**Settlements & Billing**

Configuration Guide: Ancillary Services

**Pre-calculation**

 Version 5.13

Table of Contents

[1. Purpose of Document 3](#_Toc196741654)

[2. Introduction 3](#_Toc196741655)

[2.1 Background 3](#_Toc196741656)

[2.2 Description 4](#_Toc196741657)

[3. Charge Code Requirements 4](#_Toc196741658)

[3.1 Business Rules 4](#_Toc196741659)

[3.2 Predecessor Charge Codes 11](#_Toc196741660)

[3.3 Successor Charge Codes 11](#_Toc196741661)

[3.4 Inputs – External Systems 12](#_Toc196741663)

[3.5 Inputs - Predecessor Charge Codes or Pre-calculations 18](#_Toc196741667)

[3.6 CAISO Formula 20](#_Toc196741668)

[3.7 Outputs 33](#_Toc196741669)

[4. Charge Code Effective Date 42](#_Toc196741670)

# Purpose of Document

 The purpose of this document is to capture the business and functional requirements for the Ancillary Services Pre-calculation.

# Introduction

## Background

 The CAISO will procure the Ancillary Services, Regulation Up, Regulation Down, Spinning Reserve, and Non-Spinning Reserve in the Day Ahead Integrated Forward Market (IFM) and procure incrementally as needed in the Real-Time Market (RTM). Ancillary Services (AS) are procured simultaneously with Energy Bids to meet Regulation and Operating Reserve requirements, using submitted Ancillary Service bids. IFM is performed for each hour of the next Trading Day. The Fifteen Minute Market performs AS procurement, if needed, at 15-minutes intervals for the current hour and next Trading Hour. The AS Pricing and Settlement will be based on Ancillary Service Marginal Price (ASMP), which are calculated for each AS region for each market time interval for each market.

 The AS procurement cost is the payment for AS Awarded bids in the Day Ahead IFM, and RTM. This Charge Code is part of the family of Charge Codes for payment to Scheduling Coordinators (SCs) for Awarded Ancillary Services Capacity bids: (1) Regulation Up, (2) Regulation Down, (3) Spinning Reserve, and (4) Non-Spinning Reserve.

 The fundamental concepts of Settlement methodology for allocation of AS procurement cost to scheduling coordinators are as follows:

* The AS procurement cost allocation for all AS commodity types is hourly, system-wide, and across IFM, and Real-Time markets
* The cost of procuring the AS by the CAISO on behalf of the demand will be allocated to the demand using a system wide user rate. The user rate is the average cost of procuring a type of AS in both the forward and Real-Time market for the whole CAISO system
* The rate for each AS incorporates the No Pay/Non Compliance Capacity and the No Pay/Non Compliance Charge to reflect the ultimate average AS cost

The rate for each AS reflects an average AS substitution to capture the cascaded AS procurement as it is performed optimally in each AS market. For example, Settlements reflects that multiple service types are procured and substituted simultaneously during IFM optimization

A difference between total net AS Requirements and total AS Obligations resultsin a neutrality adjustment for each Scheduling Coordinator for each of the Regulation Up, Regulation Down, Spinning Reserve, and Non-Spinning Reserve AS types.

 The difference between total AS Procurement and total AS Requirements over all Spinning, Non-Spinning and Regulation Up Ancillary Services results in a single Upward neutrality adjustment for all these services.

Ancillary Services awards from Intertie Resources are charged explicitly for the Marginal Cost of Congestion on the relevant inter-tie interface at the relevant Shadow Price. The cost of AS Congestion Charges is not recovered through the AS cost allocation, but is settled in the RT Congestion Offset.

 By design, the AS settlement methodology has the following property: If the total AS Procurement matches the total AS Requirements, and if the AS Requirement matches the total AS Obligation for each AS, the AS Cost Allocation is neutral.

 By reflecting AS substitution in the AS Rates, this AS settlement methodology eliminates any neutrality loss due to AS substitution and results in an equitable AS Cost Allocation to Scheduling Coordinators’ that Self-Provide AS, since there is no AS substitution among Self-Provided AS.

This Pre-calculation Configuration Guide defines a set of quantities that are common to Ancillary Services Charge Codes.

## Description

The Ancillary Services Pre-Calculation calculates a set of quantities utilized as input in No Pay, Non Compliance, Ancillary Service Obligation, and Ancillary Service Neutrality Charge Codes.

# Charge Code Requirements

## Business Rules

| Bus Req ID | Business Rule |
| --- | --- |
| 1.0 | The Hourly Total Regulation Up Effective Qualified Self-Provision for each resource shall be calculated by subtracting Hourly Total Non Compliance associated with Regulation Up Qualified Self-Provision from the Hourly Total Regulation Up Qualified Self-Provision. |
| 1.1 | The Hourly Total Regulation Up Qualified Self-Provision for each resource shall be calculated as the maximum of zero or the sum of Day Ahead IFM Qualified Self-Provision and sum of (.25) of Real-Time Qualified Self-Provision for each of the four Ancillary Service intervals for the relevant Real Time hour. |
| 1.2 | The BA Hourly Total Regulation Up Effective Qualified Self-Provision for each BA shall be calculated as the summation by BA of Hourly Total Effective Regulation Up Qualified Self-Provision. |
| 1.3 | The CAISO Hourly Total Regulation Up Effective Qualified Self-Provision shall be calculated as the summation of Hourly Total Effective Regulation Up Qualified Self-Provision. |
| 2.0 | The Hourly Total Effective Regulation Down Effective Qualified Self-Provision for each resource shall be calculated by subtracting Hourly Total Non Compliance associated with Regulation Down Qualified Self-Provision from the Hourly Total Regulation Down Qualified Self-Provision. |
| 2.1 | The Hourly Total Regulation Down Qualified Self-Provision for each resource shall be calculated as the maximum of zero or the sum of Day Ahead IFM Qualified Self-Provision and sum of (.25) of Real-Time Qualified Self-Provision for each of the four Ancillary Service intervals for the relevant Real Time hour. |
| 2.2 | The BA Hourly Total Regulation Down Effective Qualified Self-Provision for each BA shall be calculated as the summation by BA of Hourly Total Effective Regulation Down Qualified Self-Provision. |
| 2.3 | The CAISO Hourly Total Regulation Down Effective Qualified Self-Provision shall be calculated as the summation of Hourly Total Effective Regulation Down Qualified Self-Provision. |
| 3.0 | The Hourly Total Effective Spinning Reserve Qualified Self-Provision for each resource shall be calculated by subtracting Hourly Total No Pay associated with Spinning Reserve Qualified Self-Provision from the Hourly Total Spinning Reserve Qualified Self-Provision. |
| 3.1 | The Hourly Total Spinning Reserve Qualified Self-Provision for each resource shall be calculated as the maximum of zero or the sum of Day Ahead IFM Qualified Self-Provision and sum of (.25) of Real-Time Qualified Self-Provision for each of the four Ancillary Service intervals for the relevant Real Time hour. |
| 3.2 | The BA Hourly Total Spinning Reserve Effective Qualified Self-Provision for each BA shall be calculated as the summation by BA of Hourly Total Effective Spinning Reserve Qualified Self-Provision. |
| 3.3 | The CAISO Hourly Total Spinning Reserve Effective Qualified Self-Provision shall be calculated as the summation of Hourly Total Effective Spinning Reserve Qualified Self-Provision. |
| 4.0 | The Hourly Total Non-Spinning Reserve Effective Qualified Self-Provision for each resource shall be calculated by subtracting the Hourly Total No Pay associated with Non-Spinning Reserve Qualified Self-Provision from the Hourly Total Non-Spinning Reserve Qualified Self-Provision. |
| 4.1 | The Hourly Total Non-Spinning Reserve Qualified Self-Provision for each resource shall be calculated as the maximum of zero or the sum of Day Ahead IFM Qualified Self-Provision and sum of (.25) of Real-Time Qualified Self-Provision for each of the four Ancillary Service intervals for the relevant Real Time hour. |
| 4.2 | The BA Hourly Total Non-Spinning Reserve Effective Qualified Self-Provision for each BA shall be calculated as the summation by BA of Hourly Total Effective Non-Spinning Reserve Qualified Self-Provision. |
| 4.3 | The CAISO Hourly Total Non-Spinning Reserve Effective Qualified Self-Provision shall be calculated as the summation of Hourly Total Effective Non-Spinning Reserve Qualified Self-Provision. |
| 5.0 | The Hourly Total Regulation Up Net Procurement for each resource shall be calculated by subtracting Hourly Total Non Compliance associated with Regulation Up Awarded Bid from the Hourly Total Regulation Up Awarded Bid Capacity. |
| 5.1 | The Hourly Total Regulation Up Awarded Bid Capacity for each resource shall be calculated as the sum of Day Ahead IFM Awarded Bid Capacity and (.25) of Real-Time Awarded Bid Capacity for each of the four Ancillary Service intervals for the relevant Real Time hour. |
| 5.2 | The BA Hourly Total Regulation Up Net Procurement for each BA shall be calculated as the summation by BA of Hourly Total Regulation Up Net Procurement. |
| 5.3 | The CAISO Hourly Total Regulation Up Net Procurement shall be calculated as the summation of Hourly Total Regulation Up Net Procurement. |
| 6.0 | The Hourly Total Regulation Down Net Procurement for each resource shall be calculated by subtracting Hourly Total Non Compliance associated with Regulation Down Awarded Bid from the Hourly Total Regulation Down Awarded Bid Capacity. |
| 6.1 | The Hourly Total Regulation Down Awarded Bid Capacity for each resource shall be calculated as the sum of Day Ahead IFM Awarded Bid Capacity and sum of (.25) of Real-Time Awarded Bid Capacity for each of the four Ancillary Service intervals for the relevant Real Time hour. |
| 6.2 | The BA Hourly Total Regulation Down Net Procurement for each BA shall be calculated as the summation by BA of Hourly Total Regulation Down Net Procurement. |
| 6.3 | The CAISO Hourly Total Regulation Down Net Procurement shall be calculated as the summation of Hourly Total Regulation Down Net Procurement. |
| 7.0 | The Hourly Total Spinning Reserve Net Procurement for each resource shall be calculated by subtracting Hourly Total No Pay associated with Spinning Reserve Awarded Bid from the Hourly Total Spinning Reserve Awarded Bid Capacity. |
| 7.1 | The Hourly Total Spinning Reserve Awarded Bid Capacity for each resource shall be calculated as the sum of Day Ahead IFM Awarded Bid Capacity and sum of (.25) of Real-Time Awarded Bid Capacity for each of the four Ancillary Service intervals for the relevant Real Time hour. |
| 7.2 | The BA Hourly Total Spinning Reserve Net Procurement for each BA shall be calculated as the summation by BA of Hourly Total Spinning Reserve Net Procurement. |
| 7.3 | The CAISO Hourly Total Spinning Reserve Net Procurement shall be calculated as the summation of Hourly Total Spinning Reserve Net Procurement. |
| 8.0 | The Hourly Total Non-Spinning Reserve Net Procurement for each resource shall be calculated by subtracting Hourly Total No Pay associated with Non-Spinning Reserve Awarded Bid from the Hourly Total Non-Spinning Reserve Awarded Bid Capacity. |
| 8.1 | The Hourly Total Non-Spinning Reserve Awarded Bid Capacity for each resource shall be calculated as the sum of Day Ahead IFM Awarded Bid Capacity and sum of (.25) of Real-Time Awarded Bid Capacity for each of the four Ancillary Service intervals for the relevant Real Time hour. |
| 8.2 | The BA Hourly Total Non-Spinning Reserve Net Procurement for each BA shall be calculated as the summation by BA of Hourly Total Non-Spinning Reserve Net Procurement. |
| 8.3 | The CAISO Hourly Total Non-Spinning Reserve Net Procurement shall be calculated as the summation of Hourly Total Non-Spinning Reserve Net Procurement. |
| 9.0 | The Hourly Total Regulation Up Net Requirement for CAISO shall be calculated by subtracting CAISO Hourly Total Effective Regulation Up Qualified Self-Provision from Total Hourly Real-Time Regulation Up Requirement, limited to be non-negative. |
| 9.1 | The Hourly Total Regulation Down Net Requirement for CAISO shall be calculated by subtracting CAISO Hourly Total Effective Regulation Down Qualified Self-Provision from Total Hourly Real-Time Regulation Down Requirement, limited to be non-negative. |
| 9.2 | The Hourly Total Spinning Reserve Net Requirement for CAISO shall be calculated by subtracting CAISO Hourly Total Effective Spinning Reserve Qualified Self-Provision from Total Hourly Real-Time Spinning Reserve Requirement, limited to be non-negative. |
| 9.3 | The Hourly Total Non-Spinning Reserve Net Requirement for CAISO shall be calculated by subtracting CAISO Hourly Total Effective Non-Spinning Reserve Qualified Self-Provision from Total Hourly Real-Time Non-Spinning Reserve Requirement, limited to be non-negative. |
| 10.0 | The Net Requirement Scale Factor shall be calculated as the ratio of sum of Hourly total Regulation Up, Spinning Reserve, and Non-Spinning Reserve Net Procurement MW values over the sum of Hourly total Regulation Up, Spinning Reserve, and Non-Spinning Reserve Net Requirements. |
| 10.1 | The Scaled Hourly Total Regulation Up Net Requirement shall be calculated as the product of Net Requirement Scale Factor and Hourly Total Regulation Up Net Requirement. |
| 10.2 | The Scaled Hourly Total Spinning Reserve Net Requirement shall be calculated as the product of Net Requirement Scale Factor and Hourly Total Spinning Reserve Net Requirement. |
| 10.3 | The Scaled Hourly Total Non-Spinning Reserve Net Requirement shall be calculated as the product of Net Requirement Scale Factor and Hourly Total Non-Spinning Reserve Net Requirement. |
| 11.0 | The BA Hourly Total Metered Load for each BA shall be calculated as the summation by BA of Hourly metered Demand. |
| 11.1 | The CAISO Hourly Total Metered Load shall be calculated as the summation of Hourly Total metered Demand. |
| 12.0 | The Regulation Up Obligation MW for each Business Associate shall be calculated by adding (a) product of Regulation Up to Load Obligation ratio for the hour and the BA Hourly Total metered Demand (b) BA Hourly Total Regulation Up trade MW. |
| 12.1 | The Regulation Up Obligation MW with no trade adjustment for each Business Associate shall be calculated as the product of Regulation Up to Load Obligation ratio for the hour and the BA Hourly Total metered Demand. The Regulation Up Obligation MW with no trade adjustment will be used in allocation of Neutrality charges. |
| 12.2 | Regulation Up to Load Obligation ratio for the hour shall be calculated by dividing the Total Regulation Up Requirement for the hour by CAISO Hourly Total metered Demand. |
| 12.3 | The Regulation Down Obligation MW for each Business Associate shall be calculated by adding (a) product of Regulation Down to Load Obligation ratio for the hour and the BA Hourly Total metered Demand (b) BA Hourly Total Regulation down trade MW. |
| 12.4 | The Regulation Down Obligation MW with no trade adjustment for each Business Associate shall be calculated as the product of Regulation Down to Load Obligation ratio for the hour and the BA Hourly Total metered Demand. The Regulation Down Obligation MW with no trade adjustment will be used in allocation of Neutrality charges. |
| 12.5 | Regulation Down to Load Obligation ratio for the hour shall be calculated by dividing the Total Regulation Down Requirement for the hour by CAISO Hourly Total metered Demand. |
| 12.6 | The Operating Reserve Obligation MW for each Business Associate shall be calculated by adding the following components: Product of the Operating Reserve Obligation Ratio for demand and BA Hourly Total metered Demand. Plus the product of Operating Reserve Obligation percentage ratio for Import and (BA Hourly total Import and BA Hourly Dynamic Import). Plus the product of Operating Reserve Obligation percentage Intertie ratio for and BA Hourly total Dynamic ). Plus the product of Operating Reserve Obligation percentage ratio for EIM Transfer and BA Hourly total EIM Transfer. |
| 12.6.1 | BA Hourly Dynamic Import is calculated as the total Dynamic Resource Import Quantity in which the CAISO is not the responsible Balancing Authority Area for carrying the contingency reserve.  |
| 12.7 | The Spinning Reserve Obligation MW for each Business Associate shall be calculated by adding (a) product of the Adjusted Operating Reserve Obligation MW and the Real-Time Spinning Reserve to Operating Reserve Ratio (b) BA Hourly Total Spinning Reserve trade MW. |
| 12.8 | The Spinning Reserve Obligation MW with no trade adjustment for each Business Associate shall be calculated as the product of the Adjusted Operating Reserve Obligation MW and the Real-Time Spinning Reserve to Operating Reserve Ratio. The Spinning Reserve Obligation MW with no trade adjustment will be used in allocation of Neutrality charges in CC 6196. |
| 12.9 | The Non-Spinning Reserve Obligation MW for each Business Associate shall be calculated by adding (a) product of the Adjusted Operating Reserve Obligation MW and the Real-Time Non-Spinning Reserve to Operating Reserve Ratio (b) BA Hourly Total Non-Spinning Reserve trade MW. |
| 12.10 | The Non-Spinning Reserve Obligation MW with no trade adjustment for each Business Associate shall be calculated as the product of the Adjusted Operating Reserve Obligation MW and the Real-Time Non-Spinning Reserve to Operating Reserve Ratio. The Non-Spinning Reserve Obligation MW with no trade adjustment will be used in allocation of Neutrality charges in CC 6296. |
| 13.0 | Ancillary Service Capacity which has been disqualified between Day-Ahead Market and Real Time Market will subject to No Pay rescission rules. |
| 13.1 | Payments for Ancillary Service Capacity disqualified between Day-Ahead Maket and Real-Time Market based upon resource constraints shall be rescinded  |
| 13.2 | Payments for Ancillary Service Capacity disqualified between Day-Ahead Maket and Real-Time Market based upon transmission constraints shall not be rescinded |
| 13.3 | The rescission of disqualified Ancillary Service Capacity shall be applied to Ancillary Service Awards and then Ancillary Service Self-Provision Capacity.  |
| 14.1 | Ancillary Service Obligation (Spin, Non-Spin, Regulation) will be calculated based upon Gross Load only. |
| 15.0 | Advisory prices and quantities from Day Ahead NPM resources Ancillary Services: Spin, Non-Spin, Regulation will be computed in this charge code. |
| 16 | EDAM Requirements:EDAM entities have AS Self Provision (QSP) and AS Requirement.EDAM resources cannot bid in for Ancillary ServicesEDAM BAA resources cannot provide Ancillary Service for CISO BAAEDAM AS Self Provision (QSP) is not assessed No Pay |
| 16.1 | EDAM Requirements:This PC will receive Ancillary Service Awarded Bid quantities of zero and Ancillary Service Capacity Schedules of non-zero. They will be filtered out in equations. EDAM BAA Ancillary Service Self-provision and requirements are simply information at this point. |

## Predecessor Charge Codes

| Charge Code/ Pre-calc Name |
| --- |
| MSS Netting Pre-calculation |
| System Resource Deemed Delivered Energy Pre-calculation |
| Spin and NonSpin No Pay Quantity Pre-Calculation |
| Regulation No Pay Quantity Pre-Calculation |

## Successor Charge Codes

| Charge Code/ Pre-calc Name |
| --- |
| Real Time Energy Quantity Pre-calculation |
| No Pay Spinning Reserve Settlement (CC 6124) |
| No Pay Non-Spinning Reserve Settlement (CC 6224) |
| Non Compliance Regulation Up Settlement (CC 6524) |
| Non Compliance Regulation Down Settlement (CC 6624) |
| Spinning Reserve Obligation Settlement (CC 6194) |
| Non-Spinning Reserve Obligation Settlement (CC 6294) |
| Regulation Up Obligation Settlement (CC 6594) |
| Regulation Down Obligation Settlement (CC 6694) |
| Spinning Reserve Neutrality Allocation (CC 6196) |
| Non-Spinning Reserve Neutrality Allocation (CC 6296) |
| Regulation Up Neutrality Allocation (CC 6596) |
| Regulation Down Neutrality Allocation (CC 6696) |
| Upward Ancillary Services Neutrality Allocation (CC 6090) |
| ETC,TOR,CVR Quantity Pre-Calc |
| Day-Ahead Congestion – AS Spinning Reserve Import Settlement (CC 6710) |
| Day-Ahead Congestion – AS Non-Spinning Reserve Import Settlement (CC 6720) |
| Day-Ahead Congestion – AS Regulation Up Import Settlement (CC 6750) |
| Day-Ahead Congestion – AS Regulation Down Import Settlement (CC 6760) |
| Real-Time Congestion – AS Spinning Reserve Import Settlement (CC 6715) |
| Real-Time Congestion – AS Non-Spinning Reserve Import Settlement (CC 6725) |
| Real-Time Congestion – AS Regulation Up Import Settlement (CC 6755) |
| Real-Time Congestion – AS Regulation Down Import Settlement (CC 6765) |
| GMC Market Services Charge (CC 4560) |
| Spin and NonSpin No Pay Quantity Pre-Calculation |
| Regulation No Pay Quantity Pre-Calculation |
| Day-Ahead Spinning Reserve Capacity Settlement (CC 6100)  |
| Real Time Spinning Reserve Capacity Settlement (CC 6170) |
| Day-Ahead Non-Spinning Reserve Capacity Settlement (CC 6200)  |
| Real Time Non-Spinning Reserve Capacity Settlement (CC 6270) |
| Day-Ahead Regulation Up Capacity Settlement (CC 6500)  |
| Real Time Regulation Up Capacity Settlement (CC 6570) |
| Day-Ahead Regulation Down Capacity Settlement (CC 6600)  |
| Real Time Regulation Down Capacity Settlement (CC 6670) |

##

## Inputs – External Systems

| Row #  | Variable Name | Description |
| --- | --- | --- |
|  | DARegUpQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Day Ahead Regulation Up Qualified Self-Provision capacity for resource r, Contract Reference Number N, and Contract Type z’. **(MW)** |
|  | TotalRTRegUpQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc | Real-Time Regulation Up Qualified Self-Provision capacity for resource r, Contract Reference Number N, Contract Type z’. (MW).  |
|  | DARegDownQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh  | Day Ahead Regulation Down Qualified Self-Provision capacity for resource r, Contract Reference Number N, Contract Type z’. **(MW)** |
|  | TotalRTRegDownQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc  | Real-Time Regulation Down Qualified Self-Provision capacity for resource r, Contract Reference Number N, Contract Type z’ **(MW).**  |
|  | DASpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Day Ahead Spinning Reserve Qualified Self-Provision capacity for resource r, Contract Reference Number N, Contract Type z’. **(MW)** |
|  | TotalRTSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc | Real-Time Spinning Reserve Qualified Self-Provision capacity for resource r, Contract Reference Number N, Contract Type z’ **(MW)**. |
|  | DANonSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Day Ahead Non-Spinning Reserve Qualified Self-Provision capacity for resource r, Contract Reference Number N, Contract Type z’. **(MW)** |
|  | TotalRTNonSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc | Real-Time Non-Spinning Reserve Qualified Self-Provision capacity for resource r, Contract Reference Number N, Contract Type z’. **(MW)** |
|  | DARegUpAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh | Day Ahead Regulation Up Awarded Bid capacity for resource r. **(MW)** |
|  | NPMDARegUpAwardedBidQuantity BrtuT’I’M’VL’W’R’F’S’mdh | Nodal Pricing Model Day Ahead Regulation Up Awarded Bid capacity for resource r. **(MW)** |
|  | 15MinuteRTMRegUpAwardedBidQuantityBrtuT’I’Q’M’VL’W’R’F’S’mdhc | Real-Time Regulation Up Awarded Bid capacity for resource r **(MW).**  |
|  | DARegDownAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh | Day Ahead Regulation Down Awarded Bid capacity for resource r. **(MW)** |
|  | NPMDARegDownAwardedBidQuantity BrtuT’I’M’VL’W’R’F’S’mdh | Nodal Pricing Model Day Ahead Regulation Down Awarded Bid capacity for resource r. **(MW)** |
|  | 15MinuteRTMRegDownAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdhc | Real-Time Regulation Down Awarded Bid capacity for resource r. **(MW)** |
|  | DASpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh | Day Ahead Spinning Reserve Awarded Bid capacity for resource r **(MW)** |
|  | NPMDAHourlySpinAwardedBidQuantity BrtuT’I’M’VL’W’R’F’S’mdh | Nodal Pricing Model Day Ahead Spinning Reserve Awarded Bid capacity for resource r **(MW)** |
|  | 15MinuteRTMSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdhc | Real-Time Spinning Reserve Awarded Bid capacity for resource r **(MW)** |
|  | DANonSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh | Day Ahead Non-Spinning Reserve Awarded Bid capacity for resource r. **(MW)** |
|  | NPMDANonSpinAwardedBidQuantity BrtuT’I’M’VL’W’R’F’S’mdh | Nodal Pricing Model Day Ahead Non-Spinning Reserve Awarded Bid capacity for resource r. **(MW)** |
|  | 15MinuteRTMNonSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdhc | Real-Time Non-Spinning Reserve associated with Awarded Bid capacity for resource r. **(MW)**  |
|  | RegUpFromTradeMW BQ’smdh | Regulation Up (inter-SC) Trade MW Quantity sold by Business Associate B**,** Inter-SC Trade s **(MW)**  |
|  | RegUpToTradeMW BQ’smdh | Regulation Up (inter-SC) Trade MW Quantity bought by Business Associate B**,** Inter-SC Trade **(MW)** |
|  | RegDownFromTradeMW BQ’smdh | Regulation Down (inter-SC) Trade MW Quantity sold by Business Associate B**,** Inter-SC Trade **(MW)** |
|  | RegDownToTradeMW BQ’smdh | Regulation Down (inter-SC) Trade MW Quantity bought by Business Associate B**,** Inter-SC Trade **(MW)** |
|  | SpinFromTradeMW BQ’smdh | Spinning Reserve (inter-SC) Trade MW Quantity sold by Business Associate B**,** Inter-SC Trade **(MW)** |
|  | SpinToTradeMW BQ’smdh | Spinning Reserve (inter-SC) Trade MW Quantity bought by Business Associate B**,** Inter-SC Trade **(MW)** |
|  | NonSpinFromTradeMW BQ’smdh | Non-Spinning Reserve (inter-SC) Trade MW Quantity sold by Business Associate B**,** Inter-SC Trade **(MW)** |
|  | NonSpinToTradeMW BQ’smdh | Non-Spinning Reserve (inter-SC) Trade MW Quantity bought by Business Associate B**,** Inter-SC Trade **(MW)** |
|  | OperReserveObligDemandRatio | Operating Reserve Obligation percentage ratio for non hydro demand (**%)** This is standing data. Default Value = 6% |
|  | OperReserveObligIntertieRatio  | Operating Reserve Obligation percentage ratio for Intertie (**%)**This is standing data. Default Value = 3%  |
|  | AncillaryServicesQSPCONGCreditFLAG | Flag to determine if Congestion Credit is to apply for QSP for a resource, where “1” represents that Congestion Credit should be applied. |
|  | CAISORTNonSpinReq *Q’*mdhc | Total Real-Time Non-Spinning Reserve Requirement **(MWh)** |
|  | CAISORTSpinReq *Q’*mdhc | Total Real-Time Spinning Reserve Requirement **(MWh)** |
|  | CAISORTRegUpReq *Q’*mdhc | CAISO Real-Time Regulation Up Requirement **(MWh)** |
|  | CAISORTRegDownReq *Q’*mdhc | CAISO Real-Time Regulation Down Requirement **(MWh)** |
|  | CAISODASpinReq *Q’*mdh | Total Day Ahead Spinning Reserve Requirement **(MWh)** |
|  | CAISODANonSpinReq *Q’*mdh | Total Day Ahead Non-Spinning Reserve Requirement**(MWh)** |
|  | CAISODARegUpReq *Q’*mdh | CAISO Day Ahead Regulation Up Requirement**(MWh)** |
|  | CAISODARegDownReq *Q’*mdh | CAISO Day Ahead Regulation Down Requirement **(MWh)** |
|  | NPMDASpinReqQ’mdh | Nodal Pricing Model Total Day Ahead Spinning Reserve Requirement **(MWh)** |
|  | NPMDANonSpinReqQ’mdh | Nodal Pricing Model Total Day Ahead Non-Spinning Reserve Requirement **(MWh)** |
|  | NPMDARegUpReqQ’mdh | Nodal Pricing Model Day Ahead Regulation Up Requirement **(MWh)** |
|  | NPMDARegDownReqQ’mdh | Nodal Pricing Model Day Ahead Regulation Down Requirement **(MWh)** |
|  | 15MRegUpResConstraintFlag Brtmdhc | 15 Minute Regulation Up Resource Constraint Flag by resource id r.Value of “1” represents that the resource had Regulation Up Capacity Disqualified due to a Transmission Constraint |
|  | 15MRegDownResConstraintFlag Brtmdhc | 15 Minute Regulation Down Resource Constraint Flag by resource id r**.**Value of “1” represents that the resource had Regulation Down Capacity Disqualified due to a Transmission Constraint |
|  | 15MSpinResConstraintFlag Brtmdhc | 15 Minute Spinning Reserve Resource Constraint Flag by resource id r.Value of “1” represents that the resource had Spinning Reserve Capacity Disqualified due to a Transmission Constraint |
|  | 15MNonSpinResConstraintFlag Brtmdhc | 15 Minute Non-Spinning Reserve Resource Constraint Flag by resource id r**.**Value of “1” represents that the resource had Non-Spinning Reserve Capacity Disqualified due to a Transmission Constraint |
|  | BAResourceDynamicASObligationFlag Brt | Dynamic Resource Ancillary Service Obligation Flag 1 = Dynamic Resource shall be included in Ancillary Service Obligation0 = Dynamic Resource shall be excluded from Ancillary Service ObligationFactor DataNote: This flag value has a value 1 for Dynamic Import, or Static “AS Tie Gen” Import resources, for which CAISO procures AS. In these cases, the SC’s portfolio will not get a 3% credit for AS obligation.  |
|  | BA5MEIMTransferToTaggedQty BrtQ’AA’pF’S’Qmdhcif | The Final Tagged To Quantity for EIM Transfer Resources |
|  | BA5MEIMTransferFromTaggedQty BrtQ’AA’pF’S’Qmdhcif | The Final Tagged From Quantity for EIM Transfer Resources |
|  | NPMDARegUpCapacityASMPrtQ’mdh | Nodal Pricing Model Day Ahead Regulation Up Ancillary Service Marginal Price (ASMP) for the resource *r*  for Trading Day *d and*  Trading Hour *h* **($/MW)** |
|  | NPMDASpinCapacityASMPrtQ’mdh | Nodal Pricing Model Day Ahead Spinning Reserve Ancillary Service Marginal Price (ASMP) for the resource *r*  for Trading Day *d* and Trading Hour *h* **($/MW)** |
|  | NPMDANonSpinCapacityASMPrtQ’mdh | Nodal Pricing Model Day Ahead Non Spinning Reserve Ancillary Service Marginal Price (ASMP) for the resource *r*  for Trading Day *d* and Trading Hour *h* **($/MW)** |
|  | NPMDARegDownCapacityASMPrtQ’mdh | Nodal Pricing Model Day Ahead Regulation Down Ancillary Service Marginal Price (ASMP) for the resource r for Trading Day d and Trading Hour h **($/MW)** |

