|  |  |
| --- | --- |
|  | Settlements & Billing |
|  |  |
|  |  |
| Configuration Guide:  | Day Ahead Imbalance Reserve Up Tier 1 Allocation |
|  |  |
|  |  CC 8076 |
|  |  |
|  | Version 5.0 |

Table of Contents

1. Purpose of Document 3

2. Introduction 3

2.1 Background 3

2.2 Description 4

3. Charge Code Requirements 5

3.1 Business Rules 5

3.2 Predecessor Charge Codes 7

3.3 Successor Charge Codes 7

3.4 Inputs – External Systems 9

3.5 Inputs - Predecessor Charge Codes or Pre-calculations 9

3.6 CAISO Formula 10

3.7 Outputs 15

4. Charge Code Effective Dates 19

# Purpose of Document

The purpose of this document is to capture the requirements and design specification for a Settlements Charge Code in one document.

# Introduction

## Background

The Day-Ahead Market Enhancements initiative introduced the imbalance reserves product to address imbalances caused by uncertainty in the day-ahead net load forecast and granularity differences between hourly day-ahead market and fifteen-minute real-time market schedules. Imbalance reserves ensure the integrated forward market schedules sufficient dispatch capability to meet net load imbalances between the day-ahead and real-time markets. Imbalance reserves can be imbalance reserves up (IRU) that provide upward dispatch capability or imbalance reserves down (IRD) that provide downward dispatch capability. A resource awarded schedule for IRU, IRD or both has an obligation to provide economic energy bids to the real-time market for the quantity of their awards. The market may schedule a resource to provide both IRU and IRD, but not for the same hourly intervals.

The integrated forward market co-optimizes the procurements of energy, ancillary services, and imbalance reserves. It procures imbalance reserves to meet an hourly imbalance reserve requirement. The market uses imbalance reserve deployment scenarios to ensure imbalance reserves are transmission-feasible to the locations the uncertainty is expected to materialize if they are fully deployed. The market clears prices for imbalance reserves at each node, resulting in locational marginal prices that reflect transmission constraints.

Imbalance reserves enable the day-ahead market to compensate resources that provide flexible reserves to meet net load uncertainty and ramping needs. Imbalance reserves are meant to reduce the need for out-of-market actions by the market operators and create a market price signal for day-ahead flexible reserves.

The day-ahead market only awards imbalance reserves to resources that are dispatchable in the fifteen-minute market. Although the day-ahead market will schedule imbalance reserves hourly, the maximum award would be based on a resource’s 30-minute ramp capability. Offline resources could be awarded imbalance reserves if the resource has a start-up time of 15 minutes or less.

Resources awarded imbalance reserves would receive a day-ahead payment at the product’s locational marginal price. Ramping capability provided by imbalance reserve awards in the day-ahead market would be settled against the flexible ramping product in the real-time market. The market would recover the costs of imbalance reserves, including congestion costs, through cost allocations that collect payments from entities based on their contribution to the need for procuring the product.

## Description

Charge Code “CC 8076 – Day Ahead Imbalance Reserve Up Tier 1 Allocation” will perform the calculations necessary to implement the business rules identified in the Business Rules of the following section here below.

# Charge Code Requirements

## Business Rules

| Bus Req. ID | Business Rule |
| --- | --- |
|  | This Charge Code shall be calculated on a daily basis.  |
|  | For adjustments to the Charge Code that cannot be accomplished by correction of upstream data inputs/recalculation or operator override Pass Through Bill Charge logic will be applied. |
|  | Actual Scheduling Coordinators (SCs) are referenced by Business Associate ID, and CAISO shall settle with Business Associates (BA) through these IDs. |
|  | The formulas herein adopt the convention that payments made by CAISO to BAs will be negative, while payments received by the CAISO from BAs (charges to BAs) will be positive. (In other words, the signs reflect the flow of money from the point of view of the CAISO.) |
|  | Settlements will allocate IFM IRU costs in 2 tiers |
|  | **Tier-1 IRU Cost Allocation**For each individual component, and on hourly basis:* Tier-1 IFM IRU Allocation Cost = Tier-1 IRU Allocation Quantity \* Tier-1 IRU BAA Allocation Price.
* Tier-1 IRU Allocation Quantity shall be calculated and varies per resource type, or for the case of an MSS that has elected to load follow, would be based on the MSS-level net portfolio uninstructed deviation.
 |
|  | **Tier-1 IRU Allocation Quantities (See table below)** |
|  | Load Following is an MSS Annual Election. For the MSS that has elected to Load Follow, the generation and load resource shall be excluded from the Generation Bucket and Load Bucket, and instead be calculated as a separate bill determinant at the MSS portfolio level based upon Net Deviation of the portfolio (Net of Generation UIE and Load UIE). The Net UIE shall determine if that MSS Bubble receives an IRU or IRD allocation for any given interval. |
|  | **Tier-1 IRU BAA Allocation Price**For each BAA, and on hourly basis, this price shall be calculated as follows:* Min (IRU BAA Requirement Price , IRU BAA Derived Price)
* where
* IRU BAA Requirement Price = Sum (IRU Requirement Cost - IRU Surplus Adjustment + IRU No Pay Revenue)/ (Sum of IRU Requirement – sum of Surplus MW) over all zones in BAA
* IRU BAA Derived Price = (Sum (IRU Requirement Cost – IRU Surplus Adjustment + IRU No Pay Revenue) across BAA) / (Sum of Tier-1 IRU Allocation Quantity) across BAA.
* Where IRU Requirement Cost across BAA = IRU Requirement \* IRU BAA Requirement Price
* IRU Surplus Adjustment = Sum of (IRU Surplus MW \* IRU Surplus Marginal Price) over all Surplus zones in BAA
 |
|  | Tier-2 IRU Cost AllocationFor each BAA, and on hourly basis:* System shall calculate Tier-2 IRU BAA Allocation Cost as the remainder (left over) of unallocated IRU costs from Tier-1, as follows:
* Tier-2 IRU BAA Allocation Cost = [IRU Requirement Cost minus Sum of IRU Surplus Adjustment plus IRU No Pay Revenue across BAA – Sum of Tier-1 IRU Cost Allocation across BAA]
* System shall allocate Tier-2 IRU BAA Allocation Cost proportional to Metered Demand within each BAA, except for:
* If a BAA is Gen-only (does not have metered demand), Tier-2 IRU BAA Allocation Cost shall be directly allocated to the Entity of the BAA.
 |
|  | Treatment of MSS* If MSS operator has elected to load follow to manage its own load variability, it shall get IRU Tier-1 and IRU Tier-2 cost allocations based on the MSS operator’s net portfolio uninstructed deviations.
* Otherwise, for both IRU Tier-1 and IRU Tier 2 cost allocations, MSS resources shall be settled in a similar manner as non-MSS resources, regardless of their Net versus Gross selection.
 |
|  | Treatment of ETC, and TOR* System shall exclude the ETC and TOR self-schedules from IR Tier-1 and IR Tier-2 allocations up to the valid and balanced portion of ETC and TOR self-schedules.

In contrast, System shall consider quantities above the valid and balanced portion of the ETC or TOR self-schedules in IRU Tier-1 and IRU Tier-2 cost allocations. |
|  | Tier-1 IRU Cost Allocation to Generation and Import/Export component types applies to all generation resources, regardless of whether they are awarded IRU or not. |
|  | ESRs (using either the NGR model or the proposed ESR mode) will be considered under the “Generation” component type of the Tier-1 IRU cost allocations. |
|  | For each BAA, if the IRU obligation is higher than the IRU awards, all of the IRU cost will be allocated to IRU Tier-1, otