limit Indicator specified in a RUC Bid Component for a Trading Hour in a Generating Resource Bid, SIBR will check to see if the RA Flag for the Generating Resource specified in that Bid and for that Trading Hour is "Yes", if there is then a Capacity Limit Indicator will be generated by SIBR in that RUC Bid Component with a value of "No".

If there is a Capacity Limit Indicator of "Yes" specified in a RUC Bid Component for a Trading Hour in a Generating Resource Bid, a Capacity Limit must be generated in that RUC Bid Component equal to the RA Capacity.

Real Time bids can be affected by RUC if there is a RUC Award; in the event that there is a RUC Award but no RT bid then an Energy Bid will be created by SIBR. Participants observing RUC Awards that are equal to Pmin should submit an energy bid from Pmin to Pmin+.01 if the RUC capacity is equal to Pmin for the resource.

7.2   RUC Availability Bid Component Validation

The RUC Bid validation follows the Bid validation process described in Section 8 (Bid Submission and Validation). The Bid validation rules related specifically to the RUC Bid components are referenced in Appendix A.

8.   Bid Submission & Validation

Welcome to the *Bid Submission & Validation* section of the CAISO *BPM for Market Instruments*. In this section you will find the following information:

How CAISO accepts Bids and Inter-SC Trades for Energy, Ancillary Services and other commodities from SCs that are certified to transact through CAISO

How CAISO ensures that those Bids and Inter-SC Trades are valid and modifies the Bids for correctness when necessary

How CAISO enters the Bids and Inter-SC Trades from SCs into a database for processing by other components of CAISO's business systems

How CAISO provides feedback to SCs concerning Bids and Inter-SC Trades that are submitted

Detailed Bid validation rules are referenced in Attachment A of this BPM.

8.1   Timeline

This section presents the timelines for the DAM, HASP, and RTM as they relate to Bid submission and validation. DAM is for both physical Bids and Virtual Bids.

Exhibit 8-2 Time-Line for Bid Submission

Stages	Day-Ahead Timeline	Real-Time Timeline	Activities
1	Up to seven days prior to the Trading Day SC may begin submitting Bids	Beginning at approximately 1:00 pm the day prior to the Trading Hour SCs may begin submitting RTM bids for all 24 hours of the RTM for the following trading day	SCs continuously submit bids before Market Close time to CAISO. CAISO validates bids upon receipt and provides messages back to SCs as to the validity of their bids referencing specific validation rules that have fired on their bids. Master-file data is updated on a daily basis. All affected DAM bids are revalidated based on new master file data.
2	10:00 am	T- 75	The DAM and RTM are closed for bid submission CAISO performs any necessary bid generation All market accepted bids with a status

Stages	Day-Ahead Timeline	Real-Time Timeline	Activities
			of Modified or Valid are considered Clean Bids and sent to IFM/RTM to continue processing the markets.

8.1.1   Day-Ahead Market

Day-Ahead Market Bids may be submitted up to seven days prior to the Trading Day for each of the seven days when the DAM opens and must be submitted prior to Market Close for each Trading Hour in the Trading Day, at 1000 hours of the day prior to the Trading Day.

In the DAM, SC submits a Day-Ahead Bid for a resource for a 24-hour market period. The Day-Ahead Bid comprises two types of components:

Daily Components – These are physical Bid parameters that are associated with the resource for the Trading Day, not with an individual market or hourly intervals of the physical Bid and are not applicable to Virtual Bids. Daily components include:

- Start-Up information (Cost curve, time curve)
- Minimum Load information
- Transition Information (Multi-Stage Generating Resources only)
- Ramp Rate information
- Minimum and Maximum Energy Limit information

Hourly Components – These are physical Bid parameters that may vary from one Trading Hour to the next through the Trading Day. Hourly components are not applicable for Virtual Bids except as noted below:

- RUC Availability Bid price

- RUC Availability Bid quantity

- Capacity Limit Indicator

- Ancillary Services quantities

- Ancillary Services Bid prices

- Contingency Dispatch information

- Self-Provision quantities

▪ Energy Bid Curve (Virtual Bids consist of only the Energy Bid Curve)

▪ Demand Bid curve

▪ Pump Shut-Down and Pumping Cost information

▪ Pumping Level

▪ Distribution Location and Factors (for a Generating Unit that consists of multiple individual Generating Units)

8.1.2   Hour Ahead Scheduling Process & Real-Time Market

The RTM for a given Trading Hour opens after the DAM results are published for the Trading Day that includes the relevant Trading Hour (by 1300 hours of the day before the Trading Day) and closes 75 minutes before the start of that Trading Hour. RTM Bids are submitted for one-hour periods (the Trading Hour) of the Trading Day.

The daily and hourly components of the Bid are the same as for the DAM. If daily components are submitted for a Generating Unit with the Day-Ahead Market Bid, the SC does not need to submit this data again for the RTM.

8.2   Energy Bid Validation Rules

This section is based on the following CAISO Tariff sections:

➢ CAISO Tariff Section 30.7, Bid Validation
➢ CAISO Tariff Section 30.10, Format and Validation of Operational Ramp Rates
➢ CAISO Tariff Section 30.11, Format and Validation of Startup and Shutdown Times
➢ CAISO Tariff Section 30.12, Format and Validation of Startup and Shutdown Costs
➢ CAISO Tariff Section 30.12, Format and Validation of Minimum Load Costs
➢ CAISO Tariff Section 30.7.3.6.2 Credit Requirement

CAISO validates all Energy Bids submitted by SCs prior to carrying out any of the market processes. Bids are validated for content and for consistency with the Registered Data contained in the Master File. In addition Virtual Bids are validated for available credit with the Credit Tracking System. For physical Bids, the rules can also generate Bids for any missing or invalid data. The same basic approach to Bid validation takes place for the DAM and the RTM, with one additional step in the DAM to validated Bids against updated Master File content. CAISO carries out Bid validation in four steps:

Step 1: CAISO validates all Bids after submission of the Bid for content, which determines that the Bid adheres to the structural rules required of the Bid (as described in more detail in Section 8.2.48.2.3). If the Bid fails any of the content level rules, CAISO assigns the Bid a status of "Rejected Bid" and the SC has the opportunity to correct and re-submit the Bid.

Step 2: After the Bids are successfully validated for content, but prior to the Market Close of the DAM, CAISO carries out the second level validation rules to verify that the Bid adheres to the applicable CAISO Market rules and if applicable, limits based on the content of the Master File. If the Bid fails any level two validation rules, CAISO assigns the Bid a status of "Invalid" and the SC has the opportunity to correct or resubmit the Bid.

Step 3: Physical Bids Only - If the Bid successfully passes validation in Step 2, it continues through the third level of processing where CAISO analyzes the Bid based on its content, to identify any missing Bid components that must be present for the Bid to be valid consistent with the market rules. At this stage, the Bid is either automatically modified for correctness and assigned a status of:

- "Conditionally Modified" or "Valid"

Step 4: Virtual Bids Only - If the Virtual Bid successfully passes validation in Step 2, it is passed on to the Credit Tracking System where it will be validated against available credit, if Approved the assigned Bid status will remain as "Conditionally Valid" or "Valid", if Disapproved, the assigned Bid status will be set to "Invalid".

Virtual Bid position limits exist at each location and are associated to a Convergence Bidding Entity which may have multiple Scheduling Coordinators authorized to submit Virtual Bids at each location. Bidding validation rules are triggered each time a Virtual Bid is submitted, if the sum of all bids at that location by the Scheduling Coordinators associated to a single Convergence Bidding Entity exceeds the Position Limit, all bids at that location for that Convergence Bidding Entity will become Invalid.

Physical Bids that trigger bidding validation rules that result in warnings do not result in an invalid or rejected Bid status but simply notify the user of an issue with the Bid that they have submitted. SCs will need to take action on warnings to ensure their Bids or Trades will be accepted for a particular market.

Bids submitted in advance of the DAM are revalidated after the daily Master File update. After the update, all conditional Bids must be re-validated prior to the trading period when the Bid takes effect. After Market Close for the DAM or RTM, to the extent that SCs fail to enter a Bid for certain resources that are required offer RA capacity, CAISO creates Energy Bids for these resources, called a Generated Bid. After Market Close for the DAM the CAISO also creates required $0 RUC Availability Bids for certain resources as well as the AS bids for those resources. Except for bids created by the CAISO, an SC can cancel a Bid any time prior to Market Close by selecting the "Cancel" button on the Bid summary page of the SIBR application or by submitting the Web Action message through web services.

> NOTE: In order to allow for sufficient time to resolve any possible validation/balancing issues before closing of a Market, Bids, including Self-Schedules, should be submitted within 30 minutes of Market Close.

Warnings are issued in the following cases:

➢ Wheeling Through transactions that are not matched (Balance Indicator is "N", meaning that there is no matching Wheeling Reference for either the Import or Export bid in the Wheeling Bid Component). Such Bids will be erased if the wheeling reference does not match.

➢ Inter-SC Trades counterparties are not matched. Inter-SC Trades without matching counterparties are deemed invalid at market close time.

➢ Circular dependency found in a chain of Inter-SC Trades. Trades with circular dependencies are deemed invalid at market close time.

➢ ETC or TOR Self-Scheduled sources and sinks that are not balanced. ETC or TOR Self-Schedules that are not balanced by market close time will not have physical scheduling priority.

➢ ETC Self-Schedules that are over the Entitlement amount. ETCs that are over their Entitlement amount at market close time will not have physical scheduling priority. TOR Self-Schedules that are over the transmission right amount. TORs that are over there transmission right amount will not have physical scheduling priority at market close time.

NOTE: Individual ETCs and TORs may be part of a chain (a combination of individual TORs or ETCs used in sequence). Each submission of an ETC or TOR Self-Schedule that is part of a chain will trigger notification to ALL Scheduling Coordinators associated with the registered chain.

Detailed steps that CAISO validation processes are outlined in Sections 8.2.1 to 8.2.3

8.2.1   Day-Ahead Market Validation
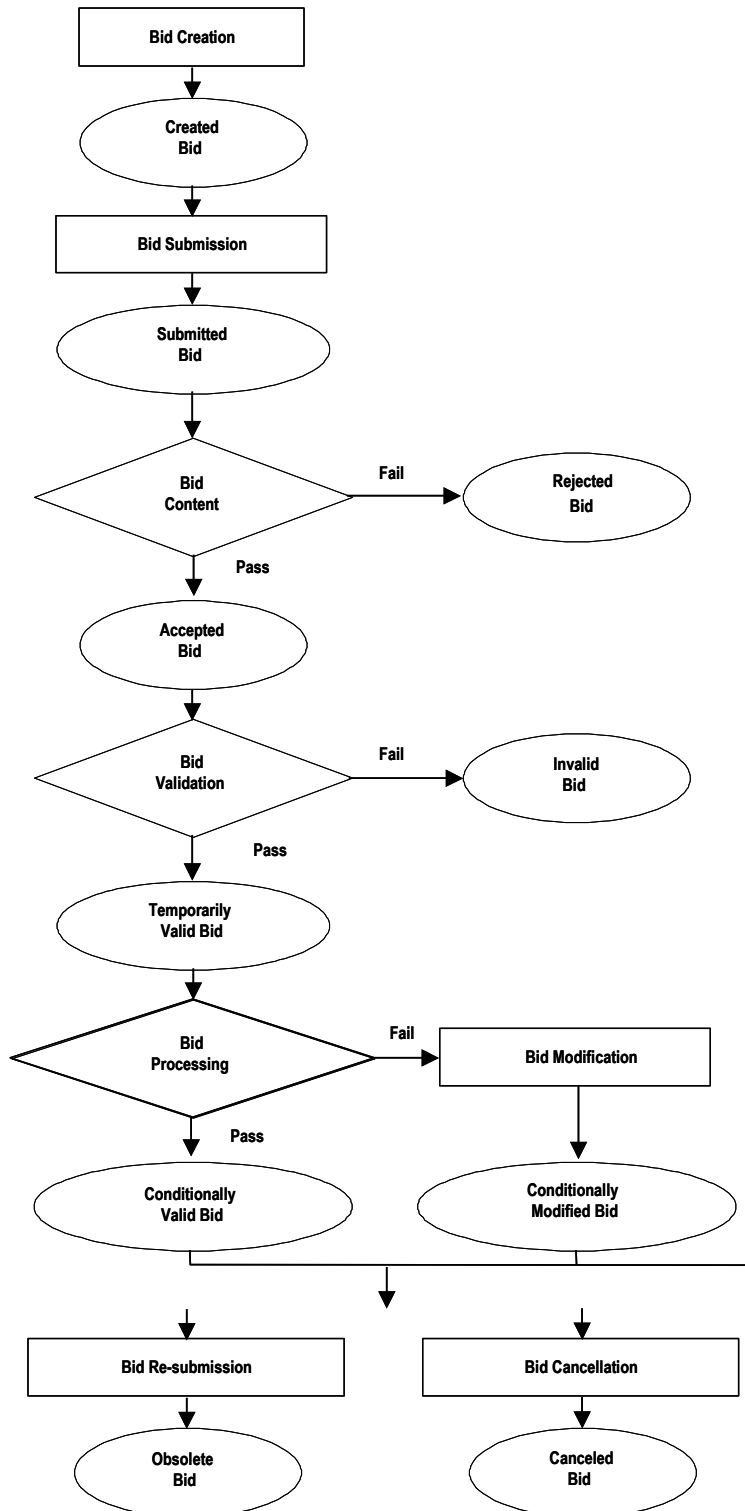
CAISO's DAM validation includes validation steps prior to the close of the market, including the update to Master File.

8.2.1.1   Physical Bid Validation Prior to Market Close & Master File Update

Exhibit 8-1 below outlines the steps CAISO takes to validate Physical Bids prior to Market Close and Master File update.

Exhibit 8-1: Bid Validation Prior to Market Close

1) **Bid Creation** – SCs create Bids, entering all required data.

2) **Bid Submission** – SCs submit Bids into the SIBR platform.

3) **Level 1: Bid Content Validation** – After the SC submits a Bid, CAISO rules engine performs a Bid content validation, to verify that the Bid is structurally complete and correct. In this step, CAISO evaluates whether the Bid adheres to all the "structural rules" required of Bids. This includes such things as validating that all required components are present and the resources or services contained in the Bid actually exist. References to the Bidding rule details are in Attachment A of this BPM.

4) **Bid Acceptance** – If the Bid passes the Bid content validation in Step 1, CAISO categorizes the Bid as an "Accepted Bid". If the Bid fails any of the content validation rules, CAISO assigns the Bid a "Rejected Bid" status. The SC must correct and re-submit the Bid.

5) **Level 2: Bid Validation** – All Accepted Bids undergo Bid validation for the entire Trading Day immediately after Bid submission to ensure all Bid contents are present and valid. Accepted Bids that fail Bid validation become Invalid Bids and Accepted Bids that pass Bid validation become Temporarily Valid Bids. This Bid is then eligible to be used in the Markets. CAISO remembers any errors and informs the SC that validation is complete, and provides the error analysis to the SC. If the validation fails, the Bid becomes an "Invalid Bid" and the SC must correct and re-submit the Bid. CAISO validates that the components of the Bid meet the applicable market rules. e.g., the Bids are a) consistent with the contents of the Master File; and b) for RTM Bids, consistent with the Schedule and Award from the Day-Ahead Market. If the Bid passes CAISO validation, CAISO characterizes the Bid as a "Temporarily Valid Bid".

Note for Multi-Stage Generating Resource bids: If any configuration within a bid does not pass Bid Content or Bid Validation all configurations submitted as part of the bid will also become Rejected or Invalid. Warning messages will indicate which configuration caused the bid to become Rejected or Invalid.

6) **Level 3: Bid Processing** – The Bid is only processed (or modified for correctness) if it at least passes through all content and validation rules, which means that the Bid submitted is structurally correct and conforms to all Master File parameters. Once a Bid passes through the content and validation rules, it

may be modified if it violates any of the processing rules. CAISO analyzes the "Temporarily Valid Bid" to identify any missing Bid components that must be present for the Bid to be valid. CAISO either modifies the Bid for correctness and assigns it a status of "Conditionally Valid Bid" or modifies the Bid and assigns it a status of "Conditionally Modified Bid". The detailed Bid processing rules are referenced in Attachment A of this BPM. At this point the SC may leave the bid unchanged or initiate a change as follows:

a) Cancel the Bid, in which case CAISO retains the Bid in the system as a "Cancelled Bid". CAISO does not process Cancelled Bids.

b) Modify and re-submit the Bid, in which case CAISO retains the original Bid in the system as an "Obsolete Bid". CAISO does not process Obsolete Bids. The re-submitted Bid is processed as a new Bid, starting with Level 1, content validation. If the new Bid is Invalid or Rejected, the current Valid or Modified Bid remains active in the designated market.

c) If the SC does not want to make any changes to their existing Bid, they may leave the Conditionally Modified Bid or Conditionally Valid Bid as is to be processed in the appropriate CAISO Market.

7) **Bid Status** – Summary of how Bid Status changes.
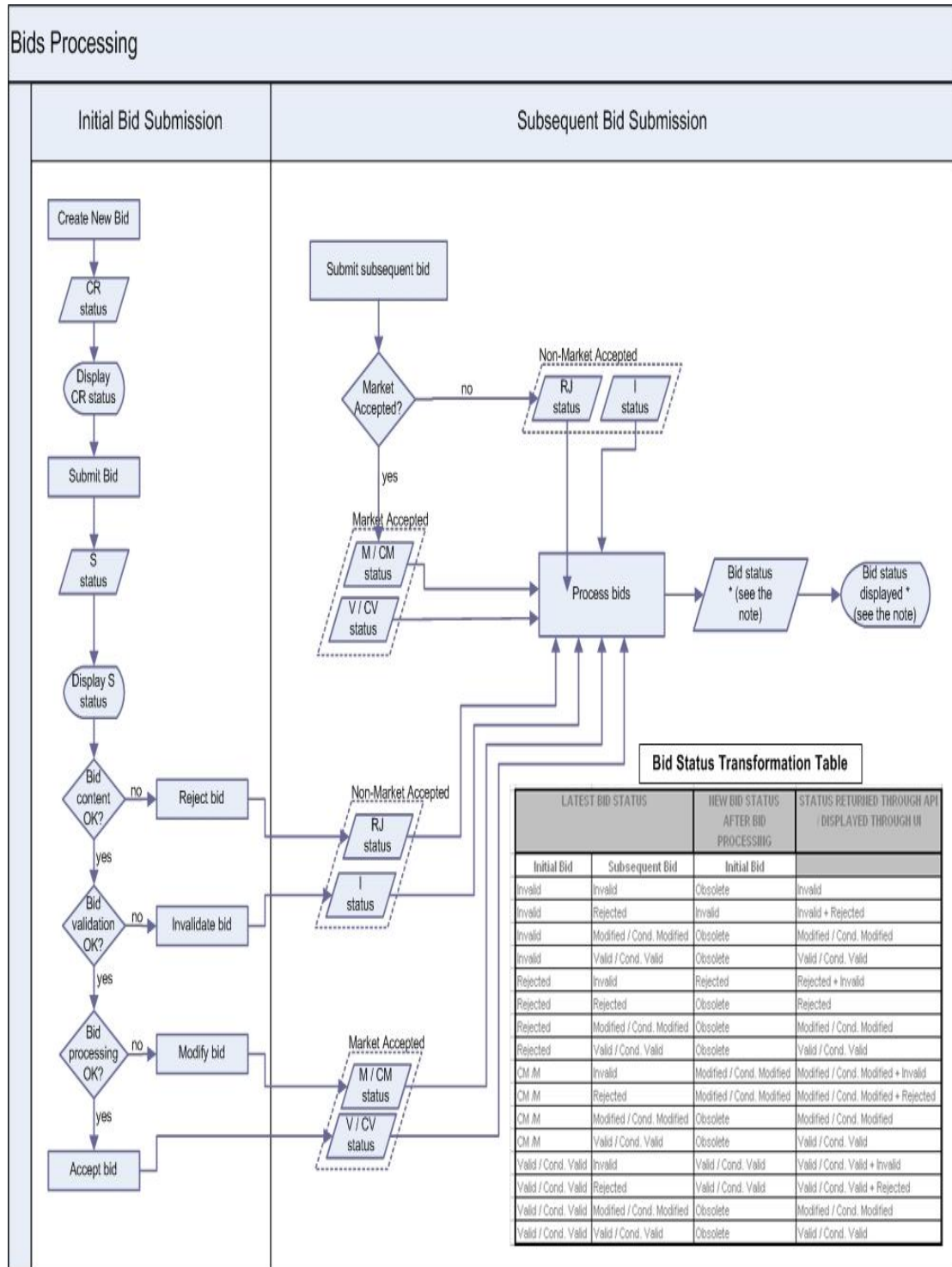
8.2.1.2   Virtual Bid Validation Prior to Market Close and Master File Update

1) **Bid Creation** – SCs create Virtual Supply and Demand Bids, entering all required data.

2) **Bid Submission** – SCs submit Bids into the SIBR platform.

3) **Level 1: Virtual Bid Content** – After the SC submits a Bid, CAISO rules engine performs a Bid content validation, to verify that the Bid is structurally complete and correct. In this step, CAISO evaluates whether the Bid adheres to all the "structural rules" required of Bids. This includes such things as validating that all required components are present and the resources or services contained in the Bid actually exist. Please refer to the Bidding rule details that are in Attachment A of this BPM.

   - **Virtual Bid Acceptance** – If the Bid passes the Bid content check the CAISO categorizes the Bid as a temporarily valid and passed to through to the next set of rules for step 2. If the Bid fails any of the content rules, CAISO assigns the Bid a "Rejected" status. The SC must correct and re-submit the Bid.

4) **Level 2: Virtual Bid Validation** – All Bids that pass the content check in Step 1 undergo Bid validation for the entire Trading Day, Bids that fail validation become an "Invalid Bid" and the SC must correct and re-submit the Bid. If the Bids are consistent with the contents of the Master File the Bid passes CAISO validation, CAISO characterizes the Bid as a "Conditionally Valid" or "Valid".

5) **Level 3: Virtual Bid Credit Approval Processing** – Only a "Conditionally Valid" or "Valid" Bid will be sent to the Credit Tracking System for credit approval. Depending on the available credit for the Convergence Bidding Entity a credit status for the Bid will be returned as "Approved" or "Disapproved", A credit status returned as "Approved" will retain the Bid status of either "Conditionally Valid" or "Valid". If the credit status is returned as "Disapproved" then the Bid status will be set to "Invalid". The detailed Bid processing rules are referenced in Attachment A of this BPM. At this point the Scheduling Coordinator may leave the bid unchanged or initiate a change as follows:

   a) Cancel the Bid, in which case CAISO retains the Bid in the system as a "Cancelled Bid". A cancelled bid will be sent to the Credit Tracking System for a release of the credit.

    b) Modify and re-submit the Bid, in which case CAISO retains the original Bid in the system as an "Obsolete Bid". Obsolete bids will be sent to the Credit Tracking System for credit release prior to the modified bid being sent to the Credit Tracking System. If the new Bid is Invalid or Rejected, the current Valid or Conditionally Valid Bid remains active in the designated market.

If the SC does not want to make any changes to their existing Bid, they may leave the "Conditionally Valid" or" Valid" Bid as is to be processed in the appropriate CAISO Market

Exhibit 8-2 below outlines the steps CAISO takes to validate Virtual Bids prior to Market Close and Master File update.

Exhibit 8-2: Bid Validation Prior to Market Close
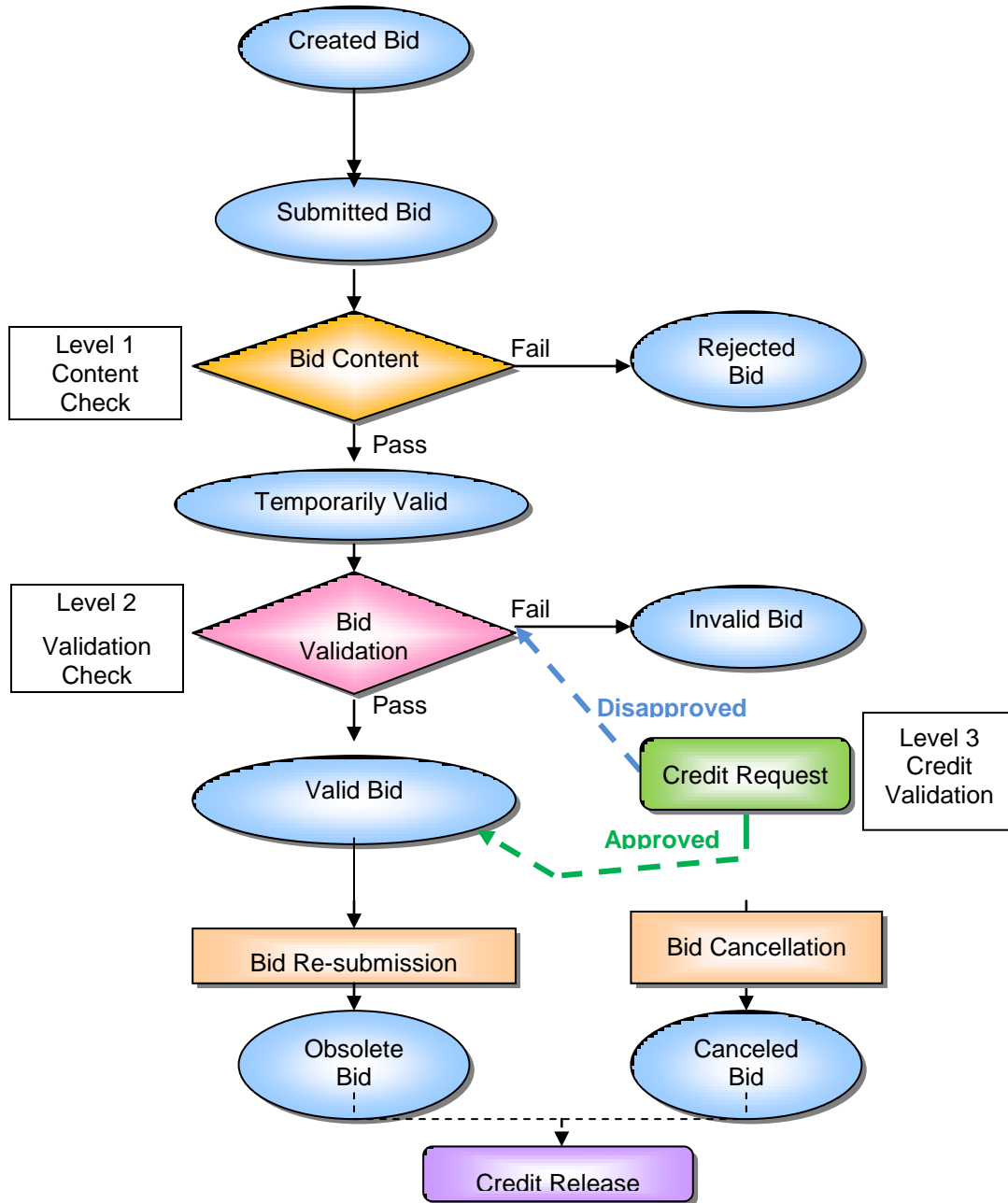
8.2.1.3   SIBR Generated Bid (Physical Bids only)

In the event that SIBR must generate a Bid or Bid component to comply with Tariff requirements SIBR will generate a Bid or Bid component for the resource. There is a series of processing rules that are executed to establish the Start-Up and Minimum Load Cost in SIBR to generate the Bid with the proper Start-Up and Minimum Load costs based on the resource's election of either the Proxy Cost Option or the Registered Cost Option , and if it is a Natural Gas resource or Non-Natural Gas resource. Registered Cost resources use the values provided for the resource that are in the Master File.

The Start-Up Cost Bid Curve specified in the generated Start-Up Bid Component for an Online Generating Resource State in a Generating Resource Bid must be Proxy Start-Up Cost Curve for that Online Generating Resource State of the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Start-Up Cost Basis of "Proxy Cost" for that Bid Period. If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid).	
The Start-Up Energy Cost Curve used to derive the Proxy Start-Up Cost Curve for an Online Generating Resource State in a Generating Resource Bid must be calculated as the product of the registered Start-Up Energy Curve for that Online Generating Resource State and the registered Energy Price Index, for the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Start-Up Cost Basis of "Proxy Cost" for that Bid Period.	
If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid). The Start-Up Fuel Cost Curve used to derive the Proxy Start-Up Cost Curve for an Online Generating Resource State in a Generating Resource Bid must be the registered Start-Up Fuel Cost Curve for that Online Generating Resource State for the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Start-Up Cost Basis of "Proxy Cost," but not as a Natural Gas Resource for that Bid Period. If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid).	
The Start-Up Fuel Cost Curve used to derive the Proxy Start-Up Cost Curve for an Online Generating Resource State in a Generating Resource Bid must be	

calculated as the product of the registered Start-Up Fuel Curve for that Online Generating Resource State and the registered Gas Price Index, for the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Start-Up Cost Basis of "Proxy Cost" and as a Natural Gas Resource for that Bid Period.
If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid).