## Inputs - Predecessor Charge Codes or Pre-calculations

| Input Req ID | Variable Name | Predecessor Charge Code/Pre-calc Configuration |
| --- | --- | --- |
|  | BAHourlyInterchangeDeemedDeliveredEnergyQuantity BrtEuT’I’Q’M’AA’F’R’pPW’QS’d’Nz’OVvHn’L’mdh | System Resource Deemed Delivered Energy Pre-calculationNote: only attributes necessary for this charge code are used. |
|  | BASettlementIntervalResCAISOMeteredGenerationQuantity BrtuT’I’Q’M’AA’R’pPW’Qd’Nz’VvHn’L’mdhcif | MSS Netting Pre-calculationNote: only attributes necessary for this charge code are used. |
|  | BAResourceNoPaySpinAwardQuantity BrtT’uI’Q’M’R’W’F’S’VL'mdhcif  | Spin and NonSpin No Pay Quantity Pre-Calculation |
|  | BAResourceNoPaySpinSelfProvisionQuantity BrtT’uI’Q’M’R’W’F’S’VL'mdhcif  | Spin and NonSpin No Pay Quantity Pre-Calculation |
|  | BAResourceNoPayNonSpinSelfProvisionQuantity BrtT’uI’Q’M’R’W’F’S’VL'mdhcif  | Spin and NonSpin No Pay Quantity Pre-Calculation |
|  | BAResourceNoPayNonSpinAwardQuantity BrtT’uI’Q’M’R’W’F’S’VL'mdhcif  | Spin and NonSpin No Pay Quantity Pre-Calculation |
|  | HourlyTotalNoPayRegDownQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh | Regulation No Pay Quantity Pre-Calculation |
|  | HourlyTotalNoPayRegDownBid BrtT’uI’Q’M’R’W’F’S’VL'mdh | Regulation No Pay Quantity Pre-Calculation |
|  | HourlyTotalNoPayRegUpBid BrtT’uI’Q’M’R’W’F’S’VL'mdh | Regulation No Pay Quantity Pre-Calculation |
|  | HourlyTotalNoPayRegUpQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh | Regulation No Pay Quantity Pre-Calculation |
|  | BAResSettlementIntervalGrossMeteredCAISODemandQuantity BrtuT’I’Q’M’AA’R’pPW’Qd’Nz’VvHn’L’mdhcif | MSS Netting Pre-calculation |

## CAISO Formula

### Hourly Total Import Congestion Awarded Bid Capacity (RegUp, RegDown, Spin, NonSpin)

#### DARegUpAward BrtQ’F’S’mdh = SUM(T’,u,I’,M’,V,L’,W’,R’) DARegUpAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh

####  Where Resource Type (t) = ‘ITIE’

#### DARegDownAward BrtQ’F’S’mdh = SUM(T’,u,I’,M’,V,L’,W’,R’) DARegDownAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh

####  Where Resource Type (t) = ‘ITIE’

#### DASpinAward BrtQ’F’S’mdh = SUM(T’,u,I’,M’,V,L’,W’,R’) DASpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh

####  Where Resource Type (t) = ‘ITIE’

#### DANonSpinAward BrtQ’F’S’mdh = SUM(T’,u,I’,M’,V,L’,W’,R’) DANonSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh

#### Where Resource Type (t) = ‘ITIE’

#### RTRegDownAward BrtQ’F’S’mdhc = SUM(T’,u,I’,M’,V,L’,W’,R’) 15MinuteRTMRegDownAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdhc

####  Where Resource Type (t) = ‘ITIE’

#### RTRegUpAward BrtQ’F’S’mdhc = SUM(T’,u,I’,M’,V,L’,W’,R’) 15MinuteRTMRegUpAwardedBidQuantityBrtuT’I’Q’M’VL’W’R’F’S’mdhc

#### Where Resource Type (t) = ‘ITIE’

#### RTSpinAward BrtQ’F’S’mdhc = SUM(T’,u,I’,M’,V,L’,W’,R’) 15MinuteRTMSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdhc

#### Where Resource Type (t) = ‘ITIE’

#### RTNonSpinAward BrtQ’F’S’mdhc = SUM(T’,u,I’,M’,V,L’,W’,R’) 15MinuteRTMNonSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdhc

Where Resource Type (t) = ‘ITIE’

#### DARegUpImportQSPBrtF’S’Nz’mdh = SUM(T’,u,I’,M’,Q’,V,L’,W’,R’) DARegUpQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh

Where Resource Type (t) = ‘ITIE’

#### DARegDownImportQSPBrtF’S’Nz’mdh = SUM(T’,u,I’,M’,Q’,V,L’,W’,R’) DARegDownQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh

Where Resource Type (t) = ‘ITIE’

#### DASpinImportQSP BrtF’S’Nz’mdh = SUM(T’,u,I’,M’,Q’,V,L’,W’,R’) DASpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh

####  Where Resource Type (t) = ‘ITIE’

#### DANonSpinImportQSP BrtF’S’Nz’mdh = SUM(T’,u,I’,M’,Q’,V,L’,W’,R’) DANonSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh

####  Where Resource Type (t) = ‘ITIE’

#### RTRegUpImportQSP BrtF’S’Nz’mdh = SUM(T’,u,I’,M’,Q’,V,L’,W’,R’) HourlyRTRegUpQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh

#### Where Resource Type (t) = ‘ITIE’

#### RTRegDownImportQSP BrtF’S’Nz’mdh = SUM(T’,u,I’,M’,Q’,V,L’,W’,R’) HourlyRTRegDownQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh

#### Where Resource Type (t) = ‘ITIE’

#### RTNonSpinImportQSP BrtF’S’Nz’mdh = SUM(T’,u,I’,M’,Q’,V,L’,W’,R’) HourlyRTNonSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh

####  Where Resource Type (t) = ‘ITIE’

#### RTSpinImportQSP BrtF’S’Nz’mdh = SUM(T’,u,I’,M’,Q’,V,L’,W’,R’) HourlyRTSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh

Where Resource Type (t) = ‘ITIE’

### ANCILLARY SERVICES SETTLEMENT

REGUP:

#### RTRegUpQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh = SUM (c) (.25 \* TotalRTRegUpQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc)

#### HourlyRTRegUpResConstraintDisqualifiedQuantity BrtQ’F’S’mdh = SUM (c) (.25 \* 15MRTRegUpResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc)

#### 15MRTRegUpResConstraintDisqualifiedQuantity =

IF

15MRegUpResConstraintFlag Brtmdhc = 1

THEN

15MRTRegUpResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc = 0

ELSE

15MRTRegUpResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc = abs (15MRTRegUpDisqualifiedQuantity BrtQ’F’S’mdhc)

#### 15MRTRegUpDisqualifiedQuantity BrtQ’F’S’mdhc = SUM( T’,u,I’,M’,R’,W’,N,z’,V,L’) (min ((TotalRTRegUpQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc – (DARegUpAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + DARegUpQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh)),0))

Where (Q’) = ‘CISO’

Note: The DARegUpAwardedBidQuantity + DARegUpQSP will be converted to MWs per Ancillary Service interval through use of special function

#### HourlyRTRegUpQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh = max (0,( RTRegUpQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh – (DARegUpAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + DARegUpQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh))

#### HourlyTotalRegUpEQSP BrtQ’mdh = SUM(T’,u,I’,M’,R’,W’,F’,S’,V,L’) max((HourlyTotalRegUpQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh-HourlyTotalNoPayRegUpQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh ),0)

##### HourlyTotalRegUpQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh = SUM(N,z’) ( Max( 0, DARegUpQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh + HourlyRTRegUpQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh)

Where (Q’) = ‘CISO’

#### BAHourlyTotalRegUpEQSPBQ’mdh = SUM (r,t) HourlyTotalRegUpEQSP BrtQ’mdh

#### CAISOHourlyTotalRegUpEQSP Q’mdh=SUM (B,r,t) HourlyTotalRegUpEQSP BrtQ’mdh

REGDOWN:

#### HourlyRTRegDownResConstraintDisqualifiedQuantity BrtQ’F’S’mdh = SUM (c) (.25 \* 15MRTRegDownResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc)

#### 15MRTRegDownResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc =

IF

15MRegDownResConstraintFlag Brtmdhc = 1

THEN

15MRTRegDownResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc = 0

ELSE

15MRTRegDownResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc = abs (15MRTRegDownDisqualifiedQuantity BrtQ’F’S’mdhc)

#### 15MRTRegDownDisqualifiedQuantity BrtQ’F’S’mdhc = SUM(T’,u,I’,M’,R’,W’,N,z’,V,L’) (min ((TotalRTRegDownQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc – (DARegDownAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + DARegDownQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh )),0))

Where (Q’) = ‘CISO’

Note: The DAAwardedRegDownBidCapacity + DARegDownQSP will be converted to MWs per Ancillary Service interval through use of special function

#### HourlyRTRegDownQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh =

max (0, (RTRegDownQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh – (DARegDownAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + DARegDownQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh )))

#### RTRegDown QSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh = SUM(c) (.25 \* TotalRTRegDownQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc )

#### HourlyTotalRegDownEQSP BrtQ’mdh = SUM(T’,u,I’,M’,R’,W’,F’,S’,V,L’) max((HourlyTotalRegDownQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh- HourlyTotalNoPayRegDownQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh ),0)

#### HourlyTotalRegDownQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh = SUM(N,z’) (Max( 0, DARegDownQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh + HourlyRTRegDownQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh))

#### BAHourlyTotalRegDownEQSPBQ’mdh = SUM(r,t) HourlyTotalRegDownEQSP BrtQ’mdh

#### CAISOHourlyTotalRegDownEQSP Q’mdh=SUM(B,r,t) HourlyTotalRegDownEQSP BrtQ’mdh

### SPIN:

#### HourlyRTSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdh= SUM(c) (.25 \* 15MRTSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc

#### 15MRTSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc =

IF

15MSpinResConstraintFlag Brtmdhc = 1

THEN

15MRTSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc = 0

ELSE

15MRTSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc = abs (15MRTSpinDisqualifiedQuantity BrtQ’F’S’mdhc)

#### 15MRTSpinDisqualifiedQuantity BrtQ’F’S’mdhc = SUM(T’,u,I’,M’,R’,W’,N,z’,V,L’) (min ((TotalRTSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc – (DASpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + DASpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh)), 0))

Where (Q’) = ‘CISO’

Note: The DAAwardedSpinBidCapacity + DASpinQSP will be converted to MWs per Ancillary Service interval through use of special function

#### HourlyRTSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh = max( 0, (RTSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh – (DASpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + DASpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh )))

#### RTSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh = SUM(c) ( .25 \* TotalRTSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc)

#### HourlyTotalSpinEQSP BrtQ’mdh = SUM(T’,u,I’,M’,R’,W’,F’,S’,V,L’) max((HourlyTotalSpinQSP BrtuT’I’Q’M’VL’W’R’F’S’mdh -HourlyTotalNoPaySpinQSP BrtuT’Q’I’M’VL’W’R’F’S’mdh ),0)

#### HourlyTotalNoPaySpinQSP BrtuT’I’Q’M’VL’W’R’F’S’mdh = SUM(c,i,f) BAResourceNoPaySpinSelfProvisionQuantity BrtT’uI’Q’M’R’W’F’S’VL'mdhcif

#### HourlyTotalSpinQSP BrtuT’I’Q’M’VL’W’R’F’S’mdh = SUM(N,z’) (Max(0, DASpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh + HourlyRTSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh))

Where (Q’) = ‘CISO’

#### BAHourlyTotalSpinEQSPBQ’mdh= SUM(r,t) HourlyTotalSpinEQSP BrtQ’mdh

#### CAISOHourlyTotalSpinEQSP Q’mdh= SUM(B,r,t) HourlyTotalSpinEQSP BrtQ’mdh

### NONSPIN:

#### HourlyRTNonSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdh= SUM(c) (.25 \* 15MRTNonSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc

#### 15MRTNonSpinResConstraintDisqualifiedQuantity =

IF

15MNonSpinResConstraintFlag Brtmdhc = 1

THEN

15MRTNonSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc = 0

ELSE

15MRTNonSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc = abs (15MRTNonSpinDisqualifiedQuantity BrtQ’F’S’mdhc)

#### 15MRTNonSpinDisqualifiedQuantity BrtQ’F’S’mdhc = SUM(T’,u,I’,M’,R’,W’,N,z’,V,L’) (min ((TotalRTNonSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdhc – (DANonSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + DANonSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh)), 0))

Where (Q’) = ‘CISO’

Note: The DAAwardedNonSpinBidCapacity + DANonSpinQSP will be converted to MWs per Ancillary Service interval through use of special function

#### HourlyRTNonSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh = max (0, (RTNonSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh – (DANonSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + DANonSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh)))

#### RTNonSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh = SUM(c) ( .25 \* TotalRTNonSpinQSPBrtT’uI’ Q’M’R’W’F’S’Nz’VL'mdhc)

#### HourlyTotalNonSpinEQSP BrtQ’mdh = SUM(T’,u,I’,M’,R’,W’,F’,S’,V,L’) max((HourlyTotalNonSpinQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh-HourlyTotalNoPayNonSpinQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh ),0)

##### HourlyTotalNoPayNonSpinQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh = SUM(c,i,f) BAResourceNoPayNonSpinSelfProvisionQuantity BrtT’uI’Q’M’R’W’F’S’VL'mdhcif

##### HourlyTotalNonSpinQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh= SUM(N,z’) (Max (0, DANonSpinQSPBrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh + HourlyRTNonSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh))

Where (Q’)= ‘CISO’

#### BAHourlyTotalNonSpinEQSPBQ’mdh = SUM(r,t) HourlyTotalNonSpinEQSP BrtQ’mdh

#### CAISOHourlyTotalNonSpinEQSP Q’mdh =SUM(B,r,t) HourlyTotalNonSpinEQSP BrtQ’mdh

#### HourlyTotalRegUpNetProc BrtQ’mdh = SUM(T’,u,I’,M’,W’,R’,F’,S’,V,L’) (HourlyTotalAwardedRegUpBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh - HourlyTotalNoPayRegUpBid BrtuT’I’Q’M’VL’W’R’F’S’mdh)

##### HourlyTotalAwardedRegUpBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh = ( DARegUpAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + (.25) \* 15MinuteRTMRegUpAwardedBidQuantityBrtuT’I’Q’M’VL’W’R’F’S’mdhc )

#### BAHourlyTotalRegUpNetProcBQ’mdh = SUM(r,t)  HourlyTotalRegUpNetProc BrtQ’mdh

#### CAISOHourlyTotalRegUpNetProc Q’mdh=SUM(B,r,t) HourlyTotalRegUpNetProc BrtQ’mdh

#### HourlyTotalRegDownNetProc BrtQ’mdh = SUM(u,T,I’,M’,W’,R’,F’,S’,V,L’) ( HourlyTotalAwardedRegDownBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh –HourlyTotalNoPayRegDownBid BrtT’uI’Q’M’R’W’F’S’VL'mdh)

##### HourlyTotalAwardedRegDownBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh =

##### (DARegDownAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + ( (.25) \* 15MinuteRTMRegDownAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdhc))

#### BAHourlyTotalRegDownNetProcBQ’mdh= SUM(r,t)  HourlyTotalRegDownNetProc BrtQ’mdh

#### CAISOHourlyTotalRegDownNetProc Q’mdh = SUM(B,r,t) HourlyTotalRegDownNetProc BrtQ’mdh

####

#### HourlyTotalSpinNetProc BrtQ’mdh = SUM(u,T’,I’,M’,W’,R’,F’,S’,V,L’) (HourlyTotalAwardedSpinBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh - HourlyTotalNoPaySpinBid BrtuT’I’Q’M’VL’W’R’F’S’mdh)

##### HourlyTotalNoPaySpinBid BrtuT’I’Q’M’VL’W’R’F’S’mdh = Min (BAResourceNoPaySpinAwardQuantity BrtT’uI’Q’M’R’W’F’S’VL'mdhcif, HourlyTotalAwardedSpinBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh)

##### HourlyTotalAwardedSpinBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh = ( DASpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh +  (.25) \* 15MinuteRTMSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdhc )

#### BAHourlyTotalSpinNetProcBQ’mdh = SUM(r,t)  HourlyTotalSpinNetProc BrtQ’mdh

#### CAISOHourlyTotalSpinNetProc Q’mdh= SUM(B,r,t) HourlyTotalSpinNetProc BrtQ’mdh

#### HourlyTotalNonSpinNetProc BrtQ’mdh = SUM(T’,u,I’,M’,W’,R’,F’,S’,V,L’) ( HourlyTotalAwardedNonSpinBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh -HourlyTotalNoPayNonSpinBid BrtT’uI’Q’M’R’W’F’S’VL'mdh)

##### HourlyTotalNoPayNonSpinBid BrtT’uI’Q’M’R’W’F’S’VL'mdh = Min (SUM(c,i,f) BAResourceNoPayNonSpinAwardQuantity BrtT’uI’Q’M’R’W’F’S’VL'mdhcif, HourlyTotalAwardedNonSpinBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh)

##### HourlyTotalAwardedNonSpinBidCapacity BrtuT’I’Q’M’VL’W’R’F’S’mdh = (DANonSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdh + SUM(c) (.25) \* 15MinuteRTMNonSpinAwardedBidQuantity BrtuT’I’Q’M’VL’W’R’F’S’mdhc)

#### BAHourlyTotalNonSpinNetProcBQ’mdh = SUM(r,t) HourlyTotalNonSpinNetProc BrtQ’mdh

#### CAISOHourlyTotalNonSpinNetProc Q’mdh = SUM(B,r,t) HourlyTotalNonSpinNetProc Brt Q’mdh

#### TotalRTRegUpReq *Q’*mdh =

IF

(CAISOHourlyRTRegUpReq *Q’*mdh - CAISODARegUpReq *Q’*mdh ) < 0

THEN

TotalRTRegUpReq *Q’*mdh = CAISODARegUpReq *Q’*mdh

ELSE

TotalRTRegUpReq *Q’*mdh = CAISOHourlyRTRegUpReq *Q’*mdh

Where (Q’) = ‘CISO’

##### CAISOHourlyRTRegUpReq *Q’*mdh = SUM(c) 0.25 \* (CAISORTRegUpReq *Q’*mdhc)

#### TotalRTRegDownReq *Q’*mdh =

IF

(CAISOHourlyRTRegDownReq *Q’*mdh - CAISODARegDownReq *Q’*mdh < 0)

THEN

TotalRTRegDownReq *Q’*mdh = CAISODARegDownReq *Q’*mdh

ELSE

TotalRTRegDownReq *Q’*mdh = CAISOHourlyRTRegDownReq *Q’*mdh

Where (Q’)=’CISO’

##### CAISOHourlyRTRegDownReq *Q’*mdh = SUM(c).25 \* (CAISORTRegDownReq *Q’*mdhc)

#### TotalRTSpinReq *Q’*mdh =

IF

(CAISOHourlyRTSpinReq *Q’*mdh - CAISODASpinReq *Q’*mdh < 0)

THEN

TotalRTSpinReq *Q’*mdh = CAISODASpinReq *Q’*mdh

ELSE

TotalRTSpinReq *Q’*mdh = CAISOHourlyRTSpinReq *Q’*mdh

Where (Q’) = ‘CISO’