The Start-Up Cost Bid Curve specified in the Start-Up Bid Component for an Online Generating Resource State of a Generating Resource Bid must be replaced by the registered Start-Up Cost Curve for that Online Generating Resource State of the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Start-Up Cost Basis of "Registered Cost" for that Bid Period.
If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid).

If a Start-Up Cost of the Start-Up Cost Bid Curve specified in a Start-Up Bid Component for an Online Generating Resource State in a Generating Resource Bid is greater than the corresponding Start-Up Cost of the Proxy Start-Up Cost Curve for that Online Generating Resource State of the Generating Resource and Bid Period specified in that Bid, that Start-Up Cost must be replaced by the corresponding Start-Up Cost of that Proxy Start-Up Cost Curve, if that Generating Resource is registered with a Start-Up Cost Basis of "Proxy Cost" for that Bid Period.

The Proxy Start-Up Cost Curve for an Online Generating Resource State in a Generating Resource Bid must be derived as the sum of the Start-Up Energy Cost Curve and the Start-Up Fuel Cost Curve for that Online Generating Resource State of the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Start-Up Cost Basis of "Proxy Cost" for that Bid Period.
If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid).

The Minimum Load Cost specified in the generated Minimum Load Cost Bid Component for an Online Generating Resource State of a Generating Resource Bid must be the Proxy Minimum Load Cost for that

Online Generating Resource State of the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Minimum Load Cost Basis of "Proxy Cost" for that Bid Period. If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid).	
The Minimum Load Fuel Cost used to derive the Proxy Minimum Load Cost for an Online Generating Resource State in a Generating Resource Bid must be calculated as the product of the registered Average Fuel Cost at Minimum Load and the registered Minimum Load for that Online Generating Resource State for the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Minimum Load Cost Basis of "Proxy Cost," but not as a Natural Gas Resource for that Bid Period. If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid).	MFR: Average Fuel Cost ($/kWh) registry by online state for Generating Resources with a Cost Basis of "Proxy Cost" not registered as Natural Gas Resources (0 by default).
The Minimum Load Fuel Cost used to derive the Proxy Minimum Load Cost for an Online Generating Resource State in a Generating Resource Bid must be calculated as the product of a) the registered Average Heat Rate at Minimum Load, b) the registered Minimum Load, for that Online Generating Resource State, and c) the registered Gas Price Index, for the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Minimum Load Cost Basis of "Proxy Cost" and as a Natural Gas Resource for that Bid Period. If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid).	MFR: Average Heat Rate (Btu/kWh) registry by online state and Gas Price Index ($/MMBtu) registry for Generating Resources with a Cost Basis of "Proxy Cost" registered as Natural Gas Resources (0 by default).
If the Minimum Load Cost specified in the Minimum Load Cost Bid Component for an Online Generating Resource State in a Generating Resource Bid is greater than the Proxy Minimum Load Cost for that Online Generating Resource State of the Generating Resource and Bid Period specified in that Bid, that Minimum Load Cost must be replaced by that Proxy Minimum Load Cost, if that Generating Resource is registered with a Minimum Load Cost Basis of "Proxy Cost" for that Bid Period.	MFR: Minimum Load Fuel Cost ($/hr) and Operation and Maintenance Cost ($/MWh) registry by online state for Generating Resources with a Minimum Load Cost Basis of "Proxy Cost".
The Proxy Minimum Load Cost for an Online Generating Resource State in a Generating Resource Bid must be derived as the sum of the Minimum Load Fuel Cost ($/hr) and the product of the registered Operation and Maintenance Cost ($/MWh) and the	

registered Minimum Load (MW) for that Online Generating Resource State of the Generating Resource and Bid Period specified in that Bid, if that Generating Resource is registered with a Minimum Load Cost Basis of "Proxy Cost" for that Bid Period. If the External Bid Status is not set to "M" (Modified) or "CM" (Conditionally Modified), set the External Bid Status to "MI" (Valid).

Below is an example of how the Bid is generated for Generating Units and Resource Specific System Resources. For non-Resource Specific System Resources, please see Appendix Attachment I.

Bid Curve Generation Example

The Generating Unit in the following example is registered as a natural gas resource. The following registered Master File data is used in the example:

Operating Levels	Average Heat Rate	Gas price index	Operating Maintenance Cost
70	14440	$5.5	$2
150	11960		
300	10909		
485.17	10366		

1) Generated Energy Curve Calculation

The generated Energy Curve is calculated as the sum of the Incremental Fuel Cost curve (calculated in section 3 and 4 below) and the product of the registered Operation and Maintenance Cost ($/MWh) and Minimum Load.

Segment 1 – (**53.85** + 2) = **$55.85**

Segment 2 – (**54.22** + 2) = **$56.22**

Segment 3 – (**52.17** + 2) = **$54.17**

The resulting Energy Curve is:

70MW – 150MW @ $55.85

150MW – 300MW @ $ 56.22

300MW – 485.17MW @ $54.17

The Generated Energy curve must be adjusted to be monotonically increasing. If a Generated Energy Bid Curve is not monotonically increasing, CAISO adjusts the Energy Bid price of each Energy Bid segment after the first one, to the previous Energy Bid segment, if higher, and the two Energy Bid segments are merged in the Energy Bid Curve

2) Final Generated Energy Curve

70MW - 150MW @ 55.85

150MW – 300MW @ 56.22

300MW – 485.17MW @ 54.17

3) Incremental Fuel Cost Curve Calculation

The Incremental Fuel Cost Curve used to derive the Energy Bid Curve must be calculated as the product of the Incremental Heat Rate Curve and the registered Gas Price Index ($/MMBtu) for that Trading Hour and the Generating Resource specified in that Bid, if that Generating Resource is registered as a Natural Gas Resource for that Trading Hour.

Segment 1 - 9790/1000 * 5.5 = **53.85**

Segment 2 – 9858/1000 * 5.5 = **54.22**

Segment 3 – 9486/1000 * 5.5 = **52.17**

4) Incremental Heat Rate Calculation

The Incremental Heat Rate of the Incremental Heat Rate Curve segment between two Operating Levels is calculated as the ratio of the difference between the product of the registered Average Heat Rate at the higher Operating Level times that Operating Level, minus the product of the registered Average Heat Rate at the lower Operating Level times that Operating Level, over the difference between the higher Operating Level and the lower Operating Level

Segment 1 – ((11960 * 150) – (14440 – 70))/(150 – 70) = **9790**

Segment 2 – ((10909*300) – (11960 – 150))/(300-150) = **9858**

Segment 3 – ((10366*485.17) –(10909 – 300))/(485.17 – 300) = **9486**

5) Minimum Load Cost Calculation

Minimum Load Cost = Minimum Load Fuel Cost + (O&M * Minimum Operating Level)

6) Transition Cost Calculation - See Attachment H of this BPM for details.

8.2.1.4   Master File Data Update

Since DAM Bids may be submitted up to seven days in advance they must be revalidated daily based on the daily update of Master File information. The Master File used in SIBR is consistent with the updated Master File for that Trade Day. The Master File can be refreshed daily and can be used for bids submitted up to t +7. However when the Master File refreshes the next day bids that were initially valid may become invalid or rejected based on new Master File data. If a resources changes ownership, the new owner will not be able to input bids or schedules on the resource until the Master File has refreshed for that day.

Bids are assigned a "Conditional" status during the initial Bid validation since the Bid status could change with the update of the Master File information. These Bids are assigned a status of "Conditionally Modified" Bid or "Conditionally Valid" Bid until the final Master File update occurs for the Trading Day designated in the Bid.

The diagram in Section 8.2.1.58.2.1.4 below shows the validation process a Bid goes through when it is in a "Conditional" state. Changes to the Master File for each SC that were submitted at least seven business days in advance are introduced into the system once per day.

8.2.1.5   Physical Bid Validation Prior to Market Close & After Final Master File Update for Trading Day

Exhibit 8-3 shows the steps CAISO uses to validate Physical Bids after Master File update and prior to Market Close.

After the Master File is updated by CAISO, CAISO re-validates all "Conditional" Bids using the following process:

1) CAISO validates the "Conditionally Valid Bids" and the "Conditionally Modified Bids" to establish that the Bids meet the applicable market rules. If the Bid passes the validation process, the Bid becomes a "Temporarily Valid Bid". If the Bid does not pass the validation process, the Bid becomes a "Rejected Bid"

2) CAISO processes the "Temporarily Valid Bid" (using CAISO Market Rules), and either accepts the Bid as submitted, to produce a "Valid Bid" or modifies the Bid to produce a "Modified Bid".

3) The SC reviews the "Valid Bid" or "Modified Bid". At this time the SC may re-submit the Bid (all validation and Bid processing steps are repeated for the new Bid), cancel the Bid or allow the Bid to stand.

4) The SC may also review the "Ind Viewer" tab on the UI at any time to check the balance and priority indicators for ETC/TOR and Wheel bids that were submitted for specified resources.

At the time of Market Close, the "Valid Bid" or "Modified Bid" becomes a "Clean Bid".

Exhibit 8-3: Physical Bid Validation After Final Master File Update and Prior to Market Close

8.2.1.6   Virtual Bid Validation Prior to Market Close & After Final Master File Update for Trading Day
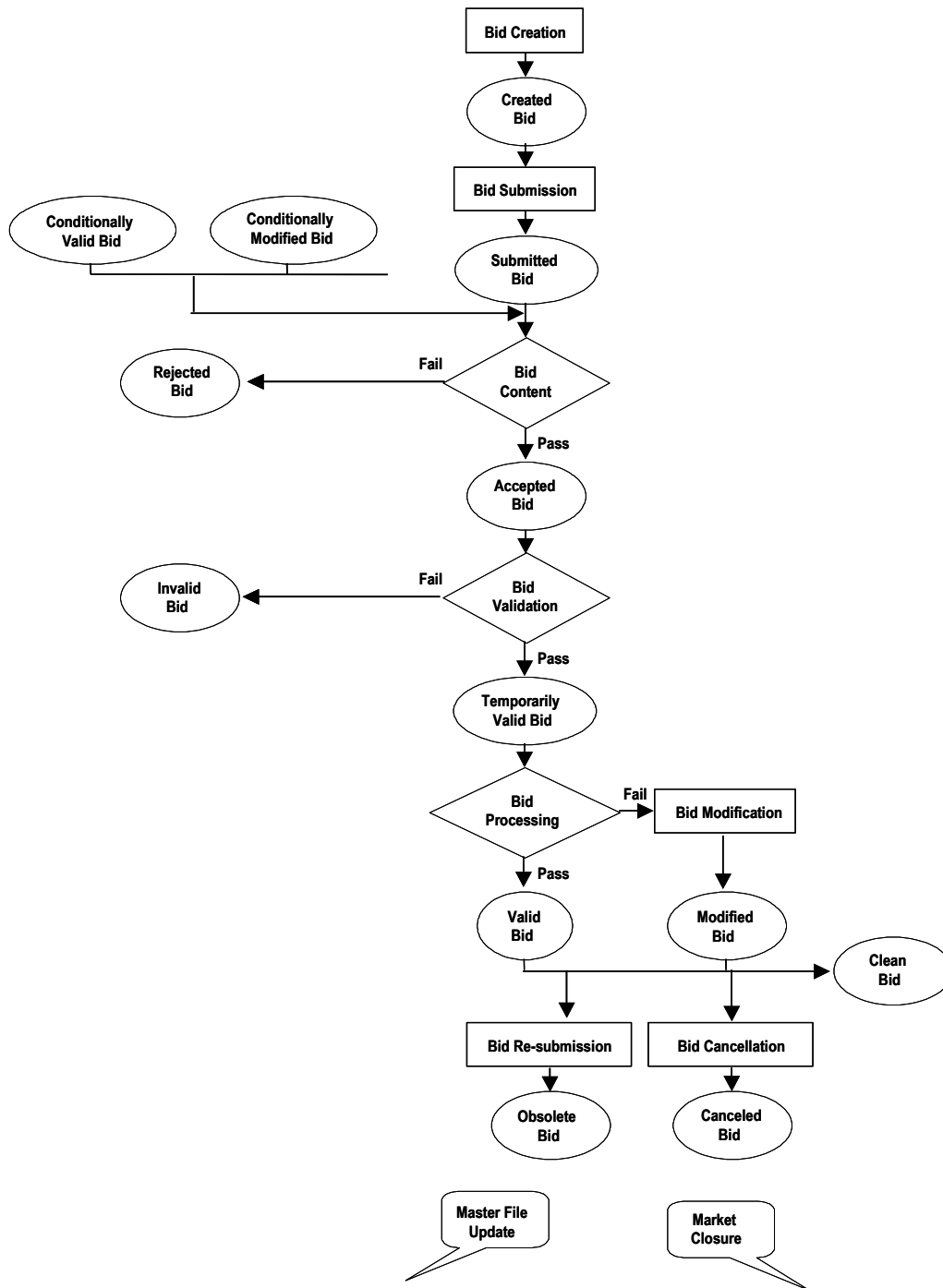
After the Master File is updated by CAISO, CAISO re-validates all "Conditional" Bids using the following process:

1) CAISO validates the "Conditionally Valid Bids" to establish that the Bids meet the applicable market rules. If the Bid passes the content check, the Bid becomes a "Temporarily Valid Bid". If the Bid does not pass the validation process, the Bid becomes a "Rejected" Bid.

2) CAISO passes the temporarily valid through to the Level 2 validation where the bid passes CAISO validation, CAISO characterizes the Bid as a "Conditionally Valid" or "Valid" or if the Bid fails validation it will become an "Invalid Bid" and the SC must correct and re-submit the Bid.

3) The SC reviews the "Valid Bid", at this time the SC may re-submit the Bid (all validation and Bid processing steps are repeated for the new Bid), or cancel the Bid or allow the Bid to stand.

4) The SC may also review the "Limit Viewer" tab on the UI at any time to see if any changes may have affected any position limits associated to a location associated to an Inter-Tie scheduling point specified in a bid.

5) Virtual Bidding may be suspended or limited by the CAISO either by SC, Location, or Convergence Bidding Entity at a Location to adjust Position Limits. These actions are supported by Tariff section 39.11.2.

Exhibit 8-4 shows the steps CAISO uses to validate Virtual Bids after Master File update and prior to Market Close.

Exhibit 8-4: Virtual Bid Validation After Final Master File Update and Prior to Market Close
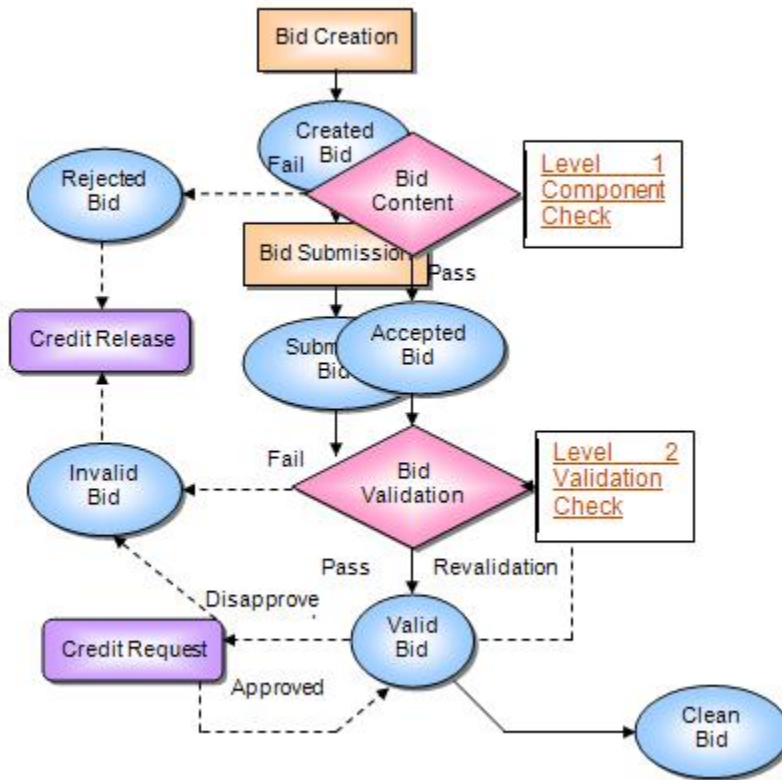
At the time of Market Close, the "Valid Bid" becomes a "Clean Bid".

8.2.1.7　　Validation After Market Close (Not applicable to Virtual Bids)

If an SC fails to submit a Bid for the full amount of available RA Capacity from a Generating Unit or Dynamic System Resource (Resource Specific System Resource) other than Use-Limited and Hydro Resources, CAISO creates an Energy Bids for these resources, called Generated Bids. CAISO creates Generated Bids after Market Close for the DAM using data in the Master File or through data provided by the applicable SC. CAISO notifies the SC of the use of a Generated Bid for each Generating Unit prior to Market Clearing of the IFM.

The Generated Bid is provided to the SC. The SC may view the Generated Bid but may not modify the Generated Bid.

8.2.2　　Open / Isolated Intertie Validation

The ISO market systems will validate all System Resources Bids, including Self-Schedules, for each Trading Hour with regard to open or isolated Intertie conditions on associated Intertie constraints (ITC) and market scheduling limits (MSL). This validation is based on the directional operational transfer capability (OTC) and the isolated Intertie status reported by the Existing Transmission Contract Calculator (ETCC) on the ITCs / MSLs.

Section 30.8 prohibits Scheduling Coordinators from submitting Bids, including Self-Schedules, on transmission paths that are out-of-service, i.e., the transmission OTC is rated at zero. These open Intertie conditions occur when the OTC is zero in both directions of the Intertie or path. If Scheduling Coordinators submit Bids at such locations, the Section 30.8 requires that the ISO reject such Bids or Self-Schedules. An isolated Intertie condition is one where the OTC is non-zero in one direction, but that OTC is reserved for resources registered as stranded load in the master file.

Under open Intertie conditions, all associated resource Bids are marked as inadmissible during the hours where the condition exists. Under an isolated Intertie condition, all associated resource Bids are marked as inadmissible, during the hours where the condition exists, except resources registered as stranded load in the direction of the non-zero OTC. In either case, inadmissible Bids are ignored in the market applications (DAM/RTN), thereby rejected by the applicable market run. While the ISO markets ignore inadmissible Bids and in effect rejecting these Bids, these Bids are not rejected or modified as are bids that fail other validation rules. Rather, an hourly indicator in the Bid indicates that the Bid is inadmissible due to open/isolated Intertie conditions. This hourly indicator is displayed on the graphical user interface for each hourly Bid component. Additionally, the Bid processing rules that determine this indicator are displayed in the defined error messages and returned in an API per rule error message.

8.2.3   RTM Validation

CAISO uses the same process to validate Bids for the RTM, with the exception that CAISO does not validate the Bid before and again after the Master File update. CAISO only validates the RTM Bids based on the current Master File Data on the relevant Trading Day.

8.2.4   Validation Process

The Bid validation process is divided into three categories:

  ➢ Bid Content
  ➢ Bid Validation
  ➢ Bid Processing

The detailed rules used in the validation process are referenced in Attachment A of this BPM.

All Bid processing rules are specific to the Bid component and are described in the relevant sections of Appendix A.

9.   Inter-SC Trades

Welcome to the *Inter-SC Trades* section of the CAISO *BPM for Market Instruments*. In this section you will find the following information:

A description of Inter-SC Trades of Energy and the timeline for submittal, and the validation rules for this type of Inter-SC Trade

A description of Inter-SC Trades of Ancillary Service capacity

A description of Inter-SC Trades of IFM Load Uplift Obligation

CAISO facilitates Inter-SC Trades (ISTs) of Energy, Ancillary Services, and IFM Load Uplift Obligation through the settlement process. ISTs do not have any impact on the scheduling or dispatch of resources. They affect only the financial settlement process. Only trades that SCs want to settle through CAISO are submitted in the IST process.

9.1   Inter-SC Trades of Energy

This section is based on CAISO Tariff Section 28.1, Inter-SC Trades of Energy.

CAISO facilitates ISTs of Energy. These Inter-SC Trades comprise two types:

Trades at Aggregated Pricing Nodes that are also Defined Trading Hubs or LAPS (APN) – Where the Inter-SC Trade is not backed by a physical resource. The CAISO will facilitate ISTs (APN) only at defined Trading Hubs and Default LAPs.

Physical Trades – Where the Inter-SC Trade is backed by a physical resource.

An IST of Energy is defined as

An Energy quantity (MWh)

Traded from one SC to another SC

For a specific hour, trade Location, and market (e.g., DAM or RTM)

For a specific type of Inter-SC Trade – Physical Trade (PHY), Aggregate Pricing Nodes (APN), Converted Physical Trade (CPT)

ISTs for Energy can take place in both the DAM and RTM. ISTs of Energy submitted for the DAM are settled at the applicable LMPs at the Aggregated Pricing Nodes or at the Pricing Node

specified in the IST. ISTs of Energy submitted in the RTM are settled hourly based on the simple average of the Dispatch Interval LMP at the applicable Aggregated Pricing Node or the Pricing Node specified in the IST.

9.1.1   Timeline

Inter-SC Trades for the Day-Ahead Market may be submitted beginning seven days prior to the Trading Day up to 1200 hours the day prior to the Trading Day. Inter-SC Trades for the Real-Time Market may be submitted beginning at midnight the day prior to the Trading Hour up to 45 minute prior to the Trading Hour.

The timeline for submission and validation of Energy IST is shown in Exhibit 9-1.

Exhibit 9-1: Timeline of Inter-SC Trades

Stages	Day-ahead Timeline	Real-time Timeline	Activities
1	Up to seven days prior to the Trading Day Only ISTs for Energy (both PHY and APN) are submitted into the DAM.	Beginning at 12:00 a.m. the day prior to the Trading Hour ISTs for Energy (APN and PHY) as well as ISTs for Ancillary Services and IFM Load Uplift Obligation are submitted.	SCs continuously submit ISTs before Inter-SC Trade Close Time and Bids before Market Close time to CAISO. CAISO continuously screens each submitted IST to check contents and search for matching IST submitted by the counterparty SC. CAISO provides feedback to the SCs regarding the validity of the ISTs based on the information that is available to CAISO at that time.
2	Between 0600 hours and 1200 hours of the day prior to the Trading Day.	Between T-180 and T-45 min (the Inter-SC Trade Close Time for IST submission in the RTM)	SCs continuously submit ISTs before Inter-SC Trade Close Time and Bids before Market Close time to CAISO. CAISO continuously screens each submitted IST to check contents and search for matching IST submitted by the counterparty SC. CAISO performs pre-market validation to evaluate and adjust PHYs if necessary, based on Generator Unit Energy Bids at pre-specified time intervals (e.g., every 20 minutes, and at the Inter-SC Trade Close Time). CAISO provides feedback to the SCs about the validity of the ISTs based on the information that is available to CAISO at the time.

Stages	Day-ahead Timeline	Real-time Timeline	Activities
3	1300 hrs (approximately)	At T-47 min (approximately)	CAISO performs post-market validation of the ISTs based on the IFM or RTM results, and converts invalid portions of PHYs to Converted Physical Trades. The timing of this event is dependent on the receipt of the Market Results (DA/RT(HASP)).

During the Day-Ahead IST Trading period (which closes at 1200 hours), CAISO notifies SCs if their submitted IST does not have a counterparty. At 1200 hours, CAISO rejects any ISTs for the Day-Ahead Market that do not have a matching counterparty. For PHYs, CAISO adjusts the quantity of ISTs if necessary, based on the Generating Unit Bid in the DAM, on which the PHY is dependent. (Note: For Multi-Stage Generating Resources that may be used in a PHY Trade as the location, the maximum quantity of the Energy Curve or Self-Schedule on the highest Configuration will be used in the validation for the PHY Trade).

Beginning at 0600 hours CAISO conducts pre-market validation on PHYs based on the Bids reflecting the dependent Generating Unit. SCs are sent warnings if necessary that their Inter-SC Trades may be adjusted at the close of the market. PHY Trades that are not supported by a market accepted bid will be adjusted to 0. Pre-market validation continues to run every 20 minutes until Inter-SC Trade market close time of1200 hours.

When the DAM clears, at approximately 1300 hours, CAISO conducts a post-market validation on Day-Ahead PHYs, based on the final DAM results from the IFM. Any portion of a PHY, where the dependent Generating Unit's final Day-Ahead Schedule is less than the PHY trade amount becomes a Converted Physical Trade (CPT). CAISO informs the SC of the amount of the CPT.

SCs may submit Inter-SC Trades for the RTM from 0000 hours of the day prior to the Trading Day up to 45 minutes prior to Market Close (Real-Time IST Trading Period). During the Real-Time IST Trading Period, CAISO validates the ISTs for content as well as searching for the matching IST submitted by the designated counterparty. Beginning at T-180 up until T-45, CAISO conducts pre-market validation every 20 minutes based on the Bid reflecting the Generating Unit. SCs are warned that their Inter-SC Trades may be adjusted at the close of the market. At T-45, CAISO rejects any Inter-SC Trades that do not have a matching counterparty.

CAISO conducts a post-market validation using the HASP awards once the RTM has closed. Any invalid quantities where the dependent Generating Unit's Real-Time Dispatch Instructions do not cover the PHY amount becomes a CPT. CAISO informs the SC of the amount of the CPT.

Example of PHY Trade Validation (simplified):

Trade A   PHY Trade Qty= **100MW** (using a resource "Res_1" as the location).

Res_1 has a Bid/Schedule = **80MW**

Pre-cyclic validation runs to see the 80MW submitted and adjusts the "**Trade A"** PHY Trade Qty = **80MW**.

Market results are returned to SIBR from IFM; "**Res_1"** clears with **50MW** instead of the bid in 80MW.

Post-cyclic validation runs and now sees the 50MW award for "Res_1" and does the following:

Adjusts "**Trade A"** PHY Trade Qty = **50MW**

Generates the **CPT** for "**Trade A"** Trade Qty = **30MW** (difference between adjusted Trade Qty and IFM award with the Trading Location at the Trading Hub.

So the IFM Award of 50MW plus the generated CPT of 30MW = the Adjusted Trade quantity of the Pre-cyclic validation.

This works the same way for the RTM with the exception that during the Pre Cyclic Validation there is also a check for any DA Trade Qty on the PHY Trade using the Resource.

Using the example above as a result of the DA Trade where the PHY "Trade A" is awarded 50MW.

"Trade A" (RTM)   PHY Trade Qty= **50MW** (using "Res_1" as the location).

Res_1 has a Bid/Schedule = **80MW**

Pre Cyclic Validation runs to see the 80MW submitted and also the DA Trade at that location for 50MW. So the bid = 80MW minus (-) the DA Trade at that location = 50MW results in an adjusted trade quantity for "**Trade A"** (RTM) PHY Trade Qty = **30MW**.

It would then follow the same process for the Post Cyclic Validation to see if any CPT would be generated.

9.1.2 Information Requirements

This section identifies the information requirements for APN ISTs and PHY ISTs. It also presents the validations rules.

9.1.2.1 APN Inter-SC Trades

An SC submitting an APN IST submits the following information

ID of "From" SC

ID of "To" SC

IST Type – APN

Trade Location – i.e., Trading Hub or Load Aggregation Point

Trading Hour, Trading Day

Market Type – i.e., Day-Ahead; Real-Time

Quantity (MW)

9.1.2.2 Physical Inter-SC Trades (PHY)

An SC submitting a PHY IST submits the following information to CAISO:

ID of "From" SC

ID of "To" SC

IST Name

IST Type – PHY

Trade Location – i.e., Generating Unit Location

Trade Time period – i.e., Trading Hour, Trading Day

Market Type – i.e., Day-Ahead; Real-Time

Quantity (MW)

Depend on name – indicating either the name of the Inter-SC Trade on which the current Inter-SC Trade depends on, or the name of the Generating Unit if the generator that supports this PHY is scheduled by the "From" SC ID

9.1.2.3   Validation of IST of Energy

CAISO validates three aspects of the IST:
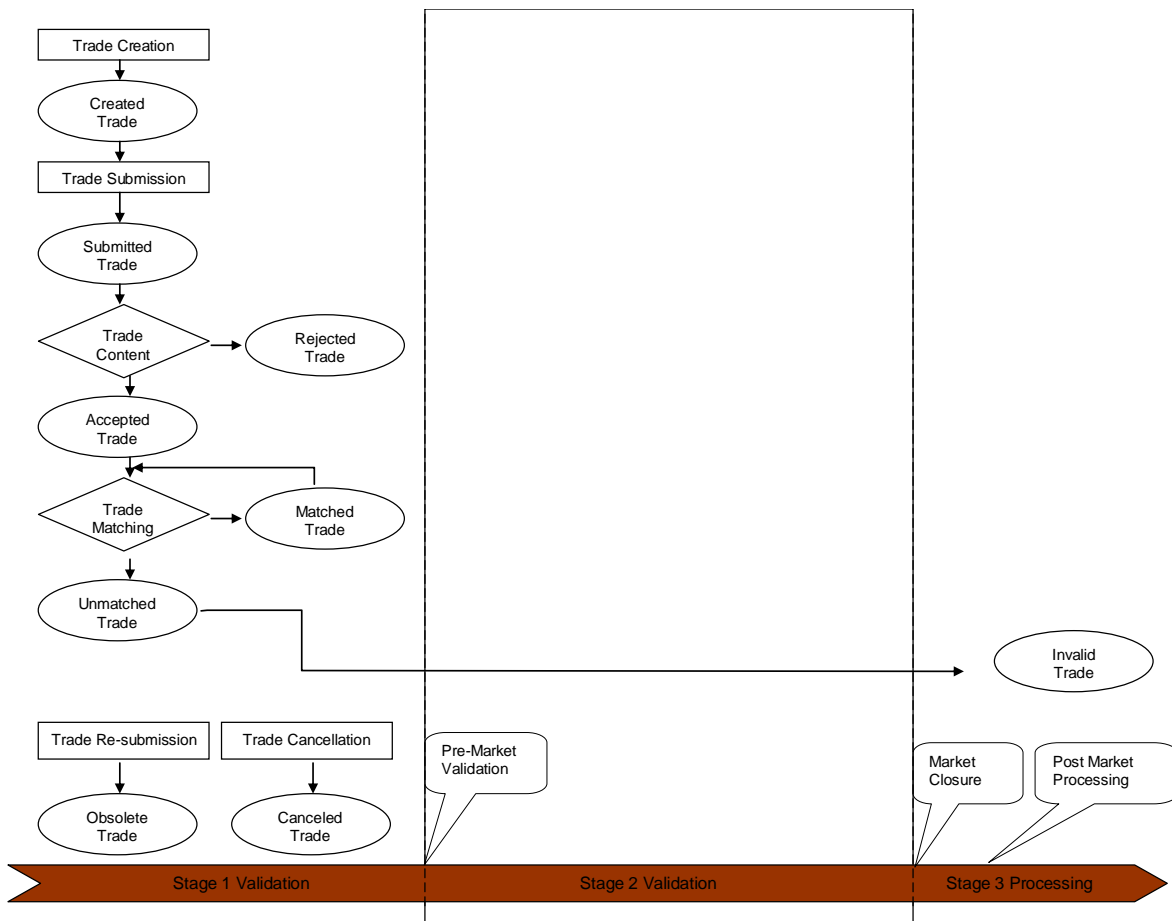
> ➢ Content
> ➢ Validation

Processing

CAISO validates APNs for content and for a matching counterparty to the Inter-SC Trade prior to the Inter-SC Trade Close time. APNs that do not have a matching counterparty to the Inter-SC Trade at the Inter-SC Trade Close time are rejected by CAISO. CAISO notifies the SC of the rejection.

Exhibit 9-2 Validation Process for APN Trades

1) SCs submit APNs. APNs that pass the content validation process are deemed to be "Accepted" APNs.

2) Up until Inter-SC Trade Close time, CAISO searches for matching Inter-SC Trades with counterparty SC. When a match is found, the ISTs are deemed to be a "Matched" IST. Prior to Inter-SC Trade Close time, CAISO continues to search for matching IST and to ensure that any previously "Matched" IST do not become obsolete, due to changes in an IST submitted by a SC. If CAISO determines that a previously "Matched" IST is no longer matched, CAISO deems it to be an "Obsolete" IST.

CAISO validates PHYs prior to and after the CAISO Market clears. In the post-market confirmation of PHYs, CAISO determines whether SC's PHY ISTs are supported (either directly or through an IST with another SC) by a transmission feasible Generating Unit scheduled at the same PNode that has scheduled energy that is equal to or greater than the amount of the IST.

Exhibit 9-3 describes the process CAISO uses to validate the PHY Inter-SC Trades. In addition to the steps used for APN Inter-SC Trade validation, CAISO carries out the following steps:

1) At the Inter-SC Trade Close time, CAISO validates that, for matched PHY Inter-SC Trades, there exists a valid dependent Inter-SC Trade, or physical resource with capacity greater than or equal to the capacity of the Inter-SC Trade. If CAISO does not find either a valid dependent Inter-SC Trade or physical Generating Unit, it designates the Inter-SC Trade as "Invalid". Dependent PHYs must not form a circular relationship without a dependent Generating Unit. If CAISO identifies a circular relationship of PHYs, all PHYs involved in the circular relationship are deemed "Invalid" ISTs.

1) At the Inter-SC Trade Close Time, in the event that the capacity of a matched IST exceeds the capacity of the dependent Generating Unit or IST, CAISO adjusts the amount of the matched IST pro-rata. As noted above, the validation process for the HASP also considers the Day-Ahead PHY ISTs at the same location in determining the validation of HASP PHY ISTs. The pro-rata curtailed portions of PHY ISTs in this process are not settled by CAISO.

2) At Inter-SC Trade Close Time, CAISO determines that all un-matched or "Obsolete" IST are Invalid. All other matched PHY Inter-SC Trades remain classified as "Conditionally Valid" Inter-SC Trades.

3) CAISO validates PHYs after the market clears, to ensure that the amount of a PHY does not exceed the scheduled capacity of the Generating Unit, on which

the IST is dependent. If the capacity of the PHY exceeds the scheduled Energy of the Generating Unit, CAISO adjusts the amount of the PHY to match the scheduled quantity. Any reduction in quantity is converted to a Converted Physical Trade (CPT). At this time each IST is classified as either Modified or Valid.

Exhibit 9-3: Validation Process for PHY Trades of Energy
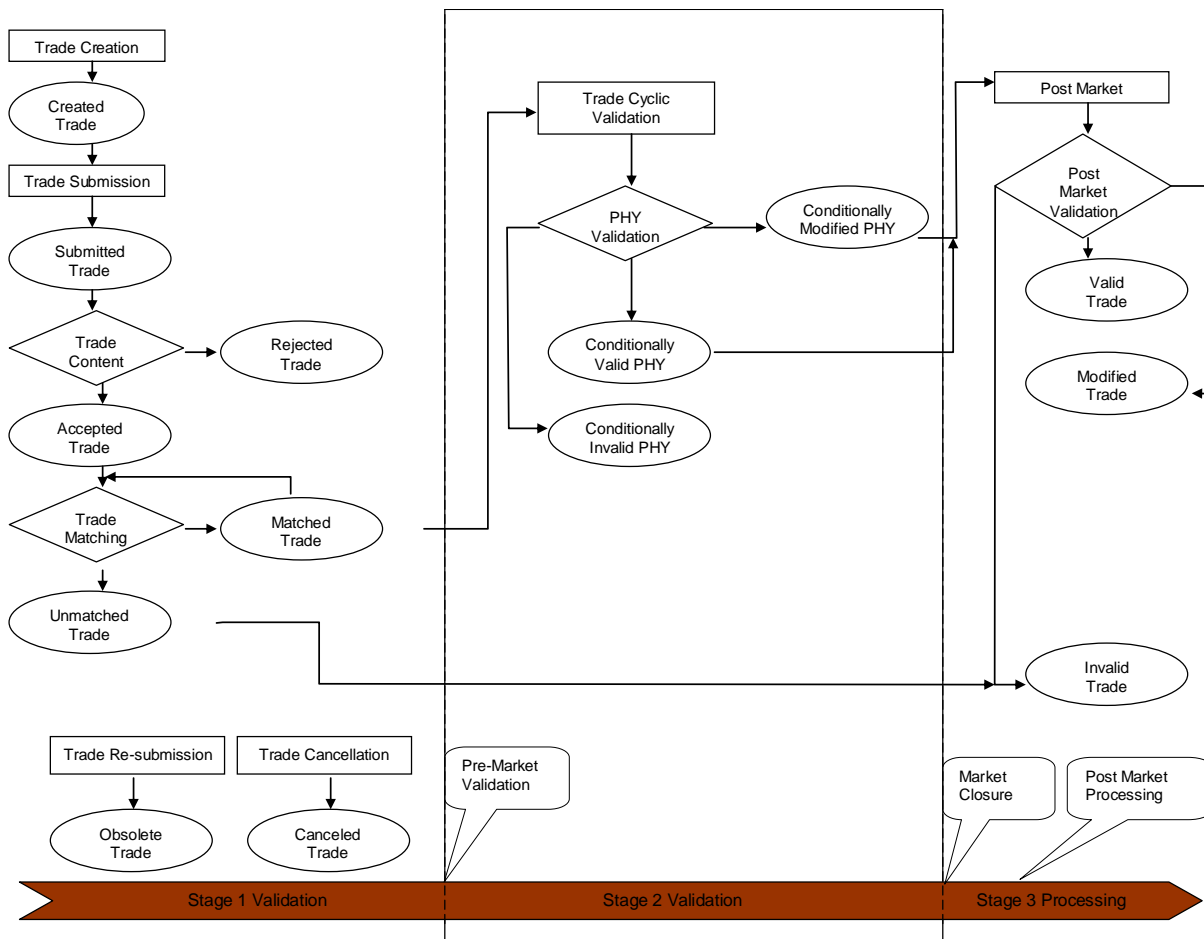
The Inter-SC Trade validation rules are referenced in more detail in Attachment A of this BPM.

It should be noted that in the event of a HASP failure and there is no data to validate PHY Trades at the close of the Trade Market the Final Trades will be generated as PHY Trades at the Adjusted Trade Quantity.

9.2   Inter-SC Trades of Ancillary Services Obligation

This section is based on CAISO Tariff Section 28.2, Inter-SC Trades of Ancillary Services.

SCs have an obligation to pay for AS. SCs may trade the financial obligation for Ancillary Services through an Inter-SC Trade. An Inter-SC Trade of Ancillary Services Obligation is an AS quantity (MW) traded from one SC to another SC for a specific hour and AS type. This is a financial transaction only – it does not allow the SC to trade the obligation to provide Ancillary Services.

Since CAISO charges a single system-wide user rate for each AS, Inter-SC Trades of Ancillary Services Obligation (AST) are settled by the system-wide user rate for the respective service for a specific Trading Hour, independent of markets (RTM or DAM). SCs therefore make a single AST for each Trading Hour. ASTs may be submitted in the HASP Inter-SC Trade Periods. ASTs may be submitted beginning at midnight the day prior to the Trading Hour up to 45 minute prior to the Trading Hour.

9.2.1   Types (Spinning Reserve, Non-Spinning Reserve, Regulation-Up, and Regulation-Down)

There are four types of AS that SCs can trade:

- ➢ Regulation Up
- ➢ Regulation Down
- ➢ Spinning Reserve
Non-Spinning Reserve

9.2.2   Timeline

Inter-SC Trades of AS are submitted by SCs following the Real-Time Market timeline as described in Exhibit 9-4. ASTs may be submitted beginning at midnight the day prior to the Trading Hour up to 45 minute prior to the Trading Hour.

Exhibit 9-4: Timeline of Inter-SC Trades of Ancillary Services

Timeline	Activities
HASP Inter-SC Trade Period	SCs continuously submit ASTs in either Inter-SC Trade Period
	CAISO continuously screens each submitted AST to check contents and search for matching AST submitted by the counterparty SC. CAISO provides feedback to the SCs regarding the validity of the ASTs based on the information that is available to CAISO at that time.

9.2.3   Information Requirements

SCs submitting an AST must provide the following information

Submitting SC ID

From SC ID

To SC ID

AST Type – (Spinning reserve (SPT), Non-Spinning Reserve (NST), Regulation Up (RUT), Regulation Down (RDT)

Trade time period (Trading Hour)

Trading Day

Quantity (MW)

9.2.4 Validation of Inter-SC Trades Ancillary Services

CAISO validates ASTs using the following process:

1) SCs submit ASTs. ASTs that pass the content validation process are deemed to be "Accepted" ASTs

2) Up until the time of Market Close, CAISO searches for matching ASTs with counterparty SC. When a match is found, the ASTs are deemed to be "Matched" ASTs. Prior to Market Close, CAISO continues to search for matching ASTs and to ensure that any previously "Matched" ASTs do not become obsolete, due to changes in an AST submitted by a SC. If CAISO determines that a previously "Matched" ASTs is no longer matched, CAISO deems it to be an "Obsolete" match.

3) At Trade Close Time, CAISO determines that all un-matched or "Obsolete" ASTs are Invalid. All other Matched ASTs are classified as "Valid" ASTs.

The Inter-SC Trade validation rules are referenced in Attachment A of this BPM.

9.3 Inter-SC Trades of IFM Load Uplift Obligation

(This section is based on CAISO Tariff Sections 6.5.4.1.2 and 28.2.3).

ISTs of IFM Load Uplift Obligation measured in MWh is the billing determinant for allocating the IFM Load Uplift Obligation to SCs. CAISO facilitates IST of this obligation between SCs. Similar to Inter-SC Trades of Ancillary Services, CAISO settles the IFM Load Uplift Obligation Trades

using a single system-wide user rate for a specific Trading Hour, independent of markets (RTM or DAM).

9.3.1   Timeline

Inter-SC Trades of IFM Load Uplift Obligation (UCT) are submitted by SCs following the RTM timeline as described in Exhibit 9-5.

Exhibit 9-5: Timeline of Inter-SC Trade of IFM Load Uplift Obligation

Timeline	Activities
Submitted as early as 12:00 midnight on the Trading Day up to the close time of T-45.	SCs continuously submit UCTs in the HASP Inter-SC Trade Periods. CAISO continuously screens each submitted IFM to check contents and search for matching UCT submitted by the counterparty SC. CAISO provides feedback to the SCs regarding the validity of the UCTs based on the information that is available to CAISO at that time.

9.3.2   Information Requirements

A UCT contains the following information:

> ➢ Submission SC ID
> ➢ From SC ID
> ➢ To SC ID
> ➢ Trade time period

Quantity (MW)

9.3.3   Validation of IST IFM Load Uplift Obligations

CAISO applies content and processing rules to IST IFM Load Uplift Obligations (UCT) as referenced in Attachment A of this BPM.

10.   Reporting Information

Welcome to the *Reporting Information* section of CAISO *BPM for Market Instruments*. In this section you will find the following information:

> ➢ A description of the reports that are available to SCs

Technical interface documentation and report content details can be found in the Interface Specification for Market Results Services and Market Results Report Overview documentation at: http://www.caiso.com/2359/2359b9866b2c0.html

10.1   Scope of CMRI Reports available to SCs

Exhibit 10-1.1 summarizes the reports that are available to SCs through the CAISO Market Results Interface (CMRI). Details of the report contents are provided in subsequent sections.

Exhibit 10-1.1: Summary of CMRI Reports

Title	Contents
Day-Ahead Generation Market Results	Day-Ahead Energy Schedules, Ancillary Services Awards, Load Following and RUC Capacity for Generating Units
Day-Ahead Demand Market Results	Day-Ahead Energy Schedules and Ancillary Services Awards of Participating Loads and Day-Ahead Energy Schedules for Non-Participating Loads
Day-Ahead Residual Unit Commitment (RUC) Capacity	RUC Capacity and RUC Awards from the Residual Unit Commitment process
Day-Ahead Import/Export Schedules	Day-Ahead Energy Schedules and Ancillary Services Awards at Intertie Scheduling Points
Day-Ahead Start-Up Instructions	Start-Up instructions resulting from the RUC process
Day-Ahead Ancillary Service Market Results	Resource-specific Ancillary Service Awards resulting from the Integrated Forward Market run
Day-Ahead Market Power Mitigation (MPM) Results	Segments of the "new" or mitigated Bid as a result of the Day-Ahead Market Power Mitigation Process (MPM-RRD)
Real-Time Market Power Mitigation (MPM) Results	Segments of the "new" or mitigated Bid as a result of the Real-Time Market Power Mitigation Process (MPM-RRD)
Default Energy Bid Curves	Independent Entity-supplied default Bid Curve data used in the Market Power Mitigation process
Day-Ahead Generation Commodity Prices	Day-Ahead resource-specific prices (for Energy Schedules, Ancillary Services Awards, RUC Awards) of Generating Units
Day-Ahead Demand	Day-Ahead resource-specific prices for Energy Schedules and Ancillary Services Awards of Participating Loads; and resource-specific prices

Title	Contents
Commodity Prices	for Energy Schedules of Non-Participating Loads
Hour Ahead Scheduling Process (HASP) Schedules	Displays Hour-Ahead Scheduling Process results for the next Trading Hour. Posts the HASP Binding results relevant to Hourly Pre-Dispatched Resources. Posts HASP Advisory results relevant to the Non-Hourly Pre-Dispatch Resources.
Hour Ahead Scheduling Process (HASP) Schedule Prices	Displays Hour-Ahead Scheduling Process resource-specific prices for the next Trading Hour. Posts the HASP Binding results relevant to Hourly Pre-Dispatched Resources. Posts HASP Advisory results relevant to the Non-Hourly Pre-Dispatch Resources.
Day Ahead Finally Qualified Load Following Capacity	Day-Ahead Finally Qualified Load Following Up and Down Capacity for Metered Subsystems (MSS) resources
Day-Ahead Unit Commitments	Resources that are self-committed or CAISO committed by the IFM or RUC process in the Day-Ahead Market
Default RMR Minimum Load & Startup Cost Bid Curves	Displays the default minimum load and startup cost bid curves that will used for the Market Power Mitigation (MPM) Process. This information originates from an independent entity and applies to RMR units only.
Day-Ahead Import-Export Commodity Prices	Day-Ahead resource-specific prices (for Energy Schedules, Ancillary Services Awards, RUC Awards) of System Resources
Extremely Long Start Resource Startup Instructions	Startup instructions resulting from the Extremely Long Start Commitment (ELC) process. This report is not currently active.
Day-Ahead Reliability Must Run (RMR) Dispatches	RMR units that either have an Energy Schedule (from the IFM run)that is flagged as an RMR Dispatch and/or a Manual RMR Dispatch
Expected Energy Allocation Details	Displays the post-market Expected Energy results from the energy accounting process. Expected Energy is the sum total of all DA and RT market awards, Exceptional Dispatches and any other Dispatch Instructions, taking into account physical limitations (SLIC), disaggregated into their Settlement components.
Conformed Dispatch Notice (CDN)	Summary of the Day-Ahead and Real-Time Energy Schedules, Ancillary Service Awards, RMR Dispatches, Competitive Constraint Run results of RMR resources
Expected Energy	Post-market or after-the-fact energy accounting results for Settlement calculations. This report will contain the Total Expected Energy for Day Ahead, Real Time, Instructed and Total energy.
CAISO Commitment Cost Details	Includes Commitment Flags and Commitment Cost to validate the Bid Cost Recovery charge in Settlements
CRN	Reports the MW breakdown and CRN number market results for ETC/TOR Self-Schedules in the DAM and the RTM. These MWs breakdown are inputs used in the ETC/TOR balancing rights, and are not the final ETC/TOR balancing rights. RTM CRN reporting includes ETC/TOR schedule changes after the close of the RTM.for ETC/TOR

Title	Contents
	~~Self-Schedules for DAM and RTM, including the CRN number.~~ Note: This report has limited functionality, and is only available in the GUI. The same results are posted to the CAISO SFTP site for downloading. Access to the CRN data through the SFTP site is managed through the AARF (Application Account Request Form) process.
Real-Time Pre-Dispatch (RTPD) Flexible Ramping Constraint Capacity	Reports the amount of upward ramping MW quantity of Flexible Ramping Constraint capacity awarded for each resource.

Convergence Bidding Reports

The following four Convergence Bidding reports are available through the CAISO Market Results Interface (CMRI).
Reports 4.2, 4.3 and 4.4 are associated with the CRR Adjustment Settlement Rule.
For additional details on the CRR Adjustment Settlement Rule, please see the BPM for Market Operations, Appendix F.

Title	Contents
Day Ahead Convergence Bidding Awards	Displays the market Virtual Bidding supply and demand awards that were cleared in the day-ahead market for energy
Hourly Prices due to Convergence Bidding for CRR Adjustment	Displays the hourly prices that CAISO uses to calculate Congestion Revenue Rights (CRR) adjustments due to Virtual Bidding.
Binding Transmission Constraints due to Convergence Bidding for CRR Adjustment Report	Displays supporting data for settlement charges imposed on scheduling coordinators, as a result of the application of the CRR settlement rule - specifically CRR flow impact on award locations for each scheduling coordinator.
Flow Impact due to Convergence Bidding for CRR Adjustment	Displays supporting data for settlement charges imposed on scheduling coordinators, as a result of the application of the CRR settlement rule – specifically CRR flow impact aggregated by Entity, where the Entity is a Convergence Bidding Entity name that coincides with a CRR Holder.

10.2 Scope of Transmission Constraint Reports

Exhibit 10-2 summarizes the Transmission Constraints Enforcement List reports that are available through the CAISO Market Results Interface (CMRI) for users who obtain access as detailed in Tariff Section 6.5.3.3.1. This tariff section details the process for completing the *Non-Disclosure Agreement for Transmission Constraints Enforcement Lists.*

Details of the report contents are provided in subsequent sections.

Exhibit 10-2.1: Summary of Transmission Constraints Enforcement List Reports

Title	Contents
Flowgate Constraints	Displays the complete list of flowgate constraints e.g. Line, Transformer, Phase Shifter, Series Device or Transmission Corridor
Transmission Corridor Constraints	Displays the complete list of transmission corridor constraints defined in the market
Nomogram Constraint Enforcements	Displays the list of nomogram constraints that are active for the particular trading day and market, which can be either enforced or not enforced
Nomogram Constraint Definitions	Displays the complete list of defined nomogram constraints in the market
Transmission Contingencies	Displays the complete list of transmission contingencies defined in the market

10.2.1 Flowgate Constraints

Exhibit 10-2.2: Flowgate Constraints

Report Description	Displays the complete list of flowgate constraints e.g. Line, Transformer, Phase Shifter, Series Device or Transmission Corridor
Business Trigger	Publication of the Post Day-Ahead Market (D+1) by one hour after the publication of the Day-Ahead results and Pre Day-Ahead Market (D+2) by 18:00.
Layout	For illustrative purposes, the following is a sample listing report layout:

Listed below are the data elements contained in this report.

Attributes

P = denotes a user input report parameter

G = denotes a report group section attribute; displayed within the report title

#	Attribute	High-Level Description
	Trade Date ^{PG}	Date on when the trade transaction occurs within the market
	Market ^{PG}	Type of market in which the nomogram constraints applies to: ▪ Post Day-Ahead ▪ Pre Day-Ahead
❶	Flowgate Name	The unique alphanumeric identifier name of a flowgate
❷	Type	The equipment classification of the flowgate, as follows: ▪ LINE (Individual transmission line between two sta ions) ▪ XFMR (Transformer in station transforming from one voltage to another) ▪ PHSH (Phase shifter controlling flow) ▪ SERD (eries dev ce capacitor, reactor) ▪ TCOR (Transmission Corridor)
❸	Enforced Flag	The indicator specifying if the flowgate is enforced or not (Yes/No)
❹	Competitive Flag	The indicator specifying if the flowgate is competitive (Yes/No)

10.2.2   Transmission Corridor Constraints

Exhibit 10-2.3: Transmission Corridor Constraints

Report Description	Displays the complete list of transmission corridor constraints defined in the market
Business Trigger	Publication of the Post Day-Ahead Market (D+1) by one hour after the publication of the Day-Ahead results and Pre Day-Ahead Market (D+2) by 18:00.
Layout	For illustrative purposes, the following is a sample listing report layout:

Transmission Corridor Name	Equipment Name	Equipment Type	FROM Station	T
BRANCHGRPA_MSL	11111_XXXXX_230_ 3457_AAAAAA_230_BR_1 _1	LINE	STATION1	ST
BRANCHGRPA_MSL	11111_YYYYY_ 3457_BBBBB_500_BR_1 _1	LINE	STATION3	ST
BRANCHGRPA_MSL	22222_ZZZZZ_230_ 3457_ABABAA_230_BR_1 _1	LINE	STATION5	ST
BRANCHGRPA_MSL	33333_AAAAA_500_ 5784_BBBBB_500_BR_1 _1	LINE	STATION7	ST
BRANCHGRPA_MSL	44444_XXXXX_230_ 7777_XXXXX_230_BR_1 _1	LINE	STATION9	ST
BRANCHGRPA_MSL	5555_ XXXXX_230_ 3457_AAAAAA_230_BR_1 _1	LINE	STATION1	ST

Attributes	Listed below are the data elements contained in this report. P = denotes a user input report parameter G = denotes a report group section attribute; displayed within the report title

#	Attribute	High-Level Description
	Trade Date PG	Date on when the trade transaction occurs within the market
	Market PG	Type of market in which the transmission corridor constraints applies to: ▪ Post Day-Ahead ▪ Pre Day-Ahead
❶	Transmission Corridor Name	The unique alphanumeric identifier name of a transmission corridor
❷	Equipment Name	The unique alphanumeric identifier for an equipment comprising a transmission corridor

		The classification of the equipment, as follows:
❸	Equipment Type	• LINE (Ind vid al transmission line between two stations) • XFMR (Transformer in station transforming from one voltage to anothe • PHSH (Phase shifter controlling flow) • SERD (Series device capacitor, reactor)
❹	FROM Station	This refers to the name of station at the "FROM" end of the line
❺	TO Station	This refers to the name of station at the "TO" end of the line

10.2.3   Nomogram Constraint Enforcements

Exhibit 10-2.4: Nomogram Constraint Enforcements

Report Description	Displays the list of nomogram constraints that are active for the particular trading day and market, which can be either enforced or not enforced
Business Trigger	Publication of the Post Day-Ahead Market (D+1) by one hour after the publication of the Day-Ahead results and Pre Day-Ahead Market (D+2) by 18:00.
Layout	For illustrative purposes, the following is a sample listing report layout:

Nomogram Name	Enforced Flag	Competitive Flag	Constraint Type	Curve ID	Segment ID	Effective Start Datetime	Effective End
T-XXX_SALXX_NG_SUM	Yes	Yes	LE	1	1	mm/dd/yyyy hh:mm:ss AM/PM	mm/dd/yyyy hh:r
BBBB_YYYYYY_NG	No	Yes	LE	1	1	mm/dd/yyyy hh:mm:ss AM/PM	mm/dd/yyyy hh:r
2222220-ABAB-OLPOL-LOS9	Yes	Yes	GE	1	1	mm/dd/yyyy hh:mm:ss AM/PM	mm/dd/yyyy hh:r
X-111 AAAAAA_NG_SUM	No	No	GE	1	1	mm/dd/yyyy hh:mm:ss AM/PM	mm/dd/yyyy hh:r
PAULX_115_NM	Yes	No	LE	1	1	mm/dd/yyyy hh:mm:ss AM/PM	mm/dd/yyyy hh:r
ZZZZZZ_TKs_QAFLG_NG	No	No	LE	1	1	mm/dd/yyyy hh:mm:ss AM/PM	mm/dd/yyyy hh:r
SC_OOOOO_XYXYXYX_NG	Yes	Yes	GE	1	1	mm/dd/yyyy hh:mm:ss AM/PM	mm/dd/yyyy hh:r

	Listed below are the data elements contained in this report.
Attributes	P = denotes a user input report parameter G = denotes a report group section attribute; displayed within the report title

#	Attribute	High-Level Description

	Trade Date ^{PG}	Date on when the trade transaction occurs within the market
	Market ^{PG}	Type of market in which the nomogram constraint enforcements applies to: ▪ Post Day-Ahead ▪ Pre Day-Ahead
❶	Nomogram Name	The unique alphanumeric identifier name of a nomogram
❷	Enforced Flag	The indicator specifying if the nomogram is enforced or not (Yes/No)
❸	Competitive Flag	The indicator specifying if the nomogram is competitive (Yes/No)
❹	Constraint Type	The classification of the constraint, as follows: ▪ LE (Less or equal) ▪ GE (Greater or equal)
❺	Curve ID	The numeric identifier of the Curve. There can be up to N number of Curves defined per transmission corridor
❻	Segment ID	The numeric identifier of the Segment of the Curve. There can be up to N number of segments per Curve
❼	Effective Start Datetime	The effective start datetime of the nomogram enforcement (Pacific)
❽	Effective End Datetime	The effective end datetime of the nomogram enforcement (Pacific)

10.2.4   Nomogram Constraint Definitions

Exhibit 10-2.5: Nomogram Constraint Definitions

Report Description	Displays the complete list of defined nomogram constraints in the market
Business Trigger	Publication of the Post Day-Ahead Market (D+1) by one hour after the publication of the Day-Ahead results and Pre Day-Ahead Market (D+2) by 18:00.
Layout	For illustrative purposes, the following is a sample listing report layout:

Nomogram Name	Variable Name	Variable Type	Curve ID	Segment ID	Coeff
T-XXX_SALXX_NG_SUM	XXXX_NG_1	TCR	1	1	1
T-XXX_SALXX_NG_SUM	XXXX_NG_2	TCR	1	1	0.07
T-XXX_SALXX_NG_SUM	XXXX_NG_3	TCR	1	1	0.25
T-XXX_SALXX_NG_SUM	XXXX_NG_4	TCR	1	1	0.32
BBBB_YYYYYY_NG	YYYY_NG_7	AGR	1	1	1
BBBB_YYYYYY_NG	YYYY_NG_8	AGR	1	1	0.20
BBBB_YYYYYY_NG	YYYY_NG_9	AGR	1	1	0.66

Listed below are the data elements contained in this report.