##### CAISOHourlyRTSpinReq *Q’*mdh =SUM(c) 0.25 \* (CAISORTSpinReq *Q’*mdhc)

#### TotalRTNonSpinReq *Q’*mdh =

IF

(CAISOHourlyRTNonSpinReq *Q’*mdh - CAISODANonSpinReq *Q’*mdh < 0)

THEN

TotalRTNonSpinReq *Q’*mdh = CAISODANonSpinReq *Q’*mdh

ELSE

TotalRTNonSpinReq *Q’*mdh = CAISOHourlyRTNonSpinReq *Q’*mdh

Where (Q’) = ‘CISO’

##### CAISOHourlyRTNonSpinReq *Q’*mdh = SUM(c) 0.25 \* (CAISORTNonSpinReq *Q’*mdhc)

#### HourlyTotalRegUpNetReq *Q’*mdh = Max (0, TotalRTRegUpReq *Q’*mdh- CAISOHourlyTotalRegUpEQSP Q’mdh)

#### HourlyTotalRegDownNetReq *Q’*mdh = Max (0, TotalRTRegDownReq *Q’*mdh– CAISOHourlyTotalRegDownEQSP Q’mdh)

#### HourlyTotalSpinNetReq *Q’*mdh = Max (0, TotalRTSpinReq *Q’*mdh- CAISOHourlyTotalSpinEQSP Q’mdh)

#### HourlyTotalNonSpinNetReq *Q’*mdh = Max (0, TotalRTNonSpinReq *Q’*mdh- CAISOHourlyTotalNonSpinEQSP Q’mdh)

#### NetReqScaleFactor *Q’*mdh =

#### IF

#### (HourlyTotalRegUpNetReq *Q’*mdh + HourlyTotalSpinNetReq *Q’*mdh + HourlyTotalNonSpinNetReq *Q’*mdh ) <> 0

#### THEN

NetReqScaleFactor *Q’*mdh = (CAISOHourlyTotalRegUpNetProc *Q’*mdh + CAISOHourlyTotalSpinNetProc *Q’*mdh + CAISOHourlyTotalNonSpinNetProc *Q’*mdh) / (HourlyTotalRegUpNetReq *Q’*mdh + HourlyTotalSpinNetReq *Q’*mdh + HourlyTotalNonSpinNetReq *Q’*mdh )

ELSE

NetReqScaleFactor *Q’*mdh = 1.0

#### ScaledHourlyTotalRegUpNetReq *Q’*mdh = NetReqScaleFactor *Q’*mdh \* HourlyTotalRegUpNetReq *Q’*mdh

#### ScaledHourlyTotalSpinNetReq *Q’*mdh = NetReqScaleFactor *Q’*mdh \* HourlyTotalSpinNetReq *Q’*mdh

#### ScaledHourlyTotalNonSpinNetReq *Q’*mdh = NetReqScaleFactor *Q’*mdh \* HourlyTotalNonSpinNetReq *Q’*mdh

#### BAHourlyTotalMeteredDemandBQ’mdh= SUM(r,t,T’,u,I’,M’,A,A’,R’,p,P,W’,Q,d’,N,z’,V,v,H,n’,L’,c,i,f) (-1) \*BAResSettlementIntervalGrossMeteredCAISODemandQuantity BrtuT’I’Q’M’AA’R’pPW’Qd’Nz’VvHn’L’mdhcif

Where Balancing Authority Area (Q’) = ‘CISO’

#### CAISOHourlyTotalMeteredDemand Q’mdh=

####  SUM(B) BAHourlyTotalMeteredDemandBQ’mdh

#### BAHourlyCAISODeemedDeliveredEnergyQuantity BQ’mdh = SUM(r,t,E,u,T’,I’,M’,A,A’,F’,R’,p,P,W’,Q,S’,d’,N,z’,O,V,v,H,n,L’) (-1) \* BAHourlyInterchangeDeemedDeliveredEnergyQuantity BrtEuT’I’Q’M’AA’F’R’pPW’QS’d’Nz’OVvHn’L’mdh

Where (Resource Type (t) = ‘ITIE’ or ‘ETIE’) And (Entity Component Type (F’) <> ‘TG’ or ‘HYBD’) And Balancing Authority Area (Q’) = ‘CISO’

#### BAHourlyCAISODynamicEnergyQuantity BQ’mdh = SUM(r,t,E,u,T’,I’,M’,A,A’,F’,R’,p,P,W’,Q,S’,d’,N,z’,O,V,v,H,n,L’)

#### IF BAResourceDynamicASObligationFlag Brt = 0

THEN

#### BAHourlyCAISODynamicEnergyQuantity BQ’mdh = (-1) \* BAHourlyInterchangeDeemedDeliveredEnergyQuantity BrtEuT’I’Q’M’AA’F’R’pPW’QS’d’Nz’OVvHn’L’mdh

ELSE

BAHourlyCAISODynamicEnergyQuantity BQ’mdh = 0

Where (Entity Component Type (F’) = ‘TG’ or ‘HYBD’) and Balancing Authority Area (Q’) = ‘CISO’

Implementation Note: TG and HYBD with CISO are only ITIE

#### BAHourlyEIMDynamicTransferEnergyQuantity BQ’mdh = SUM(r,t,A,A’,p,Q,F’,S’) ((-1) \* (BA5MEIMTransferToTaggedQty BrtQ’AA’pF’S’Qmdhcif - BA5MEIMTransferFromTaggedQty BrtQ’AA’pF’S’Qmdhcif )/12))

Where Entity Component Subtype (S’) = ‘EIM\_DYN’ and Balancing Authority Area (Q’) = ‘CISO’

#### RegUpObligMW BQ’dmh = RegUpObligNoTradeMW BQ’mdh + BAHourlyTotalRegUpTradeMW BQ’mdh

##### RegUpToLoadObligRatio Q’mdh = TotalRTRegUpReq Q’mdh / CAISOHourlyTotalMeteredDemand Q’mdh

##### BAHourlyTotalRegUpTradeMW BQ’mdh = SUM(s) (RegUpFromTradeMW BQ’smdh - RegUpToTradeMW BQ’smdh )

#### RegUpObligNoTradeMW BQ’mdh = RegUpToLoadObligRatio Q’mdh \* BAHourlyTotalMeteredDemand BQ’mdh

#### RegDownObligMW BQ’mdh = RegDownObligNoTradeMW BQ’mdh + BAHourlyTotalRegDownTradeMW BQ’mdh

##### RegDownToLoadObligRatio Q’mdh = TotalRTRegDownReq Q’mdh / CAISOHourlyTotalMeteredDemand Q’mdh

##### BAHourlyTotalRegDownTradeMW BQ’mdh = SUM(s) (RegDownFromTradeMW BQ’smdh - RegDownToTradeMW BQ’smdh )

#### RegDownObligNoTradeMW BQ’mdh = RegDownToLoadObligRatio Q’mdh \* BAHourlyTotalMeteredDemand BQ’mdh

#### BAHourlyEIMDynamicTransferObligationQuantity BQ’mdh = OperReserveObligIntertieRatio \* BAHourlyEIMDynamicTransferEnergyQuantity BQ’mdh

#### OperReserveOblig BQ’mdh = OperReserveObligDemandRatio \* BAHourlyTotalMeteredDemandBQ’mdh+ OperReserveObligIntertieRatio \* (BAHourlyCAISODeemedDeliveredEnergyQuantity BQ’mdh + BAHourlyCAISODynamicEnergyQuantity BQ’mdh) + BAHourlyEIMDynamicTransferObligationQuantity BQ’mdh

#### AdjustedOperReserveOblig BQ’mdh =

IF

OperReserveOblig BQ’mdh >= 0

THEN

AdjustedOperReserveOblig BQ’mdh = OperReserveOblig BQ’mdh

ELSE

AdjustedOperReserveOblig BQ’mdh = OperReserveOblig BQ’mdh \* OperReserveObligAdjustFactor Q’mdh

#### BAAdjustedOperReserveOblig BQ’mdh =

IF

OperReserveOblig BQ’mdh >= 0

THEN

BAAdjustedOperReserveOblig BQ’mdh = (OperReserveOblig BQ’mdh - BAHourlyEIMDynamicTransferObligationQuantity BQ’mdh)

ELSE

BAAdjustedOperReserveOblig BQ’mdh = (OperReserveOblig BQ’mdh - BAHourlyEIMDynamicTransferObligationQuantity BQ’mdh) \* OperReserveObligAdjustFactor Q’mdh

##### OperReserveObligAdjustFactor Q’mdh = SUM(B)

#### IF

#### ExcessOperReserveObligNetofEQSP Q’mdh < 0

#### THEN

#### OperReserveObligAdjustFactor Q’mdh = Max (0, (BAHourlyTotalSpinEQSPBQ’mdh+ BAHourlyTotalNonSpinEQSPBQ’mdh - Max (0, OperReserveOblig BQ’mdh )) / SUM(B) Min (0, OperReserveOblig BQ’mdh))

ELSE

 OperReserveObligAdjustFactor Q’mdh = 1

Note: should be evaluated for all positive and negative OperReserveOblig Bdh values

###### ExcessOperReserveObligNetofEQSP Q’mdh = SUM(B) (OperReserveOblig BQ’mdh - BAHourlyTotalSpinEQSPBQ’mdh- BAHourlyTotalNonSpinEQSPBQ’mdh)

#### SpinObligMW BQ’mdh = AdjustedOperReserveOblig BQ’mdh \* RTSpinToOperReserveReqRatio Q’mdh + BAHourlyTotalSpinTradeMW BQ’mdh

##### RTSpinToOperReserveReqRatio Q’mdh = TotalRTSpinReq Q’mdh / (TotalRTSpinReq Q’mdh + TotalRTNonSpinReq Q’mdh)

##### BAHourlyTotalSpinTradeMW BQ’mdh = SUM(s) (SpinFromTradeMW BQ’smdh - SpinToTradeMW BQ’smdh)

#### SpinObligNoTradeMW BQ’mdh = AdjustedOperReserveOblig BQ’mdh \* RTSpinToOperReserveReqRatio Q’mdh

#### NonSpinObligMW BQ’mdh = AdjustedOperReserveOblig BQ’mdh \* RTNonSpinToOperReserveReqRatio Q’mdh + BAHourlyTotalNonSpinTradeMW BQ’mdh