Attributes

P = denotes a user input report parameter

G = denotes a report group section attribute; displayed within the report title

#	Attribute	High-Level Description
	Trade Date PG	Date on when the trade transaction occurs within the market
	Market PG	Type of market in which the nomogram constraints applies to: ▪ Post Day-Ahead ▪ Pre Day-Ahead
❶	Nomogram Name	The unique alphanumeric identifier name of a nomogram
❷	Variable Name	The unique alphanumeric identifier of the nomogram variable
❸	Variable Type	The variable type, representing flow across a transmission corridor (TCR), aggregated generator (AGR), or generator (G)
❹	Curve ID	The numeric identifier of the Curve. There can be up to N number of Curves defined per nomogram
❺	Segment ID	The numeric identifier of the Segment of the Curve. There can be up to N number of segments per Curve.
❻	Coefficient	The participation factor of the variable in the nomogram inequality

10.2.5 Transmission Contingencies

Exhibit 10-2.6: Transmission Contingencies

Report Description	Displays the complete list of transmission contingencies defined in the market
Business Trigger	Publication of the Post Day-Ahead Market (D+1) by one hour after the publication of the Day-Ahead results and Pre Day-Ahead Market (D+2) by 18:00.
Layout	For illustrative purposes, the following is a sample listing report layout:

Listed below are the data elements contained in this report.

Attributes

P = denotes a user input report parameter

G = denotes a report group section attribute; displayed within the report title

#	Attribute	High-Level Description
	Trade Date ^{PG}	Date on when the trade transaction occurs within the market
	Market ^{PG}	Type of market in which the transmission contingencies applies to: ▪ Post Day-Ahead ▪ Pre Day-Ahead
❶	Contingency Title	The unique alphanumeric identifier of the contingency name
❷	Enforced Flag	The indicator specifying if the contingency is enforced or not (Yes/No)
❸	TAC Area	This represents the zone at which the contingency is defined in
❹	Equipment Station	The substation where the outaged equipment is located at

⑤	Equipment Voltage	The voltage level of the outaged equipment (e.g. 115, etc)
⑥	Equipment Name	The alphanumeric identifier of the outaged equipment

10.3   SIBR Reports

Exhibit 10-3.1 summarizes the reports that are available to SCs through CAISO Portal for the DAM and RTM.

Exhibit 10-3.1: SIBR Report Content

Title	Contents
Up to the minute transaction report DAM/RTM	Hourly details on Bids that have been submitted to the Day-Ahead and Real-Time Markets (to include SIBR generated Bids) The report includes the time the Bid was received by CAISO, Bid status, submitted by SC or CAISO and all Bid details broken out by resource type and product type. This report should display the most current Bid that is active in the market for which it was submitted. Detail of Clean Bids produced by SIBR after the close of the Day-Ahead and Real-Time Markets will indicate whether Clean Bid was submitted by the SC or created by CAISO (SIBR).
Bid Activity Audit Report DAM/RTM	Bid statuses of a Bid throughout its lifecycle broken out by Market type, resource type and resource ID. Details include time received, Bid status, whether submitted through GUI or web services and any relevant error messages tied to the Bid by Bid status.
Self-Schedule Contracts Report	Hourly CRN Entitlement values for ETC/TOR contracts registered with the CAISO. Note: CVR information will be displayed as an ETC (the difference being the CRN is registered in MF based off of the TRTC Instructions received which distinguishes it as a CVR.)
Distribution Location Reports DAM/RTM	GDFs distribution locations and factors by hour for generating resources for both the DAM and RTM
Trade Status Report DAM/RTM	This report displays the status of Inter-SC Trades for the DAM and RTM. This report closely mimics the information shown in the Inter-SC Trade summary display in the SIBR UI. This report shows the most recent status of an Inter-SC Trade in the market.
Trade Activity Audit Report DAM/RTM	This report shows an audit trail of a trade by displaying all of its associated statuses and error messages.

11.   Dispatch Information/ADS

Welcome to the *Dispatch Information* section of CAISO *BPM for Market Instruments*. In this section you will find the following information:

Application Function.

Dispatch Instruction Cycle

Dispatch Information

Data Dictionary for ADS

Technical Information for ADS

Automated Dispatching System (ADS) is the application developed by CAISO to communicate real-time dispatch instructions to Market Participants. Users of ADS are able to:

Receive and generally respond to in-hour dispatch instructions in real-time.

Receive confirmation of accepted pre-dispatch instructions

Retain a local record of the transactions

Query a database for historical instructions.

11.1   ADS Instruction Cycle

The typical ADS instruction cycle is as follows:

The RTM application determines the Energy needed to meet demand. An instruction list, in the form of a requested MW amount for each resource is generated from Ancillary Services and Energy Bids in the RTM.

The instruction list is transferred from RTM to the ADS system and is sent to the Market Participant.

All ADS instructions are Binding for all non-intertie resources.

The ADS system determines who has rights to view and to respond to each of the instructions and sends individual instructions to authorized ADS users based on the digital certificate (this will be the same certificate used for CAISO Portal access) used to login to ADS and the ADS

Client associated with the certificate. Each ADS Client is associated with one or more resources and can have Primary, Secondary or Read only permissions on the identified resources.

For all non-intertie resources, ADS automatically obtains an acknowledgement per instruction once it reaches the corresponding ADS client.

ADS automatically responds with an "accept".

The user has approximately 90 seconds to review the instruction and is then expected to begin ramping to meet the instruction MW.

For example, an instruction is received by ADS at 1:31:00. The user must begin ramping the resource at 1:32:30 and reach the RT DOT MW at 1:37:30. The target time of 1:37:30 is labeled DOT Start Time on the ADS display

NOTE: If there are any known limitations to dispatchable resources, a SLIC ticket will need to be submitted prior to receiving Real Time dispatch instructions.

For Intertie System Resources, the user (with Primary or Secondary permissions) has the option to accept, partially accept or decline the instruction. The user is allowed to provide a response or undo a response at any time within the 5 minute window.

If the user does not respond within the 5 minute window, ADS automatically responds with a "Timed–out" and the supplemental portion of the instruction will be forcibly declined. The CAISO dispatcher may modify the response up until the close of the instruction cycle at 45 minutes after the hour. Dispatch Information Supplied by CAISO

11.2   Dispatch Information Supplied by CAISO

The output information from the RTM applications that CAISO sends to ADS is listed in Exhibit 11-1.

Exhibit 11-1: ADS Output

Application	Output
HASP	Hourly Pre-dispatch for hourly pre-dispatch resources
	Hourly AS Awards for hourly pre-dispatched resources
STUC	Binding start-up and shut-down instructions (looks ahead 4hours beyond the Trading hour) (Can be Advisory or Binding depending on the resource limitations to meet start-up)

RTUC	Binding start-up and shut-down instructions
	Binding 15 minute AS Awards for five-min dispatchable resources
RTED	Binding five minute dispatch for five -min dispatchable resources
RTMD	Binding five minute **Manual** dispatch for five -min dispatchable resources
RTCD	Binding **10** minute **contingency** dispatch for five -min dispatchable resources

Please refer to section 2.3.2 Real Time Market Process of the *BPM for Market Operations* for a description of the HASP, STUC, RTUC, RTED, RTMD, and RTCD.

11.3   ADS DOT Breakdown

This is intended to clarify the various MW components in CAISO's Automated Dispatch System (ADS) for the Dispatch Operating Target (DOT) breakdown. Relevant business functions and usages of these components are also described as well.

1.   **Business Purpose**

The DOT breakdown that CAISO provides to market participants through ADS is to provide the energy component in terms of MW capacity constituting the DOT MW. It can be used for two different purposes:

> 1. Operational including, but not limited to, compliance checking, available operating reserve calculation, etc.

> 2. Shadow settlement.

Although these components are used to represent energy component of the DOT, they are calculated and represented in terms of MW capacity and hence they do not represent the energy difference due to ramping effect between intervals.

There are two types of real-time dispatch instructions that CAISO sends out through ADS, i.e., hourly pre-dispatch (RTPD) instruction and real-time dispatch (RTD) instruction. There are some subtle differences in how to interpret and use those MWs between those two types of instructions.

2.   **DOT Breakdown in Hourly Pre-dispatch Instruction**

The hourly pre-dispatch instructions apply to hourly pre-dispatch resources, i.e., the inter-tie system resources. There are two critical components,

SCHED: The SCHED MW reflects the real-time energy self schedule for that resource in the SIBR clean bid;

SUPP: This MW is the difference between DOT and SCHED calculated by (DOT – SCHED). It is effectively the incremental (positive) or decremental (negative) from the self schedule MW.

Although the standard ramp RMPS is also calculated for the inter-tie resources in the DOT breakdown, the standard ramp has little relevance to the ultimate energy settlement of hourly pre-dispatched system resources since such energy is accounted for on a block basis. It is also worth mentioning that, there are two scenarios under which the SCHED will be equal to the final day-ahead energy schedule,

Scenario 1, for the market participants who elects to protect their day-ahead final energy schedule from IFM, i.e., the DA energy schedule MW is submitted as real-time self schedule;

Scenario 2: no explicit real-time energy bid curve or self schedule is submitted. SIBR will convert the final DA energy schedule into a real-time self schedule.

Following examples assume a real-time self schedule MW as 80MW,

- Example 2.1 (incremental),

DOT: 100MW

DOT breakdown is,

SCHED: +80MW

SUPP: +20MW

- Example 2.2 (decremental),

DOT: 60MW

DOT breakdown is,

SCHED: +80MW

SUPP: -20MW

2.1   ADS Decline Functionality For Hourly Pre-dispatch Instruction

In ADS, we allow the market participants to decline or partially accept a pre-dispatch instruction[14]. It is CAISO's policy that only the SUPP component MW in the DOT breakdown can

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[14] Excessive declines of hourly pre-dispatched instructions for System Resources can be subject to penalties.

be rejected or partially accepted. In other words, the SCHED MW component cannot be changed after the HASP run. A final accepted DOT is recorded in ADS and available to market participant as "Accept DOT".

Decline/Partial Accept for example 2.1,

Market participants can decline the 20MW or partially accept any portion of the 20MW. Therefore the Accept DOT will be any number between 80MW to 100MW.

Decline of 20MW: Accept DOT will become 80MW;

Partially acceptance of 10MW out of 20: Accept DOT will become 90MW;

Full acceptance of 20MW: Accept DOT will stay as 100MW.

Decline/Partial Accept for example 2.2,

Market participants can decline the -20MW or partially accept any portion of the -20MW. Therefore the Accept DOT will be any number between 60MW to 80MW.

Decline of -20MW: Accept DOT will become 80MW;

Partially acceptance of -10MW out of -20: Accept DOT will become 70MW;

Full acceptance of -20MW: Accept DOT will stay as 60MW.

3.   DOT Breakdown in Real-time Dispatch Instruction

The real-time dispatch instructions apply to non hourly pre-dispatch resources, i.e., the generators, tie generators (including dynamic resources and the resources used to model AS import on the ties) and participating loads (using the pump-storage model). There are five critical components here,

SCHED: The SCHED MW reflects the real-time self energy schedule for that resource in the SIBR clean bid;

SUPP: This MW is the difference between DOT and SCHED calculated by (DOT – SCHED). It reflects the incremental (positive) or decremental (negative) from the self schedule MW. SUPP is inclusive of the SPIN and NSPN MWs and MSSLF whichever applicable;

SPIN: If this resource gets dispatched out of spin capacity (either in contingency or non-contingency mode[15]), this value will reflect dispatched SPIN capacity amount. Otherwise, this amount is zero. SPIN MW can be used for available reserve calculation;

NSPN: If this resource gets dispatched out of non-spin capacity (either in contingency or non-contingency mode[16]), this value will reflect dispatched Non-Spin capacity amount. Otherwise, this amount is zero. Non-SPIN MW can be used for available reserve calculation;

MSSLF: This only applies to MSS load following resources. If market participants submit MSS load following instructions for those resources, the validated load following instructions will be sent back through this component. For all non load following resources, this amount will be zero.

Although the standard ramp RMPS is also provided for the real-time dispatch instructions in the DOT breakdown, it is recommended the value of RMPS be determined outside of the dispatch instruction based on the standard ramp 20 minute cross-hour ramp between Day-Ahead schedules. It is also worth mentioning that, there are two scenarios under which the SCHED will be equal to the final day-ahead energy schedule,

Scenario 1, for the market participants who elects to protect their day-ahead final energy schedule from IFM, i.e., the DA energy schedule MW is used to submitted as real-time self schedule;

Scenario 2: no explicit real-time energy bid curve or self schedule is submitted. SIBR will convert the final DA energy schedule into a real-time self schedule.

Following examples assume a real-time self schedule MW as 80MW,

- Example 3.1 (incremental without dispatch out of Spin or Non-Spin),

DOT: 100MW

DOT breakdown is,

SCHED: +80MW

SUPP: +20MW

- Example 3.2 (incremental with dispatch out of Spin and Non-Spin),

DOT: 100MW

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[15] Although it is not the scope of this document, it is worth mentioning that a contingency AS can only be dispatched in a contingency dispatch run or if the resource is flagged as contingency individually. A non-contingent AS can be dispatched in a normal real-time interval dispatch.

[16] See Note 1.

DOT breakdown is,

SCHED: +80MW

SUPP: +20MW

SPIN: +5MW

NSPN: +5MW

In example 3.2, the 5 MWs for dispatched out of Spin and Non-spin are part of the SUPP as the incremental amount. Besides the 5 MWs from Spin and Non-spin, it implies the 20 – 5 -5 = 10MW as the market energy dispatch component. This is different from the current ADS in production in which the SUPP is exclusive from the Spin and Non-spin amount.

- Example 3.3 (decremental),

DOT: 60MW

DOT breakdown is,

SCHED: +80MW

SUPP: -20MW

- Example 3.4 (incremental with dispatch out of Spin, Non-Spin And Load following),

DOT: 100MW

DOT breakdown is,

SCHED: +80MW

SUPP: +20MW

SPIN: +5MW

NSPN: +5MW

MSSLF: +5MW

In example 3.4, the 5 MWs for dispatched out of Spin, Non-spin and MSS load following are part of the SUPP as the incremental amount. Besides the 5 MWs from Spin, Non-spin and MSSLF, it implies the 20 – 5 -5 – 5 = 5MW as the market energy dispatch component not associated with any other capacity.

- Example 3.5 (decremental with MSS load following),

DOT: 60MW

DOT breakdown is,

SCHED: +80MW

SUPP: -20MW

MSSLF: -5MW

In example 3.5, the -5 MWs for MSS load following are part of the SUPP as the decremental amount. Besides the -5 MWs from MSSLF, it implies the -20 – (-5) = -15MW as the market energy dispatch component.

11.4   Technical Information for ADS

The ADS Technical information for the system will be made available on the CAISO Website. ADS Technical Information can be found at: http://www.caiso.com/clientserv/ads/index.html

Technical information posted includes:

- User Documentation (installation and set up guides)
- API information, such as an interface specification with supporting WSDL and XSD files
- Business level documentation

Exceptional Dispatch Instruction Type Codes can be found at:
http://www.caiso.com/23fb/23fba87657500.pdf

12.   Public Market Information

Welcome to the *Public Market Information* section of CAISO *BPM for Market Instruments.*
These reports are based on the requirements detailed in the CAISO Tariff Section 6.5, CAISO
Communications.

In this section you will find the following information:

List of Report Tabs provided on the CAISO OASIS site. (http://oasis.caiso.com)

Content of the reports included under those Report Tabs

Interface Specifications regarding the downloading of the OASIS data through an API can be
found at:

http://caiso.com/235f/235fcbd556310.html

CAISO provides the following reports groups through OASIS listed by the Tab name as they
appear on the CAISO OASIS web site:

- ➢ Prices
- ➢ Transmission
- ➢ System Demand
- ➢ Energy
- ➢ Ancillary Services
- ➢ CRR
- ➢ Public Bids
- ➢ Atlas

12.1   Prices

CAISO provides information on prices to the public through the OASIS web page. The Price
reports contain the following information:

Locational Marginal Prices (LMP) – Posts Hourly Locational Marginal Prices for all
PNodes, APNodes and Scheduling Points in $/MWh, for the DAM and RUC market
processes. Data fields are as follows:

    LMP

- LMP Marginal Cost of Energy (MCE)

- LMP Marginal Cost of Congestion (MCC)

- LMP Marginal Cost of Losses (MCL)

Note: For the RUC prices, only the RUC price is posted. The three-component LMP breakdown is not applicable for RUC pricing.

HASP Locational Marginal Prices (LMP) – Posts hourly, the 4 15-minute Locational Marginal Prices in $/MWh, for the HASP hour. Posts the LMP, plus the Congestion, Loss and Energy Components that make up the LMP.

- Posts the HASP Binding LMP for PNodes and APNodes relevant to Hourly Pre-Dispatched Resources.

- Posts the HASP Advisory LMP for PNodes and APnodes relevant to the Non-Hourly Pre-Dispatch Resources.

Data fields are as follows:

LMP

- LMP Marginal Cost of Energy (MCE)

- LMP Marginal Cost of Congestion (MCC)

- LMP Marginal Cost of Losses (MCL)

Interval Locational Marginal Prices (LMP) – Posts the five-minute Locational Marginal Prices for PNodes and APNodes in $/MWh, for each five-minute interval Real-Time Economic Dispatch (RTED). Data fields are as follows:

LMP

- LMP Marginal Cost of Energy (MCE)

- LMP Marginal Cost of Congestion (MCC)

- LMP Marginal Cost of Losses (MCL)

Contingency Dispatch Locational Marginal Prices (LMP) – Similar to the Interval Locational Marginal Prices (LMP) report, but for Real Time Contingency Dispatch (RTCD) runs.

Posts the ten-minute Locational Marginal Prices for PNodes and APNodes in $/MWh, for each ten-minute interval RTCD. Data fields are as follows:

LMP

- LMP Marginal Cost of Energy (MCE)

- LMP Marginal Cost of Congestion (MCC)

- LMP Marginal Cost of Losses (MCL)

AS Clearing Prices – Posts the Ancillary Services Marginal Price (ASMP) for all Ancillary Service types for all binding AS Regions. Posted hourly in $/MW for the DAM.

DAM - Hourly ASMP ($/MW)

Interval AS Clearing Prices - Ancillary Services Marginal Price (ASMP) for all Ancillary Service types for all binding AS Regions. Posts 15-Minute price relevant to the next 15 minute binding interval for RTM on a fifteen minute basis.

RTM - 15Min Binding ASMP ($/MW)

Intertie Constraint Shadow Prices – Posts the hourly constraint pricing at each Intertie-based Transmission Interface And Intertie Constraint, for each Market Process (DAM, HASP) in $/MWh, and the 15-Minute Shadow Price in $/MWh for the RTPD in RTM. Report will also include an indication of whether the Constraints were binding because of the base operating conditions or contingencies, and if caused by a Contingency, the identity of the specific Contingency.

Nomogram/Branch Shadow Prices – Posts the hourly constraint pricing at each binding Nomogram and Branch, for each Market Process (DAM, HASP) in $/MWh, and the 15-Minute Shadow Price in $/MWh for the RTPD in RTM. Report will also include an indication of whether the Constraints were binding because of the base operating conditions or contingencies, and if caused by a Contingency, the identity of the specific Contingency.

Fuel Prices – For each Gas Flow Day, lists the gas price in $/mmBTU by fuel region.

Current Locational Marginal Price – This report is available for download only. Five minute Locational Marginal Prices for all PNodes and APNodes for the current interval. (Returns the most recently posted interval only) This download is provided to allow Oasis users to quickly receive the most current LMP without any prior intervals included in the payload.

Interval Intertie Constraint Shadow Prices – Posts the 5-Minute constraint pricing at Transmission Interfaces and Intertie Constraints in $/MWh, for the RTD run in the RTM. Report will also include an indication of whether the Constraints were binding because of the base operating conditions or contingencies, and if caused by a Contingency, the identity of the specific Contingency.

Contingency Dispatch Intertie Constraint Shadow Prices – Similar to the Interval Intertie Constraint Shadow Prices report, but for Real Time Contingency Dispatch (RTCD) runs. Posts the 10-Minute constraint pricing at Transmission Interfaces and Intertie Constraints in $/MWh, for the RTCD run in the RTM. Report will also include an indication of whether the Constraints were binding because of the base operating conditions or contingencies, and if caused by a Contingency, the identity of the specific Contingency.

Interval Nomogram/Branch Shadow Prices - Posts the 5-Minute constraint pricing at each Nomogram and Branch in $/MWh, for the RTD run in the RTM. Report will also include an indication of whether the Constraints were binding because of the base operating conditions or contingencies, and if caused by a Contingency, the identity of the specific Contingency.

Contingency Dispatch Nomogram/Branch Shadow Prices - Similar to the Interval Nomogram/Branch Shadow Prices report, but for Real Time Contingency Dispatch (RTCD) runs. Posts the 10-Minute constraint pricing at each Nomogram and Branch in $/MWh, for the RTCD run in the RTM. Report will also include an indication of whether the Constraints were binding because of the base operating conditions or contingencies, and if caused by a Contingency, the identity of the specific Contingency.

Reference Prices – Posts Quarterly Reference prices associated with each Virtual Bidding PNode and APNode for supply and demand.

Nodal Group Constraints Shadow Prices - This report displays the upper and lower MW limits, cleared MW value and associated hourly shadow prices for any binding Nodal Group Constraint. This report is triggered with the publication of the Day-Ahead results.

Flexible Ramping Constraint Results – Posts the following values for RTPD and RTD market runs, for intervals when the Flexible Ramping Constraint is enforced. Posts the RTPD every 15 minutes for all enforced intervals in that market run in conjunction with the

RTPD result publication. Posts the RTD every 5 minutes for all enforced intervals in that market run in conjunction with the RTD result publication.

- Ramp Up Capacity (MW) - Total un-loaded capacity below maximum operating limits (that can be dispatched up) of units providing ramping capability that the market has to leave when making optimization decision. It is enforced on a system level per market run and market interval.

- Ramp Up Shadow Price ($/MW) - Shadow price of the ramping up constraint when it is binding in the relevant market run and market interval.

- Ramp Down Capacity (MW) - Total system level loaded capacity above minimum operating limits (that can be dispatched down) of units providing ramping capability that the market has to leave when making optimization decision. It is enforced on a system level per market run and market interval.

- Ramp Down Shadow Price ($/MW) - Shadow price of the ramping down constraint when it is binding in the relevant market run and market interval.

12.2   Transmission

The Transmission reports contain the following information:

Current Transmission Usage - Consolidated report for current transmission capacity and usage per Transmission Interface. Starts at 7-days ahead of the Trading Day, with Constraint and OTC values updated as outage/derate/rerate values change. Transmission Right, AS and Energy utilization values are updated in conjunction with Market results publications. Data fields are as follows:

- TTC, OTC, CBM,

- Current hourly Constraints.

- Unscheduled Transmission Rights Capacity (ETC/TOR).

- Hourly AS from Imports.

- Hourly scheduled net Energy from Imports/Exports and ATC.

Transmission Interface Usage – Consolidated report for Transfer Capacity and usage as used in CAISO market operations processes based on conditions at the time of the Market Close. Lists for each Trading Hour, Transmission Interface and market process (DAM, HASP) the hourly TTC, OTC, Constraint, CBM, hourly unscheduled Transmission Rights Capacity (ETC/TOR), hourly AS from Imports, and hourly scheduled net Energy from Imports/Exports and ATC.

Market Available Transfer Capacity – Available Transfer Capacity per Transmission Interface by direction, for market processes DAM and HASP, expressed in MW.

Transmission Outages - Lists planned and actual Transmission Outage events per Transmission Interface by direction. The list is updated with every outage event. List includes: Outage description, Outage start-time and end time, rating of the curtailed line, Outage notes.

12.3   System Demand

The System Demand reports contain the following information:

CAISO Peak Demand Forecast – lists the Peak CAISO Forecast of CAISO Demand, starting 7 days before Trading Day, including Peak Demand (MW) and Peak Time (Hour) Updated daily at 1800 hours. Also posts Peak Demand Forecast by TAC Area (including MSS).

CAISO Demand Forecast – – lists the CAISO Forecast of CAISO Demand starting the evening before the DA IFM for a Trading Day. Includes the 2 Day-Ahead hourly Demand Forecast, hourly DA forecast, RTM five-minute Demand Forecast, total actual hourly integrated Demand, all expressed in MW. Also posts the 2-DA, DAM and Actual Demand by TAC Area. The RTM 5-Minute Load Forecast is posted for the next 11 intervals. Postings occur every 5-minutes for a rolling 11 interval period.

12.4   Energy

The Energy reports contain the following information:

System Load and Resource Schedules

> DAM Load, Generation, Import and Export Schedules per TAC Area and CAISO total for each Operating Hour, in MW.

RUC Capacity from Generation and Imports for each TAC Area, plus CAISO total for each Operating Hour, in MW.

Hourly Real-Time Market (HASP) Generation, Import and Export per TAC Area and CAISO total, in MW.

5 minute RTM Generation, Import and Export per TAC Area and CAISO total, in MW.

Contingency Dispatch Resource Schedules – Similar to the System Load and Resource Schedules report, but for Real Time Contingency Dispatch (RTCD) runs.

RTM Generation, Import and Export per TAC Area and CAISO total, in MW for all 10-minute RTCD runs.

Expected Energy – Lists after-the-fact Energy accounting, per Energy type. Posted daily at T+1, in MWh for ISO total.

Please refer to the table in the BPM for Market Operations, Appendix C.4 for the complete list of valid Expected Energy Types.

Exceptional Dispatch– Summary of Exceptional Dispatch Energy for each Operating Hour, expressed in MWh, and Exceptional Dispatch weighted price, in $/MWh. Posted daily at T+1. Values are summed by Exceptional Dispatch Type, by TAC Area.

Please refer to the BPM for Market Operations, Appendix C.4 for the complete list of valid Exceptional Dispatch Types.

Local Market Power Mitigation Status - Mitigation indicator showing whether any Bids were replaced by Reference Curves, for the following: DAM Hourly Market Mitigation (Yes/No), RTM 15Min Market Mitigation (Yes/No)

RMR – Lists manually and MPM-RRD determined RMR summed across resources, for each Market, including DAM RMR Capacity available, DAM manual dispatched RMR Capacity, HASP RMR Capacity available, HASP manual dispatched RMR Capacity, HASP RMR Capacity requirement.

Marginal Losses – Lists the total system Marginal Loss costs ($) and total system losses (MWh) for the DAM and HASP.

Resource Adequacy Minimum Load – Posts at T +1, for both total CAISO committed, and total CAISO RA committed. Posts for the DAM, RUC and RTM plus the Totals across all markets, the following values:

Capacity committed

Number of units committed

Minimum Load Cost ($)

Start-Up Cost ($)

Minimum Load (MW) (CAISO committed total only).

Convergence Bidding Aggregate Awards - Posts Day Ahead CAISO aggregate Virtual Bidding Awards for Energy for Supply and Demand. Publishes with the Day Ahead Market results.

Day Ahead Market Summary Report - Posts the summary of the Day Ahead Market showing physical and virtual breakdowns of energy submitted, dollars submitted, energy cleared and dollars cleared as well as the totals. The report is grouped by supply, demand, exports and imports categories. This report will post after the completion of the Day Ahead Market publication.

Net Cleared Convergence Bidding Awards - Posts Net Cleared MW for Virtual Bids for every Virtual Bidding Node per Trade Hour within a Trading Day including Trading Hubs and default LAPs. This report will post after all Real Time markets have closed for the associated Trading Day.

Posts Convergence Bidding Supply Awards, Less Convergence Bidding Demand Awards per node. Under this convention, positive net cleared virtual quantities will indicate net Virtual Supply, whereas negative net cleared virtual quantities will indicate net Virtual Demand at a given node.

A value of null Net Cleared Virtual quantities at a given node will indicate no virtual bids submitted at that node while a value of zero will indicate virtual supply and demand Awards netted to zero.

Convergence Bidding Nodal MW Limits- Posts the MW limits used by the ISO in formulating nodal MW constraints used as needed to help ensure an AC solution. An upper and lower limit is defined for each Eligible Pnode other than an Eligible Pnode established for an Intertie. This report is triggered with the publication of the Day-Ahead results.

12.5   Ancillary Services

The Ancillary Services Report contains the following information:

AS Requirements – Lists the Ancillary Service capacity minimum and maximums per AS type, per AS Region, to be procured or self-provided in each Operating Hour. Posts for the 2-DA Forecast, DAM and HASP (RTPD).

- For the 2-DA Forecast, the Maximum requirement for Spin, Non-Spin and Regulation Up will be posted by Upward AS total. The Minimum values will be posted by individual AS product type.

- When encountering a max A/S limit of zero, please interpret this as "no limit" set.

AS Results – Ancillary Service Capacity awarded and self-provided, by AS type, posted for each AS Region. Also posts the sum of the procured and self-scheduled. Posts results for the Day-Ahead (DAM), and in 15 Minute (RTPD) intervals, by resource type. Also posts Total AS Cost for each AS Region, by AS Type.

- Results will only post for AS Regions that are binding for that market run.

Actual Operating Reserves – Lists total actual Demand, AS, and Operating Reserves maintained during delivery (as a % of Load).

12.6   CRR

The CRR Reports contains the following information:

CRR Clearing Prices – Congestion Revenue Rights auction clearing prices ($/MW) by PNode

CRR Inventory – Congestion Revenue Rights Daily inventory, including:

Market Term (long-term, short-term)

Time of use

Start-time and end-time

CRR type

CRR category

CRR Option (yes/no)

Source APNode

Sink APNode

MW amount

Owner ID

12.7   Public Bids

This is a download-only data report that provides the Clean Bid payloads used by the markets, with certain fields modified for confidentiality. This report is provided at T+90, as defined in CAISO Tariff section 6.5.6.1.1 The Public Bids Reports contain the following information:

Clean Bid payloads used in the markets, with certain fields replaced by pseudo data as indicated; posted for DAM and RTM. and posted at T+90. The Public Bid Data is downloadable to XML and CSV only, for a single day at a time.

Convergence Bidding Public Bids – Posts Virtual Bidding results from the Clean Bid payloads for the DAM, with the SC ID and Node ID replaced with pseudo values. Posted at T+90. The Virtual Bidding Public Bid Data is downloadable to XML and CSV only, for a single day at a time

12.8   Atlas

The Atlas Report includes the following information:

PNode Listing – List all pricing locations. Complete Network PNode Listing including PNode IDs and effective dates of operation. For Virtual Bidding purposes, the report also displays an indicator of whether or not the PNode is eligible for Virtual Bidding, the maximum MW Limit associated with each PNode as well as the effective start and end date for the limit. Maximum MW limits will not be posted for PNodes associated with Interties.

APNode Listing – Lists All Aggregated Pricing Node locations used in CAISO Markets. For Virtual Bidding purposes, the report also displays an indicator of whether or not the APNode is eligible for CB, the maximum MW Limit associated with each APNode as well as the effective

start and end date for the limit. Maximum MW limits will not be posted for APNodes associated with Interties.

Load Distribution Factors (LDFs) – Lists typical participation factors that map PNodes to APNodes.

Load Aggregation Point Listing – List of all Load Aggregation Points in CAISO, by type. Includes APNode ID, APNode Type, and effective dates of operation.

Market Resource Listing – List of CAISO Resources. Including Generating Unit ID, PNode, aggregation type, resource type, effective dates.[17]

Trading Hub Listing– lists all Trading Hub APNodes in CAISO; APNode ID, and effective dates.

Trading Hub – **PNode Mapping** – Map of all PNodes to each Trading Hub APNode.

Ancillary Service Region – **PNode Mapping** - Map of all PNodes to each Ancillary Services Region and Sub-Region.

RUC Zone - PNode Mapping - Map of all PNodes to each Reliability Unit Commitment Zone.

TAC Area - PNode Mapping – Map of all PNodes to each Transmission Access Charge Area.

Intertie Constraint Mapping – Map of all Intertie Constraints with respective Transmission Interfaces and TSIN Registered entity ID.

Transmission Interface Listing – Lists all Transmission Interfaces in CAISO, including Transmission Interface ID, Type, WECC Path, effective dates

Peak/Off-Peak Definition – Posts Hourly Peak/.Off-Peak indicator based on the WECC definition.

 Publications and Revisions - OASIS data publication and revision. Includes publication date, publication type, operating date hour min, description, version, status, and comments. This report will log publication events for all public market data posted to the CASIO OASIS site.

OASIS Publication Schedule – Contains the usual schedule by which all other OASIS data entities are published. This includes publication type, publication interval, publication time, description, report group, and comments.

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[17] This listing does NOT include Load Resources – this is covered by the Load Aggregation Point listing.

System Operating Messages - System Operating Messages including message time, Severity, and message text.

Attachment A

BID VALIDATION RULES

A   Bid Validation Rules

Please refer to the following links to the latest versions of the SIBR Rules:

http://www.caiso.com/271f/271fcbd45ca60.html

Under the Applications Documentation

Select either:

Scheduling Infrastructure Business Rules (SIBR): Bidding or

Scheduling Infrastructure Business Rules (SIBR): Inter-SC Trades)

Technical Specifications can also be found on the above links.

Attachment B

MASTER FILE UPDATE PROCEDURES

B   Master File Update Procedures

B.1 Master File

The Master File (MF) contains internal and external operating data for all resources within the CAISO Balancing Authority Area.

The SC can submit a request to make updates to specific operating parameters for existing intertie and generator resources by submitting a revised Resource Data Template (RDT), this can be for Generating resources on the Generating Resource Data Template (GRDT) or Intertie Resources on the Intertie Resource Data Template (IRDT) via the Master File User Interface (UI) or the Master File Application Programming Interface (API).   See table for fields that are editable and those which are informational to the SC.

 Once the SC has submitted a request, the Master File analyst reviews the request and determines if the updates comply with stated MF business rules. If the updates pass the initial review, the request is presented for further review and approval by affected CAISO systems. The changes must be approved prior to them being made effective within the Master File database. If there are questions regarding the requested updates, the CAISO will contact the SC to coordinate modifications to the requested updates.

Master File change requests require at least five (5) and up to eleven (11) business days, depending on the complexity of the change, from receipt of the request to implementation into the Master File database (except as otherwise prescribed, such as to accommodate a high volume of requests for 30 day values.) The request will be treated as a new request upon resubmission, for example, if it fails business rules.

Once the change is updated in the Master File, the Master File analyst will send out a compare report with the updated data elements, the compare report will show the before and after values.

B.2 Master File Content

The following tables define the data contained in the Master File for Generators and for the Intertie resources.

More Business Rules will be posted at the following website once they have been tested:

http://www.caiso.com/1f94/1f94cd5447620.html

B.2.1 Generator Resource – May request data change

This table contains operational data for the Generator resources where changes to the data can be initiated by the Market Participants via the RDT update process. The field names are listed in the order they appear in the GRDT.

Master File Field Name (RDT Column Name)	Definition	Parameter and/or Enumerations
MAX_GEN (Maximum Generation Capacity)	The Net Dependable Capacity (NDC or PMAX) a Generator Resource can produce on a *sustained basis* as measured at or compensated to the Generating Unit's defined point of delivery.	Cannot be null
MIN_GEN (Minimum Generation Capacity)	The minimum output level at which a Generator Unit can operate. Note: Depending on schedules and bids submitted in the market, the CAISO may dispatch units in the real-time market between the values of min gen and max gen. Therefore, the CAISO strongly recommends that the min gen level be set at the Minimum Output Level (PMIN) at which a Generator Unit can operate on a **sustained** basis.	Cannot be null.
MIN_DISP_LEVEL (Minimum Dispatchable Level)	The Minimum operating level at which a Generating Unit is able to readily respond to a dispatch instruction	
MIN_ON (Minimum On Time)	The minimum amount of time that a Generating Unit must stay on-line after starting up and reaching PMin, prior to being shut down, due to physical operating constraints. In case of a Pump Storage resource, this field represents the minimum time that the resource must stay on-line in the generating mode prior to being shut down.	Cannot be null if Fuel Type is equal to GAS
MAX_ON (Maximum On Time)	The maximum amount of time that a Generating Unit can stay on-line per day, due to environmental or physical operating constraints.	If no constraint, then leave this field blank

Master File Field Name (RDT Column Name)	Definition	Parameter and/or Enumerations
MIN_OFF (Minimum Off Time)	The minimum amount of time that a Generating Unit must stay off-line after being shut down, due to physical operating constraints. In case of a Pump Storage resource, this field represents the minimum time that the resource must stay off-line after being shutdown from the generating mode prior to being started again in the generating mode.	
MAX_STRT (Maximum Startups Per Day)	The maximum number of times a Generating Unit can be started up within one day, due to environmental or physical operating constraints.	Cannot be null
MIN_LOAD_COST (Minimum Load Cost)	The costs a Generating Unit or a Participating Load incurs operating at minimum load.	The value is needed for a resource with the Cost Basis of Registered Cost (fixed value) only.
ML_COST_BASIS_TYPE (Minimum Load Cost Basis Type)	30 days Election of the type of Operational Cost used for maintaining operation at Minimum Load: If Proxy Cost: The Operating Cost of a generating resource is calculated using the Heat Rate data in the Master File and daily gas price. (PRXC). The SC is also allowed to submit a daily bid for Minimum Load Cost as long as the bid is not negative and less than or equal to the calculated Minimum Load Cost based on the Heat Rate, Daily Gas Price Index and the Operations and Maintenance (O&M) adder. If Registered Cost: Please refer to Attachment G.	If RES_TYPE = GEN or TG then ML_COST_BASIS_TYPE cannot be null, must be filled with one of the following: PRXC - Proxy Cost REGC - Registered Cost
SU_COST_BASIS_TYPE (Start-Up Cost Basis Type)	30 days Election of the type of Operational Cost used for Start-Up If Proxy Cost: The Start-Up Cost of a generating resource is calculated using the Start-Up data in the Master File and daily gas price. (PRXC). The SC is also allowed to submit a daily bid for Start-Up Cost as long as the bid is not negative and is less than or equal to the calculated Start-Up Cost based on the Start-Up data and daily gas price. If Registered Cost: Please refer to Attachment G	If RES_TYPE = GEN or TG then SU_COST_BASIS_TYPE cannot be null, must be filled with one of the following: PRXC - Proxy Cost REGC - Registered Cost
MAX_PUMP (Maximum Pump Capacity)	The Maximum Operating Level of a Pump or a Pumped-Storage-Hydro Unit operating as a hydro pump	Cannot be null if GEN_TECH_TYPE equals either PTUR or PUMP

Master File Field Name (RDT Column Name)	Definition	Parameter and/or Enumerations
MIN_PUMP_CST (Pumping Minimum Cost)	The minimum cost to start the pump up.	MIN_PUMP_CST cannot be null if GEN_TECH_TYPE = PTUR or PUMP
PUMPING_FACTOR (Pumping Factor)	The efficiency or recovering energy potential in pumping water from the lower to the upper reservoir.	Cannot be null if GEN_TECH_TYPE equals either PTUR or PUMP
PUMP_MAX_STRT (Pump Maximum Daily Startups)	The maximum number of times a Pumped Storage Hydro Resource can switch into pumping mode during a Trading Day.	Cannot be null if GEN_TECH_TYPE equals either PTUR or PUMP
PUMP_MIN_UP_TM (Pump Minimum Up Time)	The minimum time that a Pumped Storage Hydro Resource must stay in pumping mode after switching to that mode.	Cannot be null if GEN_TECH_TYPE equals either PTUR or PUMP
PUMP_MIN_DWN_TM (Pump Minimum Down Time)	The minimum time that a Pumped Storage Hydro Resource must stay out of pumping mode after switching out of that mode.	
MIN_DWN_TM_GP	The Gen-to-Pump minimum down time applies to Pump Storage Resources and reflects the minimum time (in minutes) that the resource must be offline (or self-scheduled) after being de-committed from generation mode and before being dispatched in pumping mode.	
MIN_DWN_TM_PG	The Pump-to-Gen minimum down time. applies to Pump Storage Resources and reflects the: Minimum time (in minutes) that the resource must be offline (or self-scheduled) after being de-committed from pumping mode and before being dispatched in generation mode.	
MAX_PUMP_SD_CST (Pump Maximum Shutdown Cost)	The maximum cost it would take to shutdown the pump.	MAX_PUMP_SD_CST cannot be null if GEN_TECH_TYPE = PTUR or PUMP
PUMP_SHTDWN_TM (Pump Shutdown Time)	The pump shutdown time	
COST_RANK_LMPM (Variable Cost Option)	A method of calculating Default energy Bids based on fuel costs and variable operations and maintenance costs.	Rank 1, 2, or 3
NEGO_RANK_LMPM (Negotiated Rate Option)	A method of calculating Default energy Bids based on a negotiation with the CAISO or the Independent Entity.	Rank 1, 2, or 3
PRC_RANK_LMPM (LMP Option)	A method of calculating Default energy Bids based Locational Marginal Prices.	Rank 1, 2, or 3

Master File Field Name (RDT Column Name)	Definition	Parameter and/or Enumerations
RSRV_CAP_SPIN (Reserve Capacity: Spin)	The portion of unloaded synchronized generating capacity that is immediately responsive to system frequency and that is capable of being loaded in ten minutes, and that is capable of running for at least two hours.	
RSRV_CAP_NSPIN (Reserve Capacity: Non-Spin)	The portion of off-line generating capacity that is capable of being synchronized and Ramping to a specified load in ten minutes (or load that is capable of being interrupted in ten minutes) and that is capable of running (or being interrupted) for at least two hours.	

B.2.2 Generator Resource Reference Only

This table contains Generator resource data that is provided in the GRDT for reference only. These values are reflective of a regulatory agreement with the ISO, or are established through a testing, certification, or registration process, or are based on the Full Network Model. Updates cannot be made through the RDT change process, but may be initiated through that particular service's process. The fields are listed in the order they appear in the GRDT.

Master File Field Name (RDT Column Name)	Definition	Parameter and/or Enumerations
PGA_NAME (Participating Generator Agreement Name - PGA_NAME)	The name of an agreement between the CAISO and a Participating Generator; a pro forma version of which is set forth in Appendix B.2 of the CAISO Tariff	Must correspond to the name on the PGA or QF-PGA.
RES_ID (Resource ID - RES_ID)	The ISO resource identifier used for tracking each resource for market scheduling and outage coordination purposes.	Cannot be updated by submitting an RDT. Must correspond to the RES_ID in the Regulatory Agreement with the CAISO
RES_NAME (Resource Name) - RES_NAME	Descriptive Name for the Resource.	
RES_TYPE (Resource Type) - RES_TYPE	Descriptive identifier denoting the type of resource: Generating Unit, Tie Generator, Load.	Must be one of the following: GEN – Generator LOAD – Load TG - Dynamic Inter-tie Resource

Master File Field Name (RDT Column Name)	Definition	Parameter and/or Enumerations
AGGREGATE_YN (Aggregate? - AGGR_FLAG)	A generator resource that consists of several individual "child" resources	
ENERGY_TYPE (Energy Type - ENERGY_TYPE)	Energy Type	If RES_TYPE = TG: • DYN – resource is on a Dynamic Scheduling Agreement • FIRM – import resource for scheduling of AS self-provision on ETC/TOR contracts If RES_TYPE = GEN, this field is Null
FUEL_TYPE (Primary Fuel Type - FUEL_TYPE)	Description of Primary Fuel Type of the Generator; such as, Natural Gas, Oil, Nuclear, etc.	Must be one of the following: GAS – Natural Gas COAL – Coal/Coke OIL – Oil NUCL – Nuclear WAST – Waste to Energy BIOM – Biomass GEOT – Geothermal SOLR – Solar WATR – Water BGAS – Bio Gas (Landfill Sewage Digester etc.) HRCV – Heat Recovery WIND – Wind OTHR – Other
GEN_TECH_TYPE (Prime Mover Technology - GEN_TECH)	Description of the Prime Mover Technology associated with Generators ; such as, Hydro Turbine, Gas Turbine, Combined Cycle, etc	Must be one of the following: HYDR – Hydro Turbine PTUR – Hydro Pump-Turbine GTUR – Gas Turbine STUR – Steam Turbine CCYC – Combined Cycle RECP – Reciprocating Engine PHOT – Photovoltaic WIND – Wind Turbine PUMP – Pump
GEN_TYPE (Generator Type – GEN_TYPE)		H = Hydro resources T = Other resources
FUEL_REGN_TYPE	Description of the region the resource is located in.	

Master File Field Name (RDT Column Name)	Definition	Parameter and/or Enumerations
AQM_DIST_TYPE (Air Quality Management District - AQM_DIST)	The Air Quality Management District or Air Pollution Control District in which the resource is located.	Must be one of the following: AMAD – Amador ANTV - Antelope Valley BUTT – Butte CALA – Calaveras COLU – Colusa ELDO - El Dorado FRVR - Feather River GBUN - Great Basin Unified GLEN – Glenn IMPE – Imperial KERN – Kern LAKE – Lake LASS – Lassen MARI – Mariposa MBUN - Monterey Bay Unified MEND – Mendocino MODO – Modoc MOJD - Mojave Desert NCUN - North Coast Unified NSER - Northern Sierra NSON - Northern Sonoma OTHR - Other Region PLAC – Placer SACM - Sacramento Metro SBRB - Santa Barbara SCOA - South Coast SDIE - San Diego SFBA - San Francisco Bay Area SHAS – Shasta SISK – Siskiyou SJVU - San Joaquin Valley Unified SLUO - San Luis Obispo TEHA – Tehama TUOL – Tuolumne VENT – Ventura YOSO - Yolo/Solano
CERT_PIRP (Certified PIRP - CERT_PIRP)	Resource is treated as in PIRP program and is certified (is eligible for Settlements treatment as PIRP participant).	
RA_FLAG (Resource Adequacy Flag - RA_FLAG)	An identifier of a resource that is under the Resource Adequacy (RA) program. Set if RR_CAPACITY is greater than zero in an RA Plan.	
MOO_FLAG (Must Offer Obligation Flag- MOO_FLAG)	An identifier of a resource that has a must offer obligation, either due to a RA obligation or through other obligation (i.e. future capacity market procurement, RCST, etc.) unless the unit is Use Limited (including RDRR resources) in which case the MOO_FLAG is No.	

Master File Field Name (RDT Column Name)	Definition	Parameter and/or Enumerations
RR_CAPACITY	The generation capacity of a Resource Adequacy Resource listed on a monthly Resource Adequacy Plan and a monthly Supply Plan. Note that this value changes as the Resource Adequacy capacity varies month to month.	
MOO_QUALIFIED	Y - Resource is Must Offer N - Resource is not Must Offer	R - Resource is eligible for Must Offer based on RA Capacity or RCST designation in any given trading hour
STARTUP_CD_TYPE (Startup Code Type - STARTUP_CD_TYPE)	Code used to determine the startup characteristics. FAST: Generating Units that have a Start Up Time less than ten minutes and can provide non-spin. Blank: All other resources.	
PGA_PART (Participating Generator Agreement Flag - PGA_PART_FLAG)	An identifier of the PGA Resources.	
COG (Constrained Output Generator Flag - COG_FLAG)	The output of the generation resources is not variable, ie PMax = PMin. Y: output is constrained.	
CERT_RUC (Certified for RUC - CERT_RUC_FLAG)	A setting of 'Y' allows a resource to participate in RUC market. This flag is set to 'Y' for all resources where RES_TYPE = GEN or TG.	
LMPM (Market Power Mitigation Participation Flag - MPM_PART_FLAG)	An identifier of a resource that is subject to the market power mitigation process. Defined per tariff.	
CERT_REG (Certified for AS: Regulation - CERT_REG)	An identifier of a resource that is certified to provide Regulation Reserve.	
CERT_SPIN (Certified for AS: Spin - CERT_SPIN)	An identifier of a resource that is certified to provide Spinning Reserve.	
CERT_NSPIN_DAM (Certified for AS DAM: Non-Spin - CERT_DAM_NON_SPIN)	An identifier of a resource that is certified to provide Non-Spinning Reserve in the DAM.	

Master File Field Name (RDT Column Name)	Definition	Parameter and/or Enumerations
CERT_NSPIN_RTM (Certified for AS RTM: Non-Spin - CERT_RTM_NON_SPIN)	An identifier of a resource that is certified to provide Non-Spinning Reserve in the RTM. To be procured in the RTM, a unit must also have a Startup Code Type of FAST.	
MSS_LD_FLNG_UP (MSS Load Following Down - MSS_LOAD_FOLLOWING_UP)	Identifier if a resource is load following down	
MSS_LD_FLNG_DWN (MSS Load Following Up - MSS_LOAD_FOLLOWING_DOWN)	Identifier if a resource is load following up	
QF (FERC Qualifying Facility Flag - QF_FLAG)	Identifier if a resource is a qualifying cogeneration facility or small qualifying power production facility, as defined in the Code of Federal Regulations, Title 18, Part 292	
USE_LIMIT (Use Limit - USE_LIMIT)	Identifier if a resource is energy use limited, such as limitation of energy or emission control, etc.	
OPER_MAINT_COST	Variable operations and maintenance costs. The default value for Combustion Turbine or Reciprocating Engine technology is $4/MWh. $2/MWh for other types.	
PRIOR_TYPE	Designator of Regulatory Must-Run, Reliability Must Run, and Must Take resources	
DISP	Designates a dispatchable resource	
RMR	Designates a resource that has a Reliability Must Run contract	
MAX_RR	This is a derived field that represents the maximum ramp rate in the operational ramp rate curve.	
PRC_SET_DAM	Can set Market Clearing price in Day Ahead market	
PRC_SET_RTM	Can set Market Clearing price in Real Time market	

| STRANDED_LOAD | Identifies whether or not the resource is available for stranded load.

Definition of Stranded Load (by CAISO): Load served by a Scheduling Coordinator at a sub-station located at the perimeter of the CAISO BAA, but still physically located within the CAISO BAA, that has become isolated from the rest of the CAISO BAA by a line or other facility outage that must be served via an adjacent BAA.

Definition of Stranded Load (by others): Load served by an outside load serving entity at a sub-station located adjacent to the perimeter of the CAISO BAA, that has become isolated from the adjacent BAA by a line or other facility outage and that must be served via an adjacent BAA by wheeling through the CAISO. | 'Y' (Yes) or 'N' (No) value |
| DISCRETE_DISP | Identifies whether a RDRR resource has selected the discrete dispatch option (may only be dispatched to maximum bid level) for real-time dispatch. | 'Y' (Yes) or 'N' (No) value |

B.2.3 Intertie Resource - May request data change

This table contains data for the Intertie resources where changes to the data can be initiated by the Market Participants through the RDT update process.

Master File Field Name (RDT Field Name)	Definition	Parameter and/or Enumeration
MIN_HR_BLK_LIM (Minimum Hourly Block Limit (1-24 hours))	Represents the maximum number of consecutive Trading Hours that an Intertie resource can be bid in, if a Minimum Hourly Block is specified in the Bid.	Must be a whole number from 1 to 24.
NEGO_RANK_LMPM (Negotiated Rate Option)	A method of calculating Generated Bids based on a negotiation with the CAISO or the Independent Entity.	Rank 1, 2 or null
PRC_RANK_LMPM (LMP Option)	A method of calculating Generated Bids based on Locational Marginal Prices.	Rank 1 or null
GMC_RANK_LMPM (Price Taker Option)	A method of calculating Generated Bids based on a price taker value of zero plus an estimate of the Grid Management Charge.	Rank 1, 2, or null

Explanation of the Generated Bids fields

These fields apply only to non-Resource Specific System Resources that have Resource Adequacy obligations. See the *BPM for Reliability Requirements* for more information.

There are five possible scenarios for the raking of Generated Bids fields in the Intertie Resource Data Template (IRDT).

Scenarios	LMP **PRC_RANK_LMPM**	Price Taker **GMC_RANK_LMPM**	Negotiated **NEGO_RANK_LMPM**
1			
2		**1**	
3			**1**
4	**1**	**2**	
5	**1**		**2**

PRC_RANK_LMPM = Locational Marginal Price (LMP)
GMC_RANK_LMPM = Price Taker plus the Grid Management Charge (Price Taker)
NEGO_RANK_LMPM = Negotiated

- Scenario 1, if there is nothing selected (all fields are blank or null) the default will be GMC_RANK_LMPM, (Price Taker + GMC), there is no second or third option.
- Scenario 2, Selected GMC_RANK_LMPM, (Price Taker + GMC), there is no second or third option.
- Scenario 3, Selected NEGO_RANK_LMPM, (NEGO), there is no second or third option.
- Scenario 4, Selected PRC_RANK_LMPM, (LMP), then there must be a second selection, in this scenario it is GMC_RANK_LMPM (Price Taker + GMC).
- Scenario 5, Selected PRC_RANK_LMPM, (LMP), then there must be a second selection, in this scenario it is NEGO_RANK_LMPM (Negotiated).

B.2.4   Intertie Resource Reference Only

This table contains Intertie resource data that is provided in the IRDT for reference only. Values related to Resource Adequacy are updated based on the monthly supply plan. The fields are listed in the order they appear in the IRDT.

Master File Field Name (RDT Field Name)	Definition	Parameter and/or Enumeration
RES_ID (Resource ID)	The ISO resource identifier used for tracking each resource for market scheduling.	Once created, the resource ID cannot be changed. The resource must end-dated and a new resource ID created.
ENERGY_TYPE	An identifier of the type of Energy from an Intertie resource as it pertains to Ancillary Service Requirements, Dynamic Interchange or Wheeling.	FIRM – Firm Import/Export NFRM – Non-Firm Import/Export WHL – Wheeling UCTG – Unit Contingent
CERT_SPIN	Not used for Intertie Resources	
CERT_NSPIN_DAM	Not used for Intertie Resources	
CERT_NSPIN_RTM	Not used for Intertie Resources	
RSRV_CAP_SPIN	Not used for Intertie Resources	
RSRV_CAP_NSPIN	Not used for Intertie Resources	
CERT_RUC (Certified for RUC)	Identifier of a resource that is eligible to participate in RUC.	This flag is set to Y if a resource has Resource Adequacy capacity for a given trade date.
MOO_QUALIFIED (Must Offer Obligation Qualified)	Y - Resource is Must Offer N - Resource is not Must Offer R - Resource is eligible for Must Offer based on RA Capacity or RCST designation in any given trading hour	Currently, this flag is set to N for all Intertie resources.
RR_CAPACITY	Reliability Requirement Capacity	Based on Resource Adequacy monthly showings
RA_FLAG	Identifier of a resource that has Resource Adequacy capacity	
MOO_FLAG	Must Offer Obligation Flag	This flag is set to Y if a resource has Resource Adequacy Capacity AND the MOO_QUALIFIED flag is set to Y
WHEEL_REFERENCE _NUMBER (Wheel Reference ID)	Represents the wheeling counter resource that can be used in the Wheeling Bid Component of an Intertie resource bid. This ID is created in Master File and corresponds to the import wheel resource ID	

Master File Field Name (RDT Field Name)	Definition	Parameter and/or Enumeration
STRANDED_LOAD	Identifies whether or not the resource is available for stranded load. Definition of Stranded Load (by CAISO): Load served by a Scheduling Coordinator at a sub-station located at the perimeter of the CAISO BAA, but still physically located within the CAISO BAA, that has become isolated from the rest of the CAISO BAA by a line or other facility outage that must be served via an adjacent BAA. Definition of Stranded Load (by others): Load served by an outside load serving entity at a sub-station located adjacent to the perimeter of the CAISO BAA, that has become isolated from the adjacent BAA by a line or other facility outage and that must be served via an adjacent BAA by wheeling through the CAISO.	'Y' (Yes) or 'N' (No) value

B.2.5 Operational Ramp Rate Curve

This table contains the data on the maximum ramp rate of the Generator between worst and best operating conditions between segments.

For RDRR resources, the worst operational ramp rate and longest startup time must be coordinated so that the resource starts-up and ramps from zero to full capacity in no more than 40 minutes.