##### RTNonSpinToOperReserveReqRatio Q’mdh =TotalRTNonSpinReq Q’mdh / (TotalRTSpinReq Q’mdh + TotalRTNonSpinReq Q’mdh)

##### BAHourlyTotalNonSpinTradeMW BQ’mdh = SUM(s) (NonSpinFromTradeMW BQ’smdh - NonSpinToTradeMW BQ’smdh)

#### NonSpinObligNoTradeMW BQ’mdh = AdjustedOperReserveOblig BQ’mdh \* RTNonSpinToOperReserveReqRatio Q’mdh

#### BACISONonSpinObligNoTradeMW BQ’mdh = BAAdjustedOperReserveOblig BQ’mdh \* RTNonSpinToOperReserveReqRatio Q’mdh

#### BACISOSpinObligNoTradeMW BQ’mdh = BAAdjustedOperReserveOblig BQ’mdh \* RTSpinToOperReserveReqRatio Q’mdh

## Outputs

| Output Req ID | Name | Description |
| --- | --- | --- |
|  | HourlyTotalRegUpEQSP BrtQ’mdh | Hourly Total Regulation Up Effective Qualified Self-Provision capacity for resource r **(MW)**  |
|  | BAHourlyTotalRegUpEQSPBQ’mdh | BA Hourly Total Regulation Up Effective Qualified Self-Provision capacity for resource **(MW)** |
|  | CAISOHourlyTotalRegUpEQSP Q’mdh | CAISO Hourly Total Regulation Up Effective Qualified Self-Provision capacity **(MW)** |
|  | HourlyTotalRegDownEQSP BrtQ’mdh | Hourly Total Regulation Down Effective Qualified Self-Provision capacity for resource r **(MW)**  |
|  | BAHourlyTotalRegDownEQSPBQ’mdh | BA Hourly Total Regulation Down Effective Qualified Self-Provision capacity for resource **(MW)** |
|  | CAISOHourlyTotalRegDownEQSP Q’mdh  | CAISO Hourly Total Regulation Down Effective Qualified Self-Provision capacity **(MW)** |
|  | HourlyTotalSpinEQSP BrtQ’mdh | Hourly Total Spinning Reserve Effective Qualified Self-Provision capacity for resource r **(MW)**  |
|  | BAHourlyTotalSpinEQSPBQ’mdh | BA Hourly Total Spinning Reserve Effective Qualified Self-Provision capacity for resource r **(MW)** |
|  | CAISOHourlyTotalSpinEQSP Q’mdh | CAISO Hourly Total Spinning Reserve Effective Qualified Self-Provision capacity **(MW)** |
|  | HourlyTotalNonSpinEQSP BrtQ’mdh | Hourly Total Non-Spinning Reserve Effective Qualified Self-Provision capacity for resource r **(MW)**  |
|  | BAHourlyTotalNonSpinEQSP BQ’mdh | BA Hourly Total Non-Spinning Reserve Effective Qualified Self-Provision capacity for resource **(MW)** |
|  | CAISOHourlyTotalNonSpinEQSP Q’mdh | CAISO Hourly Total Non-Spinning Reserve Effective Qualified Self-Provision capacity **(MW)** |
|  | ScaledHourlyTotalRegUpNetReq Q’mdh  | Scaled Hourly Total Regulation Up Net Requirement **(MW)** |
|  | ScaledHourlyTotalSpinNetReq Q’mdh  | Scaled Hourly Total Spinning reserve Net Requirement **(MW)** |
|  | ScaledHourlyTotalNonSpinNetReq Q’mdh  | Scaled Hourly Total Non-Spinning Reserve Net Requirement **(MW)** |
|  | HourlyTotalRegUpNetProc BrtQ’mdh | Hourly Total Regulation Up Net Procurement for resource r **(MW)** |
|  | BAHourlyTotalRegUpNetProcBQ’mdh | BA Hourly Total Regulation Up Net Procurement for Business Associate B **(MW)** |
|  | CAISOHourlyTotalRegUpNetProc Q’mdh | CAISO Hourly Total Regulation Up Net Procurement for resource r **(MW)** |
|  | HourlyTotalRegDownNetProc BrtQ’mdh | Hourly Total Regulation Down Net Procurement for resource r **(MW)** |
|  | BAHourlyTotalRegDownNetProcBQ’mdh | BA Hourly Total Regulation Down Net Procurement for Business Associate B **(MW)** |
|  | CAISOHourlyTotalRegDownNetProc Q’mdh | CAISO Hourly Total Regulation Down Net Procurement for resource r **(MW)** |
|  | HourlyTotalSpinNetProc BrtQ’mdh | Hourly Total Spinning Reserve Net Procurement for resource r **(MW)** |
|  | BAHourlyTotalSpinNetProcBQ’mdh | BA Hourly Total Spinning Reserve Net Procurement for Business Associate B **(MW)** |
|  | CAISOHourlyTotalSpinNetProc Q’mdh | CAISO Hourly Total Spinning Reserve Net Procurement **(MW)** |
|  | HourlyTotalNonSpinNetProc BrtQ’mdh | Hourly Total Non-Spinning Reserve Net Procurement for resource r **(MW)** |
|  | BAHourlyTotalNonSpinNetProcBQ’mdh | BA Hourly Total Non-Spinning Reserve Net Procurement for Business Associate B **(MW)** |
|  | CAISOHourlyTotalNonSpinNetProc Q’mdh | CAISO Hourly Total Non-Spinning Reserve Net Procurement for **(MW)** |
|  | HourlyTotalNoPaySpinBid BrtuT’I’Q’M’VL’W’R’F’S’mdh | Hourly Total No Pay Spinning Reserve Awarded Bid capacity for resource r **(MW)** |
|  | HourlyTotalNoPayNonSpinBid BrtuT’I’Q’M’VL’W’R’F’S’mdh | Hourly Total No Pay Non-Spinning Reserve Awarded Bid capacity for resource r **(MW)** |
|  | SpinObligMW BQ’mdh | Spinning Reserve Obligation MW for Business Associate B **(MW)** |
|  | NonSpinObligMW BQ’mdh | Non-Spinning Reserve Obligation MW for Business Associate B **(MW)** |
|  | RegUpObligMW BQ’mdh | Regulation Up Obligation MW for Business Associate B **(MW)** |
|  | RegDownObligMW BQ’mdh | Regulation Down Obligation MW for Business Associate B **(MW)** |
|  | RegUpObligNoTradeMW BQ’mdh | Regulation Up Obligation MW with no trade adjustment for Business Associate B **(MW)** |
|  | RegDownObligNoTradeMW BQ’mdh | Regulation Down Obligation MW with no trade adjustment for Business Associate B **(MW)** |
|  | SpinObligNoTradeMW BQ’mdh | Spinning Rserve Obligation MW with no trade adjustment for Business Associate B **(MW)** |
|  | NonSpinObligNoTradeMW BQ’mdh | Non-Spinning Rserve Obligation MW with no trade adjustment for Business Associate B **(MW)** |
|  | In addition, all inputs are required to be accessible for review by analysts and report on Settlement Statements. |  |
|  | AdjustedOperReserveOblig BQ’mdh | Adjusted Operating Reserve Obligation MW for Business Associate B **(MW)** |
|  | OperReserveOblig BQ’mdh | Operating Reserve Obligation MW for Business Associate B **(MW)** |
|  | OperReserveObligAdjustFactor Q’mdh | Operating Reserve Obligation Adjustment Factor for Business Associate B **(%)** |
|  | ExcessOperReserveObligNetofEQSPQ’mdh | Excess of Operating Reserve Obligation net of Effective Qualified Self-Provision sum over all Business Associates **(MW)** |
|  | RTSpinToOperReserveReqRatio Q’mdh | Real-Time Spinning reserve requirement to Operating reserve requirement ratio **(%)** |
|  | RTNonSpinToOperReserveReqRatio Q’mdh | Real-Time Non-Spinning reserve requirement to Operating reserve requirement ratio **(%)** |
|  | RegUpToLoadObligRatio Q’mdh | Regulation Up to CAISO total Metered Load ratio **(%)** |
|  | RegDownToLoadObligRatio Q’mdh | Regulation Down to CAISO total Metered Load ratio **(%)** |
|  | CAISOHourlyTotalMeteredDemandQ’mdh | CAISO Hourly total metered Load **(MWh)** |
|  | BAHourlyTotalRegUpTradeMW BQ’mdh | BA Hourly Total Regulation Up trade MW sold and bought by Business Associate B **(MW)** |
|  | BAHourlyTotalRegDownTradeMW BQ’mdh | BA Hourly Total Regulation Down trade MW sold and bought by Business Associate B **(MW)** |
|  | BAHourlyTotalSpinTradeMW BQ’mdh | BA Hourly Total Spinning Reserve trade MW sold by Business Associate B **(MW)** |
|  | BAHourlyCAISODeemedDeliveredEnergyQuantity BQ’mdh | BA Hourly CAISO Deemed Delivered Energy Quantity for Business Associate **B** (MWh) |
|  | BAHourlyCAISODynamicEnergyQuantity BQ’mdh | BA Hourly CAISO Dynamic Energy Quantity for Business Associate **B** (MWh) |
|  | BAHourlyEIMDynamicTransferEnergyQuantity BQ’mdh | BA Hourly EIM Dynamic Transfer Energy Quantity for Business Associate **B** (MWh) |
|  | BAHourlyEIMDynamicTransferObligationQuantity BQ’mdh | BA Hourly EIM Dynamic Transfer Obligation Quantity for Business Associate **B** (MWh) |
|  | HourlyTotalRegUpQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total Regulation Up Qualified Self-Provision for resource r **(MW)** |
|  | HourlyTotalRegDownQSPBrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total Regulation Down Qualified Self-Provision for resource r **(MW)** |
|  | HourlyTotalNoPaySpinQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total No Pay Spinning Reserve associated with Qualified Self-Provision for resource r **(MW)** |
|  | HourlyTotalSpinQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total Spinning Reserve Qualified Self-Provision for resource r **(MW)** |
|  | HourlyTotalNonSpinQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total No Pay Non-Spinning Reserve associated with Qualified Self-Provision for resource r **(MW)** |
|  | HourlyTotalNoPayNonSpinQSP BrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total Non-Spinning Reserve Qualified Self-Provision for resource r **(MW)** |
|  | HourlyTotalAwardedRegUpBidCapacityBrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total Regulation Up Awarded Bid Capacity for resource r **(MW)** |
|  | HourlyTotalAwardedRegDownBidCapacityBrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total Regulation Down Awarded Bid Capacity for resource r **(MW)** |
|  | HourlyTotalAwardedSpinBidCapacityBrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total Spinning Reserve Awarded Bid Capacity for resource r **(MW)** |
|  | HourlyTotalAwardedNonSpinBidCapacityBrtT’uI’Q’M’R’W’F’S’VL'mdh | Hourly Total Non-Spinning Reserve Awarded Bid Capacity for resource r **(MW)** |
|  | HourlyTotalRegUpNetReq Q’mdh | CAISO Hourly Total Regulation Up Requirement **(MW)** |
|  | HourlyTotalRegDownNetReq Q’mdh | CAISO Hourly Total Regulation Down Requirement **(MW)** |
|  | HourlyTotalSpinNetReq Q’mdh | CAISO Hourly Total Spinning Reserve Requirement **(MW)** |
|  | HourlyTotalNonSpinNetReq Q’mdh | CAISO Hourly Total Non Spinning Reserve Requirement **(MW)** |
|  | NetReqScaleFactor Q’mdh | Net Requirement Scale Factor for Upward Ancillary Services **(%)** |
|  | BAHourlyTotalMeteredDemandBQ’mdh | BA Hourly Total metered Demand MWh for Business Associate B **(MWh)** |
|  | DARegUpAward BrtQ’F’S’mdh | Day Ahead Regulation Up Capacity awarded for resource r |
|  | DARegDownAward BrtQ’F’S’mdh | Day Ahead Regulation Down Capacity awarded resource r. |
|  | DASpinAward BrtQ’F’S’mdh | Day Ahead Spin Capacity awarded for resource r. |
|  | DANonSpinAward BrtQ’F’S’mdh | Day Ahead Non-Spinning Capacity awarded for resource r. |
|  | RTRegDownAward BrtQ’F’S’mdhc | Awarded Regulation Down Bid capacity in Real Time market for resource r. |
|  | RTRegUpAward BrtQ’F’S’mdhc | Awarded Regulation Up Bid capacity in Real Time market for resource r. |
|  | RTSpinAward BrtQ’F’S’mdhc | Awarded Spin Bid capacity in Real Time market for resource r. |
|  | RTNonSpinAward BrtQ’F’S’mdhc | Awarded Non-Spinning Bid capacity in Real Time market for resource r. |
|  | RTRegUpQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Real Time Regulation Up Qualified Self-Provision capacity for resource r c (MW). |
|  | HourlyRTRegUpQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Real Time Regulation Up Qualified Self-Provision capacity for resource r (MW).  |
|  | RTRegDownQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Real Time Regulation Down Qualified Self-Provision capacity for resource r (MW). |
|  | HourlyRTRegDownQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Real Time Regulation Down Qualified Self-Provision capacity for resource r (MW). |
|  | RTSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Real Time Spin Qualified Self-Provision capacity for resource r (MW). |
|  | HourlyRTSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Real Time Spin Qualified Self-Provision capacity for resource r (MW).  |
|  | RTNonSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Real Time Non-Spinning Qualified Self-Provision capacity for resource r (MW). |
|  | HourlyRTNonSpinQSP BrtT’uI’Q’M’R’W’F’S’Nz’VL'mdh | Real Time Non-Spinning Qualified Self-Provision capacity for resource r (MW). |
|  | BAHourlyTotalNonSpinTradeMW Bmdh | BA Hourly Total Non-Spinning Reserve trade MW sold by Business Associate B (MW) |
|  | DARegUpImportQSP BrtF’S’Nz’mdh | Day Ahead Regulation Up Import Qualified Self-Provision capacity for resource r. **(MW)**Where Resource type = ‘ITIE’ |
|  | DARegDownImportQSPBrtF’S’Nz’mdh | Day Ahead Regulation Down Import Qualified Self-Provision capacity for resource r **(MW)**Where Resource type = ‘ITIE’ |
|  | DASpinImportQSP BrtF’S’Nz’mdh | Day Ahead Spinning Reserve Import Qualified Self-Provision capacity for resource r **(MW)**Where Resource type = ‘ITIE’ |
|  | DANonSpinImportQSP BrtF’S’Nz’mdh | Day Ahead Non-Spinning Reserve Import Qualified Self-Provision capacity for resource r **(MW)**Where Resource type = ‘ITIE’ |
|  | RTRegUpImportQSP BrtF’S’Nz’mdh | Total RT Regulation Up Reserve Import Qualified Self-Provision capacity for resource r **(MW)** |
|  | RTRegDownImportQSP BrtF’S’Nz’mdh | Total RT Regulation Down Reserve Import Qualified Self-Provision capacity for resource r **(MW)** |
|  | RTNonSpinImportQSP BrtF’S’Nz’mdh | Total RT Non Spin Reserve Import Qualified Self-Provision capacity for resource r **(MW)** |
|  | RTSpinImportQSP BrtF’S’Nz’mdh | Total RT Spin Import Qualified Self-Provision capacity for resource r **(MW)** |
|  | TotalRTSpinReq Q’mdh | Total Real-Time Spinning Reserve Requirement **(MW)** |
|  | TotalRTNonSpinReq Q’mdh | Total Real-Time Non-Spinning Reserve Requirement **(MW)** |
|  | TotalRTRegUpReq Q’mdh | Total Real-Time Regulation Up Requirement **(MW)** |
|  | TotalRTRegDownReq Q’mdh | Total Real-Time Regulation Down Requirement **(MW)** |
|  | CAISOHourlyRTRegUpReq Q’mdh | CAISO Hourly Real-Time Regulation Up Requirement **(MW)** |
|  | CAISOHourlyRTRegDownReq Q’mdh | CAISO Hourly Real-Time Regulation Down Requirement **(MW)** |
|  | CAISOHourlyRTSpinReq Q’mdh | CAISO Hourly Real-Time Spin Requirement **(MW)** |
|  | CAISOHourlyRTNonSpinReq Q’mdh | CAISO Hourly Real-Time Non-Spin Requirement **(MW)** |
|  | HourlyRTRegUpResConstraintDisqualifiedQuantity BrtQ’F’S’mdh | Total Hourly Regulation Up Capacity Disqualified based upon Resource Constraint prior to Real Time Market for resource r. |
|  | 15MRTRegUpResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc | Total 15 Minute Regulation Up Capacity Disqualified based upon Resource Constraint prior to Real Time Market for resource r. |
|  | 15MRTRegUpDisqualifiedQuantity BrtQ’F’S’mdhc | Total 15 Minute Regulation Up Capacity Disqualified prior to Real Time Market for resource r. |
|  | HourlyRTRegDownResConstraintDisqualifiedQuantity BrtQ’F’S’mdh | Total Hourly Regulation Down Capacity Disqualified based upon Resource Constraint prior to Real Time Market for resource r. |
|  | 15MRTRegDownResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc | Total 15 Minute Regulation Down Capacity Disqualified based upon Resource Constraint prior to Real Time Market for resource r. |
|  | 15MRTRegDownDisqualifiedQuantity BrtQ’F’S’mdhc | Total 15 Minute Regulation Down Capacity Disqualified prior to Real Time Market for resource r. |
|  | HourlyRTSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdh | Total Hourly Spinning Reserve Capacity Disqualified based upon Resource Constraint prior to Real Time Market for resource r. |
|  | 15MRTSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc | Total 15 Minute Spinning Reserve Capacity Disqualified based upon Resource Constraint prior to Real Time Market for resource r. |
|  | 15MRTSpinDisqualifiedQuantity BrtQ’F’S’mdhc | Total 15 Minute Spinning Reserve Capacity Disqualified prior to Real Time Market for resource r. |
|  | HourlyRTNonSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdh | Total Hourly Non-Spinning Reserve Capacity Disqualified based upon Resource Constraint prior to Real Time Market for resource r. |
|  | 15MRTNonSpinResConstraintDisqualifiedQuantity BrtQ’F’S’mdhc | Total 15 Minute Non-Spinning Reserve Capacity Disqualified based upon Resource Constraint prior to Real Time Market for resource r. |
|  | 15MRTNonSpinDisqualifiedQuantity BrtQ’F’S’mdhc | Total 15 Minute Non-Spinning Reserve Capacity Disqualified prior to Real Time Market for resource r. |
|  | BACISONonSpinObligNoTradeMW BQ’mdh | Non Spin Obligation Quantity excluding Inter SC Trades and EIM Transfer Quantities  |
|  | BACISOSpinObligNoTradeMW BQ’mdh | Spin Obligation Quantity excluding Inter SC Trades and EIM Transfer Quantities  |
|  | BAAdjustedOperReserveOblig BQ’mdh | Adjusted Operating Reserve Obligation excluding EIM Transfer by Business Associate B (MWh) |