Master File Field **Name** (RDT Field Name)	Definition	Parameter and/or Enermuration
SEG_TYPE (Segment Type)		RAMP for the Ramp Rate Type
RES_ID (Resource ID)	Unique Resource Identifier used for scheduling and billing.	Cannot be updated.
SEG_NUM (Segment Number)	Point numbers between the PMin and PMax of the Generating Unit output.	The point numbering starts at 1. Up to 5 points allowed.

RAMP_MW_OUTPUT (Operating Level)	Operating Reserve Ramp Rate (MW/min), per Generating Resource.	First point of first segment must = MIN_GEN (PMIN) Last point of last segment must = MAX_GEN (PMAX)
RAMP_MIN_RATE (Worst Operational Ramp Rate)	The maximum ramp rate under the worst operating condition of the Generating Unit between point (i) and the point (i+1). The minimum ramp rate of the last point should = the previous one.	This requires providing the minumum ramp rate of the first point (1) at PMin and last point (n) at PMax.
RAMP_MAX_RATE (Best Operational Ramp Rate)	The maximum ramp rate under the worst operating condition of the Generating Unit between point (i) and the point (i+1). The minimum ramp rate of the last point should = the previous one.	This requires providing the minumum ramp rate of the first point (1) at PMin and last point (n) at PMax.

B.2.6 Heat Rate Curve

This table contains data on the average Heat Rate, Emission Rate or Average Fuel Cost between segments.

Master File Field **Name** (RDT Field Name)	Definition	Parameter and/or Enermuration
SEG_TYPE (Segment Type)		HEAT for the Heat Rate type
RES_ID (Resource ID)	Unique Resource Identifier used for scheduling and billing.	Cannot be updated.
SEG_NUM (Segment Number)	Point numbers between the PMin and PMax of the Generating Unit output. The number of segments is selected to accurately reflect the Heat Rate characteristics of the resource.	The point starts at 1. Up to 11 points are allowed. Note: The Heat Rate, Emission Rate, and Average Cost segments cannot lie within a Forbidden Region. Must provide either Heat Rate data if gas fired, or Average Cost data if non-gas fired.
HEAT_MW_OUTPUT (Heat Rate Operating Level)	The Resource MW output pertaining to the relevant point.	The first point (1) of MW output must start at the Generating Unit's PMIN. The last point (n) of MW output must end at the Generating Unit's PMAX. Intermediate MW points cannot lie within a Forbidden Region.
HEAT_HEAT_RATE (Heat Rate)	For gas-fired units only, the average heat rate of the Generating Unit on point (i). If value at point (i) is not available, linear interpolation can be used to approximate the value. Heat rate must be provided at the first point (1) (PMin) and the last point (n) (PMax). If not a gas-fired unit, leave blank and instead complete the Average Heat Cost field.	If Gas-Fired unit cannot be null.
HEAT_EMISSION_RATE (Heat Emission Rate)	The emission rate of the Generating Unit on point (i). If value at point (i) is not available, linear interpolation can be used to approximate the value.	Emission rate must be provided at the first point (1) (PMin) and the last point (n) (PMax), Gas-Fired unit cannot be null.
HEAT_AVG_COST (Average Cost)	Use this value for non-gas fired units instead of Heat Rate. The average cost of the Generating Unit on point (i) in $/hr. If value at point (i) is not available, linear interpolation can be used to approximate the value.	Average cost must be provided at the first point (1) (PMin) and the last point (n) (Pmax). If gas-fired, make sure to enter a value in Heat Rate and leave this field blank.

B.2.7 Start-Up Curve

This table contains data on the Start-Up Time, Start-Up Fuel Cost, Start-Up Fuel Usage, and Start-Up Energy between Down Times.

For RDRR resources, the worst operational ramp rate and longest startup time must be coordinated so that the resource starts-up and ramps from zero to full capacity in no more than 40 minutes.

Master File Field **Name** (RDT Field Name)	Definition	Parameter and/or Enermuration
SEG_TYPE (Segment Type)		STRT for the Startup Type
RES_ID (Resource ID)	Unique Resource Identifier used for scheduling and billing.	Cannot be updated.
SEG_NUM (Segment Number)	The segment numbers corresponding to cooling time of the unit.	The segment starts at 1. Normally, there are 3 segments (hot, warm and cold). Up to 9 segments are allowed.
STRT_DOWN_TIME (Registered Cooling Time)	The amount of time the Generating Unit must be off (in minutes) within sequence (i). The first down time must be zero to account for a unit which has just shut down.	Cannot be null if RES_TYPE equals GEN or TG DOWN_TIME associated with the 1st Point must = 0.
STRT_STARTUP_TIME (Startup Time)	Startup Time is the time (in minutes) it takes a resource to achieve PMin from an off-line position given the corresponding Down Time (Registered Cooling Time). The startup time of the Generating Unit (in minutes) from the cooling time (i) to cooling time (i + 1). The last segment represents the startup time (in minutes) from cooling time (n) to infinity.	Cannot be null if RES_TYPE equal GEN or TG
STRT_STARTUP_COST (Startup Cost)	The startup cost of non-natural gas fired Generating Units (in dollars) from the cooling time (i) to cooling time (i + 1). The last segment represents the startup cost (in dollars) from cooling time (n) to infinity.	Values must be monotonically increasing. Required if Resource is non-Natural Gas-Fired.
STRT_STARTUP_AUX (Start-Up Aux)	The electrical power used by a Generating Unit during startup. The Generating Unit's startup auxiliary power (in MWh) from the down time (i) to down time (i + 1). The last sequence is the startup auxiliary power (in MWh) from current sequence to infinite.	Values must be monotonically increasing. Cannot be null if Fuel_type is GAS

| STRT_STARTUP_FUE L (Start-Up Fuel) | The fuel use (in mBTU per start) expected for the startup of a natural gas fired Generating Unit that has been off-line for a substantial period of time. The startup fuel of the Generating Unit (in mBTU) from the down time (i) to down time (i + 1). The last sequence is the startup fuel (in mBTU) from current sequence to infinite. | Values must be monotonically increasing. |

B.2.8   Forbidden Range Curve

This table contains data on the Lower and Upper MWs of each Forbidden Region, which a Generator cannot safely operate.

Master File Field **Name** (RDT Field Name)	Definition	Parameter and/or Enermuration
SEG_TYPE (Segment Type)		FBRD for Forbidden Region Type
RES_ID (Resource ID)	Unique Resource Identifier used for scheduling and billing.	Cannot be updated.
SEG_NUM (Segment Number)	This number represents a given forbidden region.	Segment number 1 should be the forbidden region at the lowest level in the operating range. Segment numbers should correspond to sequential regions along the operating range, ending with segment (n) at the highest operating level. Up to four (4) segments are allowed.
FRBD_LOW_MW_OUTPUT (Lower MW of Forbidden Region)	The lower MW output of the forbidden range of the current segment. The forbidden region should be inside of segment (i); meaning a forbidden region cannot cross two segments and the segment cannot be overlapped. Note: forbidden regions cannot include nor overlap regulation ranges or heat segments.	FRBD_LOW_MW_OUTPUT must be greater than or equal to MIN_GEN (PMIN) plus 0.1MW.
FRBD_HIGH_MW_OUTPUT (Upper MW of Forbidden Region)	The upper MW output of the forbidden region of the current segment. The forbidden region should be inside of segment (i); meaning a forbidden region cannot cross two segments and the segment cannot be overlapped. Note: Forbidden regions cannot include nor overlap regulation ranges or heat segments.	FRBD_HIGH_MW_OUTPUT must be less than or equal to MAX_GEN(PMAX) minus 0.1MW.
FRBD_CROSSING_TIME (Forbidden Region Crossing Time)	The amount of time for a Generator to ramp through it's Forbidden Region.	If FRBD_LOW_MW_OUTPUT is not null FRBD_CROSSING_TIME must be greater than 0

B.2.9 Regulation Range Curve

This table contains the data on the regulation range of the Generator.

MFRD Field	Definition	Business Rule
		SEG_TYPE = REG
RES_ID	Unique Resource Identifier used for scheduling and billing.	Cannot be updated.
SEG_NUM	Point numbers between the PMin and PMax of the Generating Unit output.	Up to 2 segment ranges allowed.
REG_LOW_MW_OUTPUT	The Lower MW output of the current Regulation Range segment.	REG_LOW_MW_OUTPUT must be >= MIN_LOAD and MIN_GEN
REG_HIGH_MW_OUTPUT	The Higher MW output of the current Regulation Range segment.	REG_HIGH_MW_OUTPUT must be > REG_LOW_MW_OUTPUT and <= MAX_GEN

B.2.10 Regulation Ramp Rate Curve

This table contains the data on the maximum ramp rate of the Generator for being used for regulation between worst and best operating conditions between segments.

Master File Field **Name** (RDT Field Name)	Definition	Parameter and/or Enermuration
SEG_TYPE (Segment Type)		RREG for Regulation Range Ramp Rate Type.
RES_ID (Resource ID)	Unique Resource Identifier used for scheduling and billing.	Cannot be updated.
SEG_NUM (Segment Number)	Number of the ramp rate of regulation. The ramp rate for each segment corresponds to the Regulation Range Segment Number.	Up to 2 segment ranges allowed.
RREG_MIN_RATE (Worst Regulation Ramp Rate)	The maximum Regulation Ramp Rate for the segment under the worst condition.	
RREG_MAX_RATE (Best Regulation Ramp Rate)	The maximum Regulation Ramp Rate for the segment under the best condition.	

B.2.11 Operating Reserve Ramp Rate Curve

This table contains the data on the maximum ramp rate of the Generator certified for spin and non-spin between worst and best operating conditions between segments.

MFRD Field **Name** (RDT Field Name)	**Definition**	Parameter and/or Enermuration
SEG_TYPE (Segment Type)		ROPR for Operating Reserve Ramp Rate Type.
RES_ID (Resource ID)	Unique Resource Identifier used for scheduling and billing.	Cannot be updated.
SEG_NUM (Segment Number)	Point numbers between the PMin and PMax of the Generating Unit output.	One ramp rate range covers procurement of both Spinning and Non-Spinning reserve.
ROPR_MIN_RATE (Worst Operating Res Ramp Rate)	The maximum Regulation Ramp Rate under the worst condition	If Unit has the any of the Certified for AS flags set to Y than field must be greater than 0.
ROPR_MAX_RATE (Best Operating Res Ramp Rate)	The maximum Regulation Ramp Rate under the best condition.	If Unit has the any of the Certified for AS flags set to Y than field. Must not be null.

B.3 Grouping Constraints

The reference section of the Schedule 1 of the Participating Generator Agreement (PGA) should include a description of any group of two or more resources that are subject to constraints for minimum lag time between successive startups and/or shutdowns due to physical limitations. The description of these limitations may be generic if the lag time values are subject to change.

To add or update the minimum lag times for group constraints, Scheduling Coordinators should complete the Group Constraints Request Form and submit to RDT@caiso.com. Group Constraints requests will be processed within the 5 to 11 business day Master File change process.

Attachment C

GAS PRICE INDEX CALCULATION RULES

C   Gas Price Index Calculation Rules

C.1   Background

The Gas Price Index (GPI) is the index that is used in the calculation of the Default Energy Bids, as well as the generated bids including Startup Costs, and Minimum Load Costs. The GPI has a number of key components, including principally the gas price indices themselves and the intra-state gas transport costs. Gas Price Indexes consist of a single price ($/mmBTU) for each GPI Region, of which there is at least one for each of the main LSEs. Each Resource is associated with the GPI Region in which it resides, or to which it is geographically closest

C.2   Gas Transport Cost

The proxy gas transport costs are based on the cost of gas transport in the respective service territories of the main LSEs. It is calculated in the following manner:

➢ Units served by SDG&E: The Southern California Gas Company intrastate transportation rate (currently GT-SD) plus the volumetric component of the SDG&E gas transportation rate for electric generation service, including the ITCS[18] (currently GTUEG – SD), or any successor rate for electric generation service applicable to deliveries to the Facility, divided by one minus the applicable in-kind shrinkage allowance, if any.

➢ Units served by Southern California Gas: The Southern California Gas Company intrastate transportation rate for firm electric generation service, including the ITCS (GT-F) plus the G-ITC Wheeler Ridge Interconnection Access fee, if applicable, or any successor rate for firm electric generation service applicable to deliveries to the Facility, divided by one minus the applicable in-kind shrinkage allowance, if any.

➢ Units served by PG&E: The PG&E intrastate transportation charge stated in Rate Schedule G-EG, or any successor rate for electric generation service applicable to deliveries to the Facility, divided by one minus the applicable in-kind shrinkage allowance, if any.[19]

C.3   Gas Prices

The industry sources for gas prices have been identified as:

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[18] ITCS means Interstate Transition Cost Surcharges.

[19] If the Facility does not qualify for service under Rate Schedule G-EG, the applicable rate shall be given by Rate Schedule G-NT.

> ➢ Natural Gas Intelligence
> ➢ SNL Energy/Btu Daily Gas Wire
> ➢ Platt's Gas Daily
> ➢ Intercontinental Exchange (ICE).

A key input in deciding how the GPI should be calculated is the timing and availability of the gas prices. The table below summarizes the current timing/availability of gas prices from each of these vendors. All times are in PST on the day before the gas flow date except as noted for NGI.

Source	Earliest Time Available (PST)	Latest Time Available (PST)
ICE	10:00 AM	12:00 PM
SNL Energy/BTU Daily	16:00 PM	19:00 PM
NGI	19:00 PM	2:00 AM (flow date)
Platt's	17:00 PM	19:00 PM

Based on the availability and timing of data from vendors and the need to ensure accuracy, reliability and consistency the following principles were established:

The GPI should be a one-day index, not a multi-day index. This allows for a more accurate index.

> ➢ At no stage will the number of gas prices used fall below two. Should fewer than two current gas prices be available the most recent GPI based on two or more prices will be used.
> ➢ A prior GPI will also be used whenever a current GPI is unavailable for any reason.
> ➢ The gas price will be updated between the hours of 19:00 and 22:00.
> ➢ The GPI published on TD-2 will be used for the DA market for any given TD. The GPI published on TD-1 will be used for the RT market for any given TD.
> ➢ The GPI will normally be based on three or four prices.

Attachment D

CALCULATION OF DEFAULT ENERGY BIDS

D. Calculation of Default Energy Bids

The overall intent of the Default Energy Bid mitigation system is to mirror competitive outcomes in those situations where participants might have market power. CAISO believes that under competitive outcomes generators would be paid at least their variable costs. Consequently the Default Energy Bid (DEB) is designed to approximate that cost. Additionally, pursuant to CAISO Tariff 39.7.1.6 the method for calculating RMR Unit Default Energy Bids is also discussed. The RMR DEBs are calculated similarly to non-RMR Units but utilize costs specified to their RMR Contracts.

An SC may modify the ranking of the three options for calculating the DEB up to two times during any 365-day period. If an SC would like to modify the ranking of options for calculating the DEB more than two times during any 365-day period, additional changes must be approved by the CAISO or Independent Entity responsible for determining DEBs under the Negotiated Option.

This appendix is concerned solely with the calculation of the Default Energy Bid (DEB) which forms part of the broader Market Power Mitigation (MPM). The DEB is only used for Market Power Mitigation in the incremental direction. There is no decremental mitigation as infeasible schedules will not be accepted in the Day-Ahead Market. In all four variations of the Default Energy Bid (DEB) will be calculated, namely Day-Ahead and Real-Time DEBs for both peak and off-peak separately. There is no hourly variation except in the transition hours between Off-Peak and Peak and vice versa.

D.1 Day-Ahead

CAISO has undertaken to implement a Locational Marginal Price (LMP) based market design with an Integrated Forward Market (IFM) by April 1, 2009. There are two elements of the Market Power Mitigation (MPM) system design which pertain directly to the Default Energy Bid (DEB). Before the Day-Ahead Market (DAM) runs, CAISO carries out two pre-IFM runs, referred to as the CCR (Competitive Constraints Run) and the ACR (All Constraints Run). In the CCR only the competitive constraints are enforced based on Forecast Demand. The dispatch levels from this CCR then form a baseline for subsequent runs. In the ACR, all constraints are enforced and non-RMR units that are incremented between these two runs are mitigated to the higher of their DEB or the highest priced Bid segment dispatched in the CCR pass. The purpose of the DEB is to mimic the variable cost of the generating units, so that in the IFM generators are dispatched based on their variable costs rather than their submitted Bids. Hence, the purpose of the DEB is to allow incremental dispatch based on variable cost. Once the ACR is complete, DAM LMPs are set for the dispatched capacity when the DAM runs.

D.2   Real-Time

In real-time generators enter the simplified Real Time Market Process (RTM) with their DAM schedules subject to a bidding rule that they may not submit an Energy Bid component at a lower Bid price than their highest accepted DA Energy Bid. Again mitigation only occurs in the incremental direction. Decremental dispatches are based on submitted bids that conform to the bidding rule. CAISO carries out the same process as in the DAM. Mitigation of bids remains at the hourly level although LMPs are dispatched at the 5 minute level, settlement at the 10 minute level, and unit commitment and Ancillary Service procurement at the 15 minute level.

D.3   Characteristics of the Default Energy Bid (DEB)

A Default Energy Bid is a monotonically increasing staircase function consisting of a maximum of 10 economic bid segments, or 10 ($/MW, MW) pairs and an End MW value. Each Default Energy Bid is identified by the DEB ID; it is also identifiable by the Resource ID, the Market in which it is applicable, the period of the day in terms of On Peak and Off Peak when it is applicable, and the time it is updated.

In addition to the DEB_ID there is also a Segment Number that indicates the sequence of segments. A segment of a Default Energy Bid is represented by the Start MW and the Price in terms of $/MWh. Each segment of the Default Energy Bid is associated with a field that indicates which methodology has been used to determine the segment. A DEB may be calculated using more than one methodology as explained below.

Separate DEBs are calculated for the DAM and the RTM, as well as for peak and off-peak hours. The Default Energy Bid is eligible to set the LMP at its location. LMPs set by mitigated bids will not be revisited and reset due to the presence of an updated gas index.

There are three methodology options for calculating DEBs:

➢ LMP Option: A weighted average LMP based on the lowest quartile of validated and/or corrected LMPs set at the Generating Unit location during Trading Hours in the last 90 days when the Unit was dispatched. Generating Units must pass a competitiveness screen to qualify for this option in which 50% of their MWh dispatches over the prior 90-days must have been dispatched competitively.

➢ Negotiated Rate Option: An amount negotiated with the Independent Entity. . If a Resource has ranked the Negotiated Rate Option as the first choice, the complete curve of the latest Negotiated Rate Option will be selected.

➢ Variable Cost Option: This option is based on the variable cost of the unit and includes a 10% adder for non-RMR capacity. Furthermore this option is supplemented by the Frequently Mitigated Unit (FMR) adder whereby certain units that are often mitigated qualify for a contribution towards their going-forward fixed costs. If a Resource has

ranked the Variable Cost Option as the first choice, the complete curve (i.e., including all segments) of the Variable Cost Option will be calculated and selected.

Each Resource (through their SC) will rank the three alternatives for Default Energy Bid calculation according to their order of preference for each resource. There will be a single ranking for all hours of all days.

The details of the three alternatives are described below.

D.4   LMP Option

If a Generating Unit chooses the LMP-Option as the first choice, they must have either a negotiated curve or cost-based curve as second choice, as the generator may not be eligible for the LMP option, or if eligible, the option may not be feasible due to not enough data available. If a Resource has ranked the LMP Option as the first choice, the LMP Option calculation method will be used to construct the DEB to cover as much capacity as possible to the extent that the LMP Option method is feasible. The DEB for the remaining capacity will be constructed using either the Negotiated Rate Option the Variable Cost Option according to the Resource's preference. Moreover, the segments that are not based on LMP are linked to the segments of Negotiated Rate Option or the Variable Cost Option depending on which one is used.

The LMP-Based DEB is only calculated if it is the first choice of the Resource. Since the methodology for calculating the LMP-Based DEB needs predefined segments and one of the other two methods as the fall back, the calculation will start with the second choice of the Resource, which could be either the Variable Cost Option or the Negotiated Rate Option. By doing so the resource's predefined segments are stipulated, namely;

- ➢ The first MW point is the Minimum Load
- ➢ The last MW point is the Maximum Capacity
- ➢ Each forbidden region is represented by a separate bid segment.
- ➢ The LMP-Based calculation will be used to modify the bid price for each segment that passes the Feasibility Test, which tests the availability of data for calculating the weighted average of the LMPs for the bid in each segment.

In the event that a resource fails the Feasibility Test, the second choice will be substituted for that particular segment. Finally, adjustments are made to ensure that the staircase bid curve is monotonically increasing.

D.4.1 Feasibility Test

The LMP-Based DEB will not apply during the first 100 days after the new market power mitigation under the New California ISO Nodal Market is in operation. After the first 100 days,

the following feasibility test applies to each bid segment. A bid segment will pass the Feasibility Test only if there are a threshold number of data points to allow for the calculation of an LMP-Based DEB   This threshold number will set at a level that is designed to avoid excessive volatility of the LMP DEB that could result when the LMP is calculated based on a relatively small number of prices. The initial threshold condition in the DA is set to twenty-nine (29 – approximately 2%) on Peak, and fifteen (15 – approximately 2%) on Off-Peak, out of a total of 1440 possible peak values and 720 possible Off-Peak values. For Real-Time the thresholds are slightly lower around 1%. For Peak Real-Time the threshold is set at one hundred and seventy-three (173) and for Off-Peak the initial threshold is set at Eighty-seven data points (87), out of a total of 17,280 possible peak values and 8,640 possible Off-Peak values.

Thus for example, for a segment to be eligible to be calculated via the LMP methodology for the DA Peak DEB then a dispatch within that segment must have occurred a minimum of 29 times in the last ninety days. The feasibility test is done separately for each market (Day-Ahead and Real-Time) and for each type of period (Peak and Off-Peak).

D.4.2   DEB Price Calculation

If a resource has passed the Eligibility Test and a DEB segment has passed the Feasibility Test, the DEB price for a segment is calculated to be the weighted average of the GPI-normalized LMPs that are in the lowest quartile of the set of GPI-normalized validated or corrected LMPs whose corresponding schedules/dispatches fall in the segment.

Monotonicity Adjustment

Right-To-Left Adjustment

The LMP-Based DEB must be monotonically increasing. The Right-To-Left Adjustment only applies to the LMP-Based DEB segments, i.e., not including the Cost-Based or Negotiated DEB segments that have been substituted into the LMP-Based DEB curve. The Right-To-Left Adjustment will start from the right most LMP-Based DEB segment and ensure that the price of each valid LMP-based segment to the left is not greater than the price of the previous valid LMP-based segment to the right. Any segment that fails this test shall have its value reduced to the price of the next valid LMP-based segment to the right.

Left-To-Right Adjustment

The Left-To-Right Adjustment applies to all the DEB segments, i.e., including the LMP-Based DEB, and the Cost-Based DEB segments or Negotiated DEB segments. The Left-To-Right Adjustment will start from the left-most DEB segment to ensure that price of a segment on the right is greater than the price of the segment on the left. The segment on the right that is not

greater than the price of the segment on the left shall be merged to the price of the segment immediately on the left.

D.5   Variable Cost Option

The Cost-Based DEB will be calculated based on the Incremental Heat Rate curve (for gas fueled units) multiplied by the Gas Price Index or Incremental Cost Rate curve (for non-gas fueled units), plus an Operations and Maintenance adder on file. This figure will then be multiplied by a configurable scalar (e.g., 110%), plus the DEB Adder if applicable, to produce the Cost-Based DEB[20].

RMR Units default to the Variable Cost Option and do not receive either the scalar or the DEB Adder. They do receive the RMR Contract specified values of ISO Annual Charge Adjustment (ACA) Charge and the ISO Scheduling Coordinator Administration Charge as specified in their RMR Contract Schedule C. Average Heat Rates are determined from the FERC Filed Schedule C for either gas and distillate fueled units and entered into the Masterfile RMR Heat Rate field. Fuel price, both gas and distillate are provided by the independent entity. The Cost-Based DEB is then calculated using the Incremental Heat Rate curve multiplied by the fuel price.

The value used for the Gas Price Index (GPI) is described in Attachment C.

D.5.1 Average Heat Rate Curve

Generator units are required to submit to CAISO the Average Heat Rates (Btu/kWh) measured for at least 2 and up to 11 generating operating points (MW), where the first and last operating points refer to the minimum and maximum operating levels, respectively. The average heat rate curve formed by the (Btu/kWh, MW) pairs is a piece-wise linear between operating points. An Average Cost Curve is used in place of the Heat Rate Curve for a non-gas fueled unit. Heat Rate Curves or Average Cost Curves are stored, updated and validated in the Master file. For RMR Units, the Average Heat Rate Curve is determined from FERC filed RMR Schedule C data.

D.5.2 Incremental Heat Rate Curve

DEBs under the Variable Cost Option are calculated to reflect the incremental heat rates that reflect the marginal requirement of heat input (Btu/h) for providing an extra 1 MW output at a given operating point. The incremental heat rates (Btu/kWh) are calculated from the average heat rates. The resulting incremental heat rate segments are a step function due to use of piece-wise linear average heat rate curve. Two average heat rate pairs yield one incremental heat rate segment that spans across two operating points. The first step is to covert the average

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[20] CAISO continues to use the current emissions chargeback process. CAISO only reimburses generators for legitimately incurred emissions costs due to CAISO dispatches.

heat rate to requirement of heat input (Btu/h) for each operating point by multiplying the average heat rate with the MW of the operating level. The actual incremental heat rate is then derived as dividing the change of requirement of heat input from one operating point to the next by the change of MW between two consecutive operating points. The specific formula for calculating incremental heat rates calculated from average rates is provided below.

$$IHR_{Sn}^{ini} = \frac{AvgHR_{n+1} * MW_{n+1} - AvgHR_n * MW_n}{MW_{n+1} - MW_n}$$

Where:

IHR_{Sn}^{ini} is the initial incremental heat rate for segment S_n between two consecutive generator MW output operating points $(n-1)$ and (n).

$AvgHR_n$, $AvgHR_{n-1}$ are the average heat rates measured at the operating points (n) and $(n-1)$, respectively.

MW_n, MW_{n-1} are the generator MW output levels at the operating points n (higher level) and $n-1$ (lower), respectively.

D.5.3 Adjustment of Incremental Heat Rate

Initial incremental heat rates calculated using the equations in Section D.4.1.2 will be adjusted as described in this section in order to reduce cases where – due to Left-To-Right adjustments made to ensure that DEBs are monotonically non-decreasing — DEBs under the Variable Cost Option would significantly exceed a unit's actual incremental costs for a significant portion of the unit's capacity.   This adjustment is applied only to incremental heat rate segments that correspond to operating ranges below 80% of the units' maximum operating capacity (PMax).

Specifically, initial incremental heat rates calculated using the equations in Section D.4.1.2 will be adjusted if necessary so that the resulting incremental heat rates (Btu/kWh) do not exceed the maximum of the average heat rates corresponding to the upper and lower operating points of each incremental heat rate segment.   The formula used to make this adjustment is provided below.

$$Cap_{Sn} = \max(AvgHR_n, AvgHR_{n+1})$$

$$IHR_{Sn}^{adjusted} = \min(IHR_{Sn}^{ini}, Cap_{Sn})$$

Where:

Cap_{Sn} is the maximum limit for segment S_n ;

$IHR_{Sn}^{adjusted}$ is the adjusted incremental heat for segment S_n .

Examples of this adjustment are provided in Attachment J.

D.5.4 Operations and Maintenance Adder

The Operation and Maintenance cost adder is an amount in terms of $/MW. The exact amount is dependent on resource type. The default value for the O&M adder is $2/MW for all types of resources except Combustion Turbines and Reciprocating Engines, for which it is $4/MW, regardless of fuel type. In addition, CAISO would review the default O&M adder values used for DEBs and proxy Minimum Load Cost every three years. RMR Units use the FERC Filed RMR Variable O&M cost.

Scalar

The configurable scalar is set to be 110% by default. RMR units do not receive the scalar.

FMU Bid Adder

DEB Adders only apply to the Cost-Based DEB and do not apply to LMP-Based DEB or Negotiated DEB. In general, the DEB Adder (DEBA) is resource specific; i.e., each resource can have a unique DEBA. The CAISO will establish a baseline $/MWh value of DEBA for all eligible resources except those that have negotiated special DEBA values with the CAISO.

Eligibility for DEB Adder

A resource is eligible to have a DEB Adder included in its Cost-Based DEB prices for every segment if and only if the resource is a Frequently Mitigated Resource (FMR). The determination of FMR is established on a monthly basis. The determination of FMR for each month is based on data for the 12-month period ending on the 15th day of the prior month. For example, the determination of FMR for June of 2008 will be evaluated based on data for the period between May 16, 2007 and May 15, 2008.

A resource is designated as an FMR if the resource is mitigated in over 80% of its run hours over the rolling 12-month period. An hour is considered a mitigated hour if the unit had been scheduled in a mitigated segment in the hour in DA, or the unit had been dispatched in a mitigated segment in RT in at least one of the 5-min intervals of the hour.

The FMR determination will be done outside this system, initially by the Department of Market Monitoring, and the results will be uploaded into the system.

D.5.5   Summary Example

The following example summarizes how the Cost-Based DEB is calculated for an individual segment of a unit's heat rate curve.

For a gas-fired Combined Cycle Gas Turbine (CCGT) with a segment with an 8,000 Incremental Heat Rate, the DEB for that segment would be calculated as follows, given a gas price of $4.50/mmBTu and the proxy gas transport cost were $. 50, making a GPI of $5/ mmBTU. Presume that this unit is not eligible for the DEBA.

{([HR * GPI] + O&M) * 1.1} + DEBA (if eligible)

{([8 * $5] + $2) * 1.1} + $0

= $46.20

Left-To-Right Adjustment

The Left-To-Right Adjustment applies to all Cost-Based DEB segments. The Left-To-Right Adjustment will start from the left-most DEB segment to ensure that price of a segment on the right is greater than the price of the segment on the left. The segment on the right that is not greater than the price of the segment on the left shall be merged to the price of the segment immediately on the left.

D.6   Negotiated Rate Option

The third method by which a DEB might be calculated is simply entitled the "Negotiated Rate Option". Under this option the independent entity would use documentation supplied by the market participant and its discretion to determine the DEB. Non-RMR Units that are also non-gas fueled i.e. distillate fuel may also use this option instead of providing a cost curve.   The independent entity would supply the distillate price index and the generator would provide the Average Heat Rate.

D. 6.1 Information Needed

In order to establish a Default Energy Bid for a Generating Unit based on the Negotiated Rate Option, the Scheduling Coordinator for the Generating Unit must provide the CAISO's Market Monitoring Unit or an alternative independent entity selected by the CAISO with the following information:

1. The proposed Default Energy Bid for the Generating Unit to be used under the Negotiated Rate Option.

2. The market and time periods for which the proposed bid would be applicable (DAM and RTM; peak and off-peak hours; start and end dates).

3. A descriptive explanation and justification of the basis or need for the proposed bid, including numerical calculations and supporting documentation including the Generating Unit's operating costs (e.g. fuel costs, operation and maintenance costs) and opportunity costs.

4. The rank order of the three options for determining the Generating Unit's Default Energy Bid to be used if the proposed bid is accepted under the Negotiated Rate Option.

5. If applicable, any formulas, methodology or criteria proposed for modifying the bid to be used under the Negotiated Rate Option in response to potential changes in costs, operational or market conditions, or other relevant factors.

6. If applicable, the Scheduling Coordinator may propose two alternative bids: (a) a preferred bid reflecting the Scheduling Coordinator's preferred bid under the Negotiated Rate Option, and (b) a temporary bid that could be utilized on an expedited basis pending more detailed review, discussion and negotiation concerning the preferred bid for the Generating Unit.

D.6.2 Review of Information Submitted to the CAISO of Independent Entity

After receipt of a request to establish a bid under the Negotiated Rate Option, the CAISO's Market Monitoring Unit or an alternative independent entity selected by the CAISO will review the information and provide a written response within ten (10) business days. The CAISO will assess bid levels or formulas proposed by Scheduling Coordinators on the basis of one or more of the following:

➤   Operating cost data, opportunity cost, and other appropriate input from the Market Participant;

➤   The CAISO's estimated costs of the Electric Facility, taking into account the best data available to the CAISO;

➤   An Appropriate average of competitive bids of one or more similar Electric Facilities

Additional information may be requested from the Scheduling Coordinator as necessary to assess the reasonableness of the proposed bid and other potential bid levels. To expedite this process, the Scheduling Coordinator shall make representatives available to explain and discuss the rationale and supporting documentation for the proposed bid with the CAISO and any alternative independent entity selected by the CAISO.   All information provided by a Scheduling Coordinator shall be subject to confidentiality provisions of the CAISO Tariff.

D.6.3 Effective Date of a Default Energy Bid Established by the Negotiated Rate Option

Any DEB submitted by a Scheduling Coordinator in accordance with these provisions shall become effective within three (3) business days after acceptance by the CAISO.

Any DEB proposed in writing by the CAISO to a Scheduling Coordinator shall become effective within three (3) business days after acceptance by the Scheduling Coordinator is received by the CAISO.

Any DEB agreed upon by the CAISO and a Scheduling Coordinator under the Negotiated Rate Option shall be filed at FERC within the first seven (7) days of the next calendar month. The DEB shall remain in effect unless:

> 1. The DEB is modified by FERC;
>
> 2. The DEB is modified by mutual agreement of the CAISO and a Scheduling Coordinator; or
>
> 3. The CAISO or Scheduling Coordinator provides written notification that the DEB is no longer acceptable for use under the Negotiated Rate Option.

D.6.4 Applicable DEB Pending Agreement Over Negotiated Rate Option

Pending any agreement between the Scheduling Coordinator and the CAISO with respect to a DEB to be used under the Negotiated Rate Option, the Generating Unit's Default Energy Bid shall be based on either:

> 1. The other DEB options provided in 39.7.1 (i.e., Cost-Based Option or LMP-Option); or
>
> 2. A temporary DEB established by the CAISO.

The second of these options – a temporary DEB established by the CAISO – would be applicable only in the event that the CAISO determines that market or operational conditions warrant establishing a temporary DEB (or modifying a DEB) pending any agreement or resolution of a DEB proposed by the SC under the Negotiated Rate Option. For example, this option may be necessary in the event of a sudden increase in operating costs or other conditions that may warrant immediate use of a special DEB level to avoid potential disruptions of supply critical for system local reliability. The CAISO may also need to establish a DEB under this option in the event that sufficient data are not available to calculate a DEB under any of the other options for establishing a DEB under the CAISO tariff.

Any modified DEB established by the CAISO would be based on the same criteria the CAISO would use to assess bid levels or formulas proposed by Scheduling Coordinators:

> 1. Operating cost data, opportunity cost, and other appropriate input from the Market Participant
>
> 2. The CAISO's estimated costs of the Electric Facility, taking into account the best data available to the CAISO
>
> 3. An appropriate average of competitive bids of one or more similar Electric Facilities

D.6.5 Dispute Resolution

If a Scheduling Coordinator and the CAISO cannot reach mutual agreement on a bid to be used under the Negotiated Rate Option, the Scheduling Coordinator may file at FERC pursuant to Section 205 of the Federal Power Act for approval of a rate to be used under the Negotiated Rate Option after 60 days from the commencement of initial negotiations on the proposed DEB. Figure 1 provides a decision tree depicting this process, starting from the point at which a Participant submits a request for approval of DEB under the Negotiated Rate Option through the point at which a DEB is either agreed upon or filed at FERC due to an inability to reach agreement.

Figure 1. Decision Tree on Negotiated DEB Option (N-DEB)
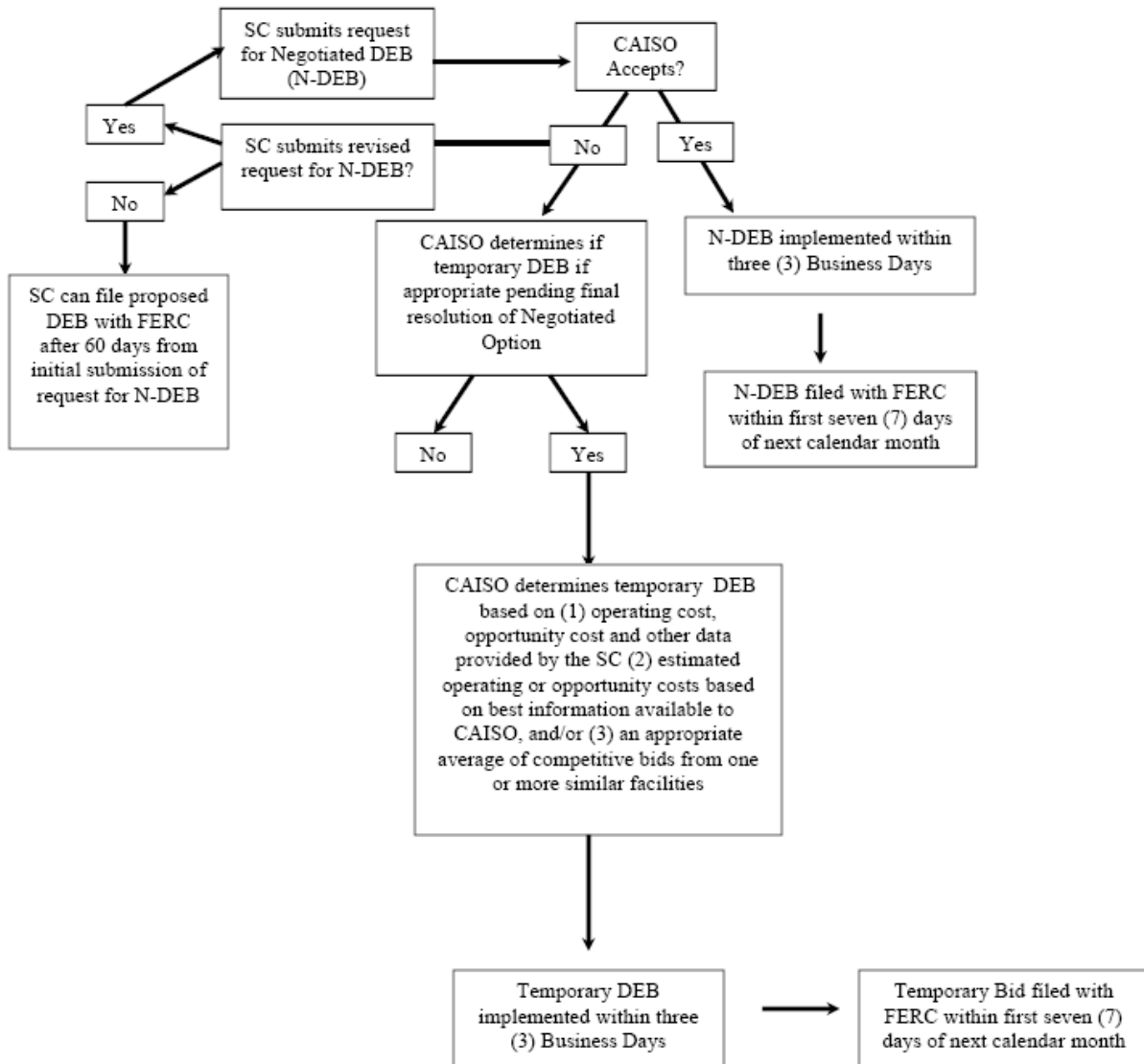
D.7   RMR Units

An RMR unit will have its Bids mitigated to the RMR Proxy Bids which are determined by the independent entity for each RMR resource using specific RMR contract values that have been filed with FERC. RMR contractual capacity is the capacity between a units Minimum Generating Capacity (PMin) and their Maximum Net Dependable Capacity (MNDC). The value of MNDC may be less than the Maximum Generation Capacity (PMax) of the unit.

The Bids utilized in the MPM-RRD process for RMR Units will be the RMR Proxy Bids for the RMR contractual capacity. RMR units are not eligible to receive the 10% adder for their RMR contract capacity. For available capacity in excess of the MNDC the Scheduling Coordinator representing the RMR unit must rank order their calculation preference between the same three methodologies, namely LMP Option, Variable Cost Option and Negotiated Rate Option. This preference will then apply to the non-RMR capacity between the MNDC and the PMax of the unit. The independent entity will concatenate these two calculation methodologies (RMR Proxy Bids for the RMR capacity and preference based for the non-RMR capacity), adjust them for monotonocity and submit them to CAISO as a single Bid curve to be used in the MPM-RRD process.

Minimum Load and Startup Cost bid curves for RMR Units also utilize RMR Contract data and are also determined by the independent entity.

Attachment E

BID ADDER CALCULATIONS

E.   Calculation of Bid Adder

The Local Market Power Mitigation (LMPM) procedures has a provision for the application of a Bid Adder to Generating Units that are frequently mitigated (FMUs). This Bid Adder is intended to provide additional revenue adequacy for Generating Units that are frequently mitigated to their variable costs (plus a 10% buffer to account for potential inaccuracies in accounting for variable costs) and, in particular, is intended to cover those costs that would be avoidable if Units were not maintained in state of readiness to generate Energy (namely fixed O&M and overhaul costs).

E.1   Eligibility Criteria for Bid Adder

Each month, CAISO establishes whether a unit is Frequently Mitigated and eligible to have the FMU Bid Adder applied to its Default Energy Bid. The eligibility is established on a monthly basis according to standard criteria.

A unit is designated as a Frequently Mitigated Unit (FMU) if the following conditions are met:

> ➢ Unit is mitigated in over 80% of its run hours over a rolling 12-month period.
> ➢ Any hour in which a unit has positive metered output count as a run hour.
> ➢ Any hour in which a unit had a mitigated bid segment dispatched count as a mitigated hour.
>   Unit does not have a capacity contract with CAISO.

The purpose for establishing a threshold for minimum run hours is to provide revenue adequacy for Generating Units that are unable to recover their avoidable fixed costs due to frequent mitigation while addressing potential situations where a unit may run very infrequently and therefore its inability to recover going forward fixed costs is due to its infrequent operation as opposed to the local market power mitigation. To the extent that infrequently run units are critical for meeting local reliability needs, their revenue requirements should be addressed through a local RA contract.

CAISO limits application of the Bid Adder to the cost-based DEB option. If a Generating Unit owner is eligible for a Bid Adder but has elected the LMP based DEB option, they have the "choice" of having a new DEB based on the cost-based option plus the adder or keeping the LMP based option. This limit preserves the avoidable cost compensation property of the bid adder while removing any "double payment" of avoidable cost.

E.2   Determination of Eligibility in the First 12-months of the CAISO's Nodal Market

CAISO uses the following approaches for determining eligibility for FMU I the first 12 months of MRTU.

E.2.1 California ISO Nodal Market Day One Eligibility

Prior to the new California ISO Nodal Market implementation, CAISO conducts analysis to determine the percent of run hours each unit is dispatched in the incremental direction through an Out-of-Sequence (OOS) dispatch or through an RMR dispatch. CAISO provides the resulting percentages to the Scheduling Coordinators. This is done for informational purposes only and the final calculation to determine if, on Day One, a unit met the 80% mitigation threshold. Performing the final analysis in mid-January provides a two week period to notify the Scheduling Coordinator for the FMU(s) and make any modifications to CAISO market systems to reflect the units that are eligible for a bid adder.

In calculating the mitigation frequency, the methodology only considers OOS and RMR dispatches. OOS and RMR dispatches from the prior market design because they most closely resemble the mechanism by which dispatches subject to LMPM are identified under the new California ISO nodal market. Specifically, under the former market design units are dispatched out-of-sequence or for RMR to provide energy to address specific localized transmission issues. This is similar to the operation performed in Pass 2 of the Pre-IFM under California ISO nodal market, where dispatches are adjusted to relieve congestion on non-competitive paths and LMPM is applied to the resulting dispatches.

In the former market, OOS and RMR dispatches are issued to address local reliability constraints whereas congestion associated with current Inter-zonal Transmission Interfaces is managed through in-merit economic dispatch. For purposes of administering Local Market Power Mitigation under the California ISO nodal market, CAISO will those Transmission Interfaces modeled in the former market as zonal interfaces as competitive paths and has committed to assessing whether additional transmission paths may be designated as "competitive" for Day-One implementation of the nodal market. To the extent additional competitive paths are identified, any OOS or RMR dispatch associated with those paths are excluded from the transitional FMU analysis. Units that are denied Must Offer Waivers have those hours counted toward their mitigation frequency to the extent they are also dispatched Out-of-Sequence.

E.2.2 Eligibility after Day One of the California ISO Nodal Market

At the mid-point of the first month of the new nodal market operation, CAISO calculates each unit's 12-month rolling average of mitigated run hours using the first two weeks of operation under the nodal market and the prior 50-weeks of operation under the prior market design. Similarly, at the mid-point of the second month of operations under the nodal market, the rolling average is based on the first 6-weeks of operations under the nodal market and prior 46 weeks of the prior market, until the first full 12-months of operations under the nodal market is completed at which point the rolling average is based entirely on Operations under the nodal market.

E.2.3 Eligibility for New Units

CAISO implements an exception to the transitional 12-month rolling average for new Generating Units that come on-line. For new units, the evaluation of eligibility criteria is based on data available since the first date the unit became available to put energy onto the grid. In this regard, the 200 run hour restriction is pro-rated to the proportion of the 12-month period that the new unit has been online.

E.3   Calculation of the Default Bid Adder Value

Once CAISO determines that a unit is eligible for the Bid Adder, that Generating Unit's cost-based Default Energy Bid includes either the default Bid Adder value or a unit-specific Bid Adder value arrived at through consultation.

The default Bid Adder value ($/MWh) is calculated as the ratio of Annual Avoidable Fixed Costs divided by Annual Expected Energy Production.

For CTs, CAISO calculates the Bid Adder value resulting from using the Fixed O&M cost figures for a new CT in California that are reported Appendix D of the California Energy Commission 2003 Final Staff Report titled "Comparative Cost of California Central Station Electricity Generation Technologies". This report calculates Fixed O&M costs of $20/kW-Yr for a new 100 MW CT that has a capacity factor of 9.4%. Using these figures, the Annual Fixed O&M Cost is $2,000,000 and the Annual Expected Energy Production is 82,344 MWh. This results in a default Bid Adder value of $24/MWh.

Note that the proposed Bid Adder value of $24/MWh is for use as a default value and that unit owners have the option to present cost data reflecting their unit specific avoidable costs to CAISO and negotiate a different Bid Adder value for that unit.

E.4   Units with a Portion of Capacity Contracted under Resource Adequacy

Partially-contracted RA units are treated in the following two ways:

Units with some portion of their capacity under an RA contract are not prohibited from receiving a Bid Adder (as stated above).

If a partial-RA unit meets the eligibility criteria to receive a Bid Adder, the Bid Adder (default or negotiated) is pro-rated to reflect the proportion of that unit's capacity that is not contracted. For example, an FMU with 75% of its capacity under an RA contract would receive a $6/MWh Bid Adder as the default.

The pro-rated Bid Adder for partial-RA units are applied to the entire cost-based DEB.

Attachment F

Examples of Generated Bid Curves

F   Example of Variable Cost Option Bid Calculation

Example 1

In this example, a gas combined-cycle generator with average heat rates (Btu/kWh) measured at five operating levels (MW) is used to demonstrate the procedure.

Operating Point (n)	Operating Level	Average Heat Rate
1	164	7,643
2	298	7,485
3	340	7,643
4	480	7,000
5	590	7,485

Step1. Calculate Initial Incremental Heat Rate

$$IHR_{S1}^{ini} = \frac{AvgHR_2 * MW_2 - AvgHR_1 * MW_1}{MW_2 - MW_1} = \frac{7485*298 - 7643*164}{298 - 164} = 7292 \text{ Btu/kWh}$$

$$IHR_{S2}^{ini} = \frac{AvgHR_3 * MW_3 - AvgHR_2 * MW_2}{MW_3 - MW_2} = \frac{7643*340 - 7485*298}{340 - 298} = 8764 \text{ Btu/kWh}$$

$$IHR_{S3}^{ini} = \frac{AvgHR_4 * MW_4 - AvgHR_3 * MW_3}{MW_4 - MW_3} = \frac{7000*480 - 7643*340}{480 - 340} = 5438 \text{ Btu/kWh}$$

$$IHR_{S4}^{ini} = \frac{AvgHR_5 * MW_5 - AvgHR_4 * MW_4}{MW_5 - MW_4} = \frac{7485*590 - 7000*480}{590 - 480} = 9601 \text{ Btu/kWh}$$

Results of these calculations are summarized below.

Operating Point, n	Operating Level	Average Heat Rate	Segment	Initial Incremental
1	164	7,643	1	7,292
2	298	7,485	2	8,764
3	340	7,643	3	5,438
4	480	7,000	4	9,601
5	590	7,485		

Step2. Adjustment of Incremental Heat Rate

First, for each segment, the maximum incremental heat rate for each segment (Cap) is calculated by taking the maximum of the average heat rates for the two operating points used to calculate the incremental heat rate segment.

$$Cap_{S1} = \max(AvgHR_1, AvgHR_2) = \max(7643, 7485) = 7643 \text{ Btu/kWh}$$

$$Cap_{S2} = \max(AvgHR_2, AvgHR_3) = \max(7485, 7643) = 7643 \text{ Btu/kWh}$$

$$Cap_{S3} = \max(AvgHR_3, AvgHR_4) = \max(7643, 7000) = 7643 \text{ Btu/kWh}$$

$$Cap_{S4} = \max(AvgHR_4, AvgHR_5) = \max(7000, 7485) = 7485 \text{ Btu/kWh}$$

Since the Cap is applied only to segments below 80% of Pmax, the Operating Level Percentage of Pmax is computed as follows.

$$OperatingLevel_1\% = \frac{OperatingLevel_1}{P\max} = \frac{164}{590} = 27.8\%$$

$$OperatingLevel_2\% = \frac{OperatingLevel_2}{P\max} = \frac{298}{590} = 50.5\%$$

$$OperatingLevel_3\% = \frac{OperatingLevel_3}{P\max} = \frac{340}{590} = 57.6\%$$

$$OperatingLevel_4\% = \frac{OperatingLevel_4}{P\max} = \frac{480}{590} = 81.4\%$$

$$OperatingLevel_5\% = \frac{OperatingLevel_5}{P\max} = \frac{590}{590} = 100\%$$

For each segment representing operating levels below 80% of the unit's Pmax, the initial incremental heat rate is then adjusted so they do not exceed the Cap calculated for the segment:

$$IHR_{S1}^{adjusted} = \min(IHR_{S1}^{ini}, Cap_{S1}) = \min(7292,7643) = 7292 \text{ Btu/kWh}$$

$$IHR_{S2}^{adjusted} = \min(IHR_{S2}^{ini}, Cap_{S2}) = \min(8764,7643) = 7643 \text{ Btu/kWh}$$

$$IHR_{S3}^{adjusted} = \min(IHR_{S3}^{ini}, Cap_{S3}) = \min(5438,7643) = 5438 \text{ Btu/kWh}$$

$$IHR_{S4}^{adjusted} = \min(IHR_{S4}^{ini}, Cap_{S4}\_Not\_Applicable\_OperatingLevel_4 = 81.4\% \geq 80\%)$$

$$= 9601 \text{ Btu/kWh}$$

Results of these calculations are summarized in the table and figure below.

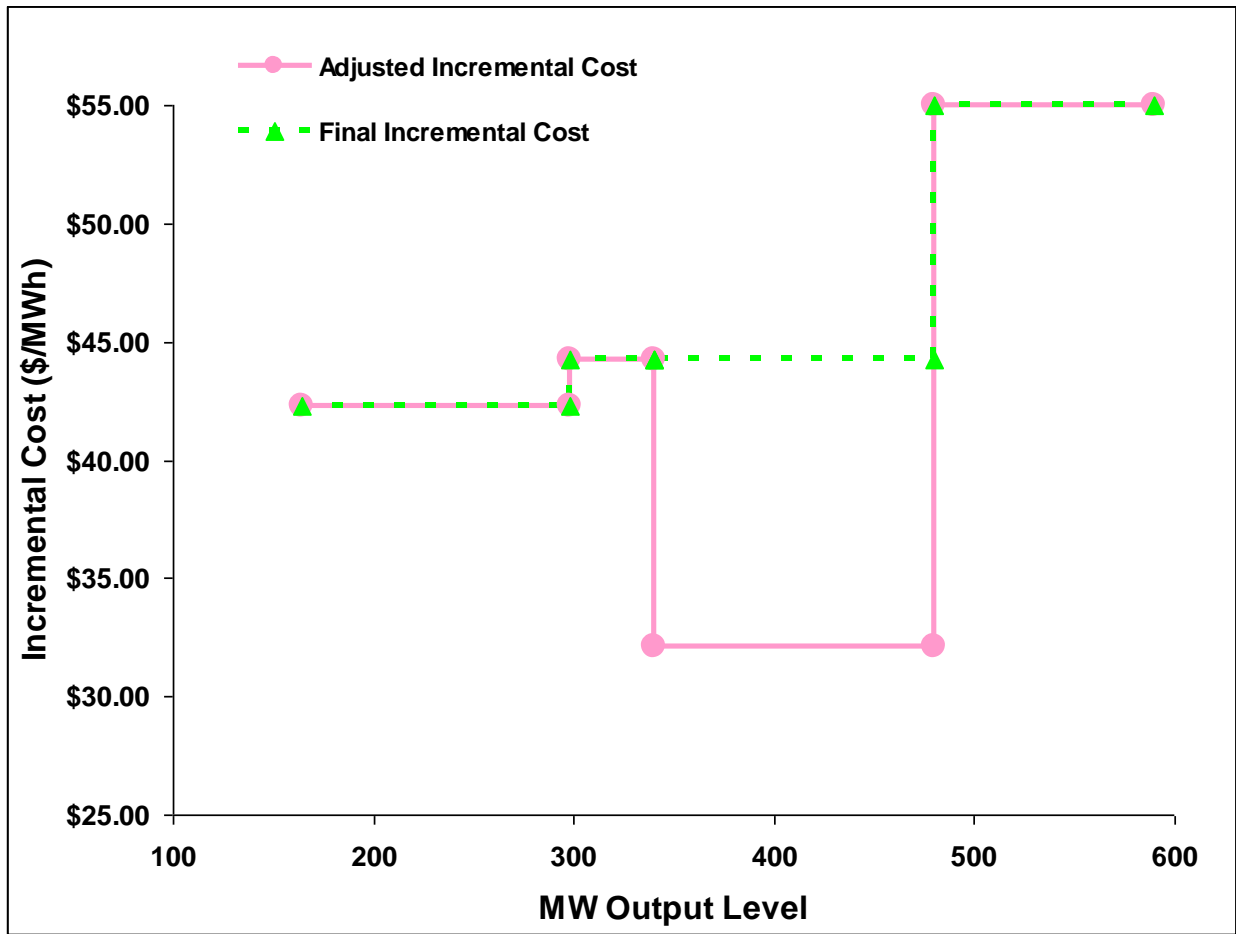| Operating Point (n)	Operating Level	Average Heat Rate	Segment	Initial Incremental Heat Rate	Cap	Operating Level % of Pmax	Adjusted Incremental Heat Rate
1	164	7643	1	7292	7643	27.8%	7292
2	298	7485	2	8764	7643	50.5%	7643
3	340	7643	3	5438	7643	57.6%	5438
4	480	7000	4	9601	7485	81.4%	9601
5	590	7485				100.0%	
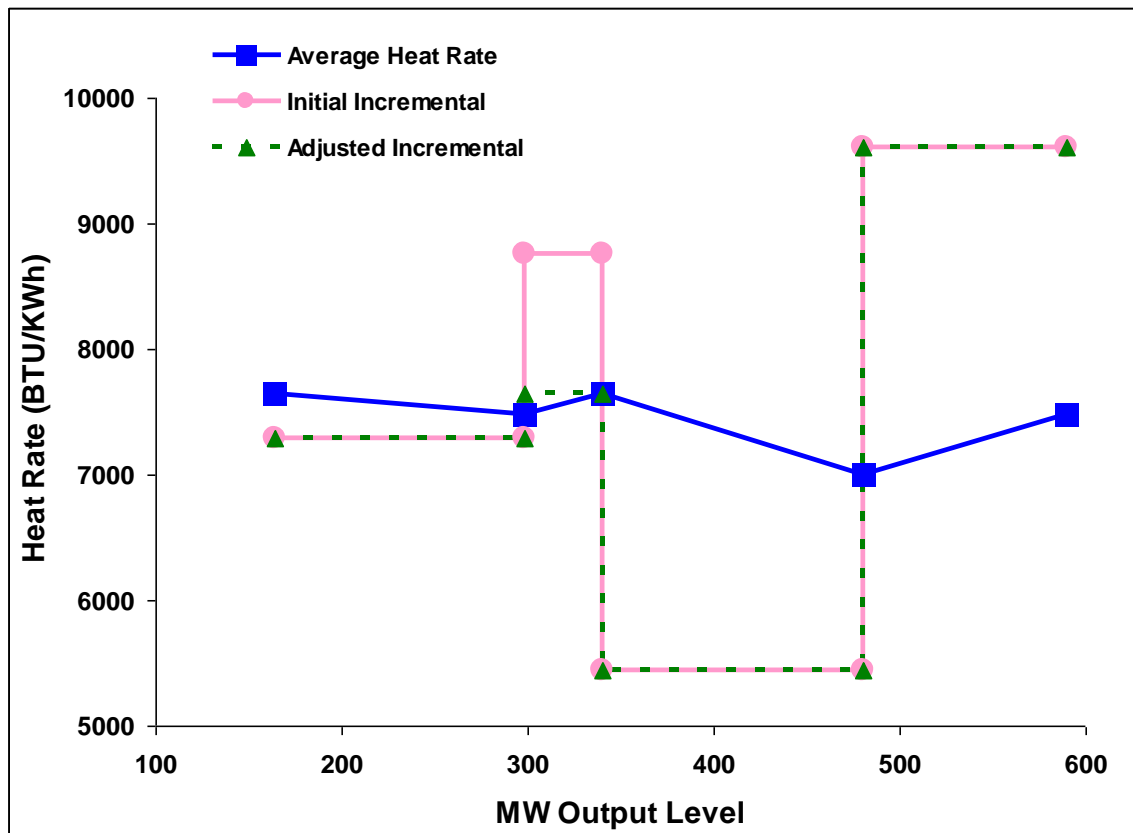
Step 3. Calculate Incremental Cost Curve

The adjusted incremental heat rate curve is then combined with gas O&M costs data to calculate the incremental cost curve. This example assumes that the gas price is $4.50/mmBTu and the proxy gas transport cost is $. 50, making a GPI of $5/ mmBTU. O&M cost is $2/MWh for a combined-cycle unit as a default. The 1.1 scalar is applied to reflect the 10% cost adder for non-RMR units. It is assumed this unit is not eligible for the DEBA.