# Charge Code Effective Date

| Charge Code/Pre-calc Name | Document Version | Effective Start Date | Effective End Date | Version Update Type |
| --- | --- | --- | --- | --- |
| Ancillary Services Pre-Calculation | 5.0 | 04/01/09 |  01/31/10 | Documentation Edits Only |
| Ancillary Services Pre-Calculation | 5.1 | 02/1/10 |  12/31/11 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.1a | 01/1/12 |  12/31/11 | Documentation Edits Only |
| Ancillary Services Pre-Calculation | 5.2 | 1/1/12 | 11/30/12 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.3 | 12/1/12 |  10/31/13 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.4 | 11/1/13 |  4/30/13 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.5 | 5/1/14 | 9/30/14 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.6 | 10/1/14 | 6/30/15 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.7 | 7/1/15 |  11/3/15 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.8 | 11/4/15 | 2/29/16 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.8a | 3/1/16 | 4/3/18 | Documentation Change Only |
| Ancillary Services Pre-Calculation | 5.9 | 4/4/18 | 4/3/18 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.9a | 4/4/18 | 12/31/20 | Documentation Change Only |
| Ancillary Services Pre-Calculation | 5.10 | 1/1/21 | 2/15/22 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.11 | 2/16/22 | 6/30/23 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.12 | 7/1/23 | 4/30/26 | Configuration Impacted |
| Ancillary Services Pre-Calculation | 5.13 | 5/1/26 | Open | Configuration Impacted |