Step 4. Left-to-Right Adjustment

Finally, the Left-To-Right Adjustment is applied to ensure that price of a segment on the right is greater than the price of the segment on the left. The segment on the right that is not greater than the price of the segment on the left is merged to the price of the segment immediately on the left.

Results of calculations in Steps 3 and 4 are illustrated in the table and figure below.

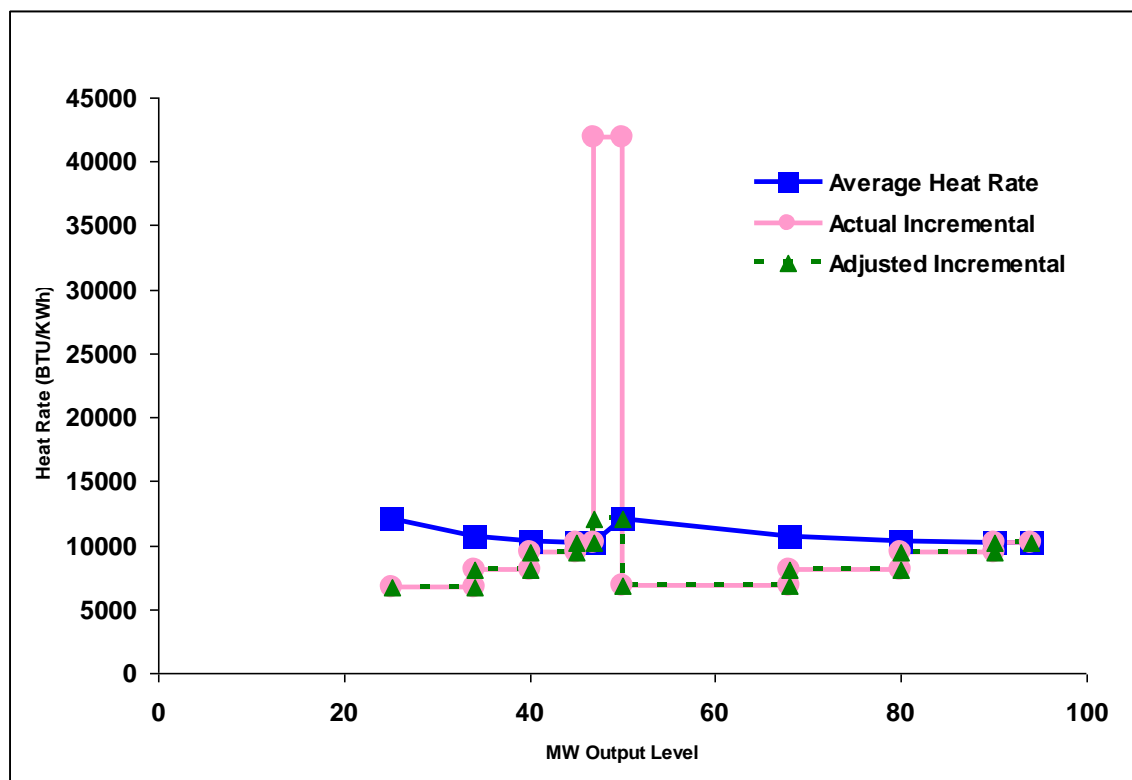| Segment	Operating Range	Adjusted Incremental Heat Rate	Incremental Cost	Incremental Cost After Right-to-Left Adjustment
1	164-297	7292	$42.30	$42.30
2	298-339	7643	$44.24	$44.24
3	340-479	5438	$32.11	$44.24
4	480-589	9601	$55.01	$55.01

Example 2

In this example, a gas peaker generator with average heat rates (Btu/kWh) measured at ten operating levels (MW) is used to demonstrate the procedure.

Results of heat rates calculations described in Steps 1 and 2 of Example 1 are shown in the table and figure below.

Operating Point, n	Operating Level (MW)	Average Heat Rate	Segment	Incremental Heat Rate	Cap	Operating Level % of Pmax	Adjusted Incremental Heat Rate
1	25	12100	1	6679	12100	26.8%	6679
2	34	10700	2	8033	10700	36.2%	8033
3	40	10300	3	9400	10300	42.6%	9400
4	45	10200	4	10200	10200	47.9%	10200
5	47	10200	5	41867	12100	50.0%	12100
6	50	12100	6	6811	12100	53.2%	6811
7	68	10700	7	8033	10700	72.3%	8033
8	80	10300	8	9400	10300	**85.1%**	9400
9	90	10200	9	10200	10200	**95.7%**	10200
10	94	10200				**100.0%**	

Results of incremental cost curve calculations described in Steps 3 and 4 of Example 1 are shown in the table and figure below. This example also assumes that the gas price is $4.50/mmBTu and the proxy gas transport cost is $. 50, making a GPI of $5/ mmBTU. The default O&M cost of $4/MWh for a combustion turbine unit is used. The 1.1 scalar is applied to reflect the 10% cost adder for non-RMR units. It is assumed this unit is not eligible for the DEBA.

Segment	Operating Range	Adjusted Incremental Heat Rate	Incremental Cost	Incremental Cost After Right-to-Left Adjustment
1	25-33	6679	$41.13	$41.13
2	34-39	8033	$48.58	$48.58
3	40-44	9400	$56.10	$56.10
4	45-46	10200	$60.50	$60.50
5	47-49	12100	$70.95	$70.95
6	50-67	6811	$41.86	$70.95
7	68-79	8033	$48.58	$70.95
8	80-89	9400	$56.10	$70.95
9	90-94	10200	$60.50	$70.95
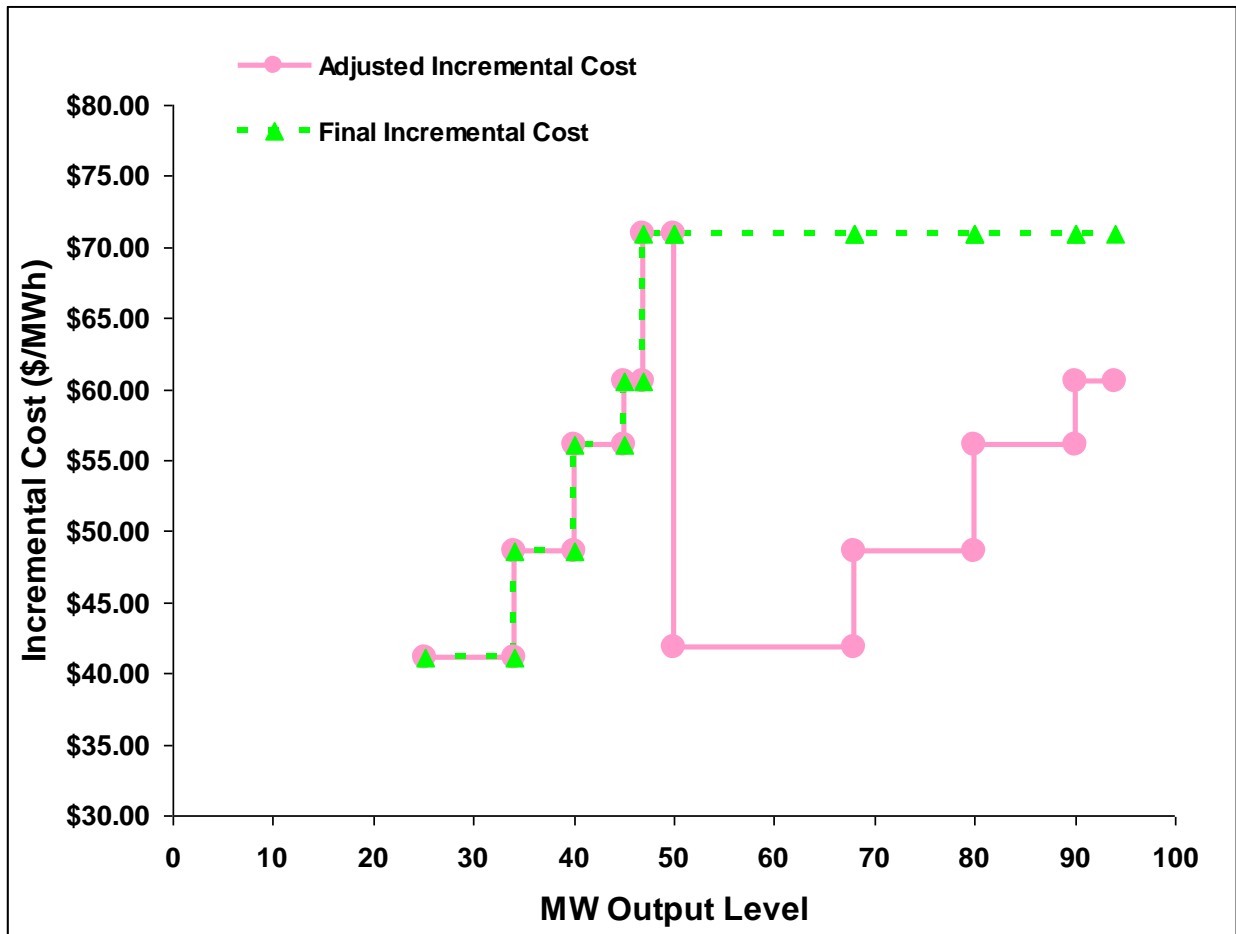
Attachment G

MAXIMUM START-UP AND MINIMUM LOAD VALUES UNDER REGISTERED COST OPTION

G   Registered Cost Option

Units selecting the Registered Cost Option in the Master File must also submit values for Start-up and Minimum Load Cost in the Master File, as described in Appendix B.

Before approving Start-up and Minimum Load Cost values submitted under the Registered Cost Option, the Master File analyst will review the values to determine if they are within the allowable levels.

- Start-Up and Minimum Load Costs under the Registered Cost Option may not exceed 200 percent of the unit's Projected Proxy Cost for Start-Up and Minimum Load Costs.

The registered Start-up and Minimum Load Cost values for units selecting the Registered Cost Option may not be modified for a period of 30 days after becoming effective. However, the SC may switch to the Proxy Cost Option during this period if fuel costs increase such that the unit's actual Start-up and Minimum Load Costs, as calculated under the Proxy Cost Option, exceed the unit's registered value under the Registered Cost Option in the Master File. Unit's switching from the Registered Cost Option to the Proxy Cost Option during this 30 day period must remain on the Proxy Cost Option for the remainder of this 30 day period.

If the Start-up Costs or Minimum Load costs exceed the maximum limit after the 30 day period expires, the costs will be lowered to the maximum limit currently in effect, as outlined in the following section.

Monthly Validation of Registered Costs

On a monthly basis, the CAISO will review the Master File Start-up and Minimum Load Cost values for units that had selected the Registered Cost Option to identify resources that have registered cost values over the allowable cap.

- Within 3 business days following the first day of the month, CAISO will review the existing registered cost values that were in effect on the first of the month and identify those resources that have registered cost values over the allowable cap.
  NOTE: Resources that had a change to minimum load or startup costs within the previous 30 days will be excluded from this review.

- Within 5 business days following the first day of the month, CAISO will communicate a list of the affected resources to the Scheduling Coordinator (SC) requesting that registered cost values be revised to comply with the new limits.

- The SC will have until the 8th business day of the month to submit a valid revised RDT, with an effective date no later than the 15th business day of the month.

- If the SC has not submitted a valid revised RDT by the 8th business day of the month, [MCI] will apply the new registered cost cap using an effective date of the 15th business day of the month.

CAISO Validation of SC-requested Change to Registered Costs

A SC may submit a GRDT to change the Start-up and Minimum Load Cost values for a resource where these values have not been modified within the previous 30 days.

- The SC submits a GRDT with change(s) to minimum load cost and/or startup cost.

- CAISO validates that the requested effective date is no greater than 15 business days from the date of submittal.

- CAISO validates that the costs do not exceed the applicable limit based on the gas price that was posted on the day the SC submitted their request.

- If the requested cost values exceed the cap, CAISO will decline the request.

- If the requested costs are within the applicable limit, and no other validation errors occur, the change will be approved and the affected resource will be excluded from the following monthly validation of registered costs.

G.1 Gas Units

G.1.1 Maximum Start-up Costs

For purposes of determining maximum Start-up costs that may be approved for gas-fired units under the Registered Cost Option, the projected Start-up costs will be calculating by combining the unit's Startup fuel and electrical energy consumption curves in the Master File and the projected gas price calculated as described in Section G.2.

For purposes of this calculation, the cost of any auxiliary power needed for start-up (as indicated in the STARTUP_ENERGY field in the Master File) will be calculated by using an estimated

electricity price equal to the projected gas price multiplied by a factor of 10. This represents a projected electricity price during unit start-up or cost of auxiliary power provided by the generator based on a unit with a heat rate of 10,000 MBtu/MWh.

An example of this calculation based on a gas price of $8.50/MMBtu is provided in the following table.

Start-Up Cost = (Start-Up Fuel x Gas Price) + (Start-Up Energy x Gas Price x Gas Price Multiplier)

Gas Price = 8.50/MMBtu
Gas Price Multiplier = 10

Example of warm start-up:
Start-Up Cost = (1083 MMBtu x $8.50/MMBtu) + (20MWh x $8.50 MMBtu x 10)
            = (9,205.5) + (1,700)
            = 10,905.5
            = 10,906 (rounded)

Table G1. Example of Projected Start-up Cost and Maximum Bid Calculation
Gas Price = $8.50/MMBtu

	Cooling Time (Minutes)	Start-Up Time (Minutes)	Start-Up Fuel (MMBtu)	Start-Up Energy (MWh)	Start-Up Cost ($)	Maximum Start-Up Bid ($)	
						Within LCA	Outside LCA
Warm	0	600	1,083	20	$10,906	$21,812	$43,624
Intermediate	240	1390	1,633	40	$15,581	$31,162	$62,324
Cold	480	1400	2,000	60	$22,100	$44,200	$88,400

G.1.2 Maximum Minimum Load Costs

For purposes of determining maximum Minimum Load Cost that may be approved for gas-fired units under the Registered Cost Option, the projected Minimum Load Cost will be calculated using the unit's Minimum Load Heat Rate and the projected gas price calculated as described in Section G.2.

The Minimum Load Cost for a unit cannot exceed the applicable limit of 200% of the unit's Projected Proxy Cost for Minimum Load Costs.

Projected Minimum Load Cost = (Unit Conversion Factor x Minimum Load Heat Rate x Minimum Operating Level x Gas Price) + (O&M * Minimum Operating Level)

Projected Minimum Load Cost = (0.001 x 14,000Btu/kWh x 20MW x $8.50/MMBtu) + ($4/MWh * 20MW)

Projected Minimum Load Cost = ($2,380) + ($80)

Projected Minimum Load Cost = $2,460

Table G2. Example of Projected Minimum Load Bid and Maximum Bid Calculation Gas Price = $8.50/MMBtu

Minimum Operating Level (MW)	Heat Rate (MBtu/MWh)	O&M Cost ($/MWh)	Minimum Load Cost ($)	Maximum Minimum Load Bid ($)	
				Within LCA	Outside LCA
20	14,000	4	$2,460	$4,920	$9,840

G.2 Gas Price Used in Start-up and Minimum Load Cost Caps

After the twenty-first day of each month, the CAISO will calculate a gas price to be used in calculating maximum Start-up and Minimum Load costs that may be registered by gas units under the Registered Cost Option. The resulting gas price will be posted on the CAISO website by the end of each calendar month. The price will be applicable for any unit submitting or revising a Start-up and Minimum Load value under the Registered Cost Option for the following month until a new gas price is calculated and posted on the CAISO website. The gas price will be calculated as follows.

First, daily closing prices for monthly natural gas futures contracts at Henry Hub for the next month are averaged over the first twenty one days of the month, resulting in a single average for the next calendar month.   Closing prices for only the first twenty-one days of the month are used in order to allow at least one week for the calculations to be completed and posted on the CAISO website by the end of each month. The purpose of averaging daily closing prices over this twenty-one day period is to avoid unusually high or low values that may result from taking prices on only one day.

Second, the average monthly price for futures contracts for basis swaps at the PG&E CityGate natural gas delivery point and futures contracts for basis swaps at the SoCal CityGate natural gas delivery point in California are calculated, using data for the first 21 trade dates in the month.

Consistent with the approach used by Potomac Economics to calculate the GPI for daily spot market prices used to calculate DEBs and bids under the Proxy Cost option, the SoCal CityGate prices are ultimately used for units in the SCE and SDG&E areas, while the PG&E Citygate prices are used for units in the PG&E area.

The next step is to combine the average Henry Hub price and the average basis swap price for each of these two delivery points for each month.

Consistent with the approach used by Potomac Economics to calculate the GPI for daily spot market prices, the final step is to add the appropriate intra-state transport price.

For units in the SCE and SDG&E areas, Potomac uses the applicable gas transportation rate from the Southern California Gas Company.[21]

For units in the PG&E area, Potomac uses rates from PG&E's Gas Schedule G-EG for Gas Transportation Service to Electric Generation.[22]

The source of gas price data used in this calculation will be the Natural Gas Intelligence Daily, or, if necessary, another available source of closing prices for natural gas futures contracts for each trade date.

G.3 Non-Gas Units

For non-gas units, maximum Start-up and Minimum Load values under the Registered Cost Option will be based on Start-up and Minimum Load cost information submitted and validated by the CAISO for each unit under the requirements for the Proxy Cost Option. Start-Up and Minimum Load Costs under the Registered Cost Option may not exceed 200 percent of the unit's validated Start-Up and Minimum Load Costs under the Proxy Cost Option.

As part of the process of validating Start-Up and Minimum Load Costs submitted under the Proxy cost Option, the CAISO may request additional information from the SC.

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[21] http://www.socalgas.com/regulatory/tariffs/tm2/pdf/GT-F.pdf.

[22] http://www.pge.com/tariffs/tm2/pdf/GAS_SCHEDS_G-EG.pdf

Attachment H

Transition Costs for Multi-Stage Generator Resources

H   Transition Costs for Multi-Stage Generator Resources

- Multi-Stage Generating (MSG) units are capable of operating in multiple output ranges due to their generating technology. A resource that has been registered as an MSG unit will also have a Transition Matrix, which contains operating constraints associated with the feasible transitions between configurations.

- Among the operating parameters defined in the Transition Matrix is the "Transition Cost Multiplier", which SIBR will use to calculate a daily transition cost. Transition costs figure into the optimization's decisions to move a multi-stage generator (MSG) resource from one configuration to another.

- The following two rules define the allowable upper and lower boundaries that transition costs must lie within.

- The first rule (Rule 1) constrains the transition costs along each feasible path from offline to each configuration such that their sum is between 100% and 125% of the cost (plus 10%) associated with starting up directly to that configuration.

  Example:
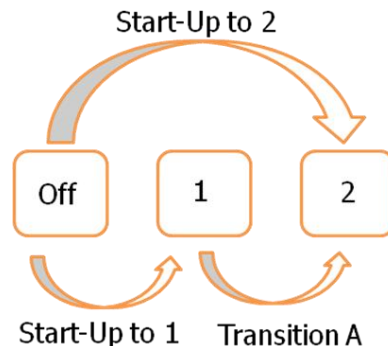
  In order to validate Rule 1, Scheduling Coordinators will need to provide the start-up fuel value for every configuration, whether it is start-able or non-start-able. A proxy start-up cost will be calculated by multiplying the start-up fuel by the current posted gas price, plus 10%.

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- Start-up fuel and start-up cost values for non-start-able configurations will be used for validation of Rule 1 only. Start-up fuel values provided for start-able configurations must be consistent with the start-up fuel values provided in the Resource Data Template (RDT).

- The second rule (Rule 2) limits transition costs between configurations such that the sum of nested transition costs is between 100% and 125% of the direct transition.

Example:
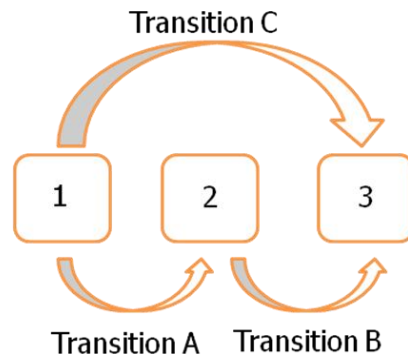
-

- Scheduling Coordinators will submit the transition costs associated with upward transitions (lower MW output configuration to higher MW output configuration), the valid monthly gas price (posted on the CAISO website on the day costs are submitted), and the "transition cost multiplier", which is calculated by dividing the transition costs by the monthly gas price. The "transition cost multiplier" values will be stored in Master File as a measure of MMBtu ("Transition Fuel" in the RDT) and utilized by SIBR to calculate a daily transition cost value.

- Costs associated with downward transitions are not subject to Rule 1 and Rule 2. Heat input values (fuel quantity) associated with downward transitions may be submitted in the Transition Fuel field of the RDT's 'TRANSITION' tab.

   Transition costs provided for upward transitions and startup fuel values provided for non-start-able configurations will be used only for the purpose of validating Rules 1 and 2.

Attachment I

CALCULATION OF GENERATED BIDS

I.   Calculation of Generated Bids

This appendix is concerned solely with the calculation of the Generated Bid for non-Resource Specific System Resources. Unlike Generating Units and Resource Specific System Resources, which have physical characteristics which make it possible to calculate a cost based bid, a different approach must be used. Information on the use of these bids in the CAISO markets can be found in section 8.

I.1   Characteristics of the Generated Bid

A Generated Bid is a monotonically increasing staircase function consisting of a maximum of 10 economic bid segments, or 10 ($/MW, MW) pairs and an End MW value. Each Generated Bid is identified by the ID; it is also identifiable by the Resource ID, the Market in which it is applicable, the period of the day in terms of On Peak and Off Peak when it is applicable, and the time it is updated.

In addition to the ID there is also a Segment Number that indicates the sequence of segments. A segment of a Generated Bid is represented by the Start MW and the Price in terms of $/MWh. Each segment of the Generated Bid is associated with a field that indicates which methodology has been used to determine the segment. A Generated Bid may be calculated using more than one methodology as explained below.

Separate Generated Bids are calculated for the DAM and the RTM, as well as for peak and off-peak hours.

There are three methodology options for calculating Generated Bids:

> ➢ LMP Option: A weighted average LMP based on the lowest quartile of validated and/or corrected LMPs set at the at the Intertie point designated for the non-Resource-Specific System Resource during Trading Hours in the last 90 days when the resource was dispatched. These resources must pass a competitiveness screen to qualify for this option in which 50% of their MWh dispatches over the prior 90-days must have been dispatched competitively.
> ➢ Negotiated Rate Option: An amount negotiated with the Independent Entity.
> ➢ Price Taker Option: Equal to $0/MWh plus the CAISO's estimate of the applicable grid management charge per MWh based on the gross amount of MWh scheduled in the DAM and HASP.

Each resource (through their SC) will select one of the three alternatives for Generated Bid calculation according to their preference for each resource. If the resource does not make a selection, the price taker option will be selected by default.

Note, if the LMP Option is selected, the resource must additionally select either the price-taker method or the negotiated-rate method as the alternative calculation method for the Generated Bids in the event that the feasibility test fails for the LMP-based method.

The details of the three alternatives are described below.

I.2   LMP Option

If a Resource has selected the LMP option, the LMP option calculation method will be used to construct the Generated Bid to cover as much capacity as possible to the extent that the LMP option method is feasible. The Generated Bid for the remaining capacity will be constructed using either the negotiated rate option or the price taker option according to the resource's preference. Moreover, the segments that are not based on LMP are linked to the segments of negotiated rate option or the price taker option depending on which one is used.

Since the methodology for calculating the LMP-Based Generated Bid needs predefined segments and one of the other two methods as the fall back, the calculation will start with the second choice of the Resource, which could be either the price taker option or the negotiated rate option. By doing so the resource's predefined segments are stipulated, namely;

- ➢ The first MW point is the Minimum Load
- ➢ The last MW point is the Maximum Capacity
- ➢ The LMP-based calculation will be used to modify the bid price for each segment that passes the Feasibility Test, which tests the availability of data for calculating the weighted average of the LMPs for the bid in each segment.

In the event that a resource fails the Feasibility Test, the second choice will be substituted for that particular segment. Finally, adjustments are made to ensure that the staircase bid curve is monotonically increasing.

I.2.1   Feasibility Test

The LMP option will not be available for the first ninety (90) days after a resource becomes a non-Resource- Specific System Resource. After the first 90 days, the following feasibility test applies to each bid segment. A bid segment will pass the Feasibility Test only if there are a threshold number of data points to allow for the calculation of an LMP-Based Generated Bid.   This threshold number will set at a level that is designed to avoid excessive volatility of the LMP Generated Bid that could result when the LMP is calculated based on a relatively small number of prices. The initial threshold condition in the DA is set to twenty-nine (29 – approximately 2%) on Peak, and

fifteen (15 – approximately 2%) on Off-Peak, out of a total of 1440 possible peak values and 720 possible Off-Peak values. For Real-Time the thresholds are slightly lower around 1%. For Peak Real-Time the threshold is set at one hundred and seventy-three (173) and for Off-Peak the initial threshold is set at Eighty-seven data points (87), out of a total of 17,280 possible peak values and 8,640 possible Off-Peak values.

Thus for example, for a segment to be eligible to be calculated via the LMP methodology for the DA Peak Generated Bid then a dispatch within that segment must have occurred a minimum of 29 times in the last ninety days. The feasibility test is done separately for each market (Day-Ahead and Real-Time) and for each type of period (Peak and Off-Peak).

I.2.2   Generated Bid Price Calculation

If a resource has passed the Eligibility Test and a Generated Bid segment has passed the Feasibility Test, the Generated Bid price for a segment is calculated to be the weighted average of the GPI-normalized LMPs that are in the lowest quartile of the set of GPI-normalized validated or corrected LMPs whose corresponding schedules/dispatches fall in the segment.

Monotonicity Adjustment

Right-To-Left Adjustment

The LMP-based Generated Bid must be monotonically increasing. The Right-To-Left Adjustment only applies to the LMP-based Generated Bid segments, i.e., not including the price taker or negotiated Generated Bid segments that have been substituted into the LMP-based Generated Bid curve. The Right-To-Left Adjustment will start from the right most LMP-based Generated Bid segment and ensure that the price of each valid LMP-based segment to the left is not greater than the price of the previous valid LMP-based segment to the right. Any segment that fails this test shall have its value reduced to the price of the next valid LMP-based segment to the right.

Left-To-Right Adjustment

The Left-To-Right Adjustment applies to all the Generated Bid segments, i.e., including the LMP-based Generated Bid, and the price taker Generated Bid segments or negotiated Generated Bid segments. The Left-To-Right Adjustment will start from the left-most bid segment to ensure that price of a segment on the right is greater than the price of the segment on the left. The segment on the right that is not greater than the price of the segment on the left shall be merged to the price of the segment immediately on the left.

I.3   Negotiated Rate Option

If the resource has selected the negotiated rate option, they shall follow the same procedure outlined for the negotiated rate option for Default Energy Bids in Appendix Attachment D.

I.4   Price Taker Option

The price taker option is based on the CAISO's estimate of the applicable grid management charge per MWh.

Before the start of each year, the CAISO will take the estimated MWh GMC components from the Market Services and System Operations cost categories and use this value for the price taker option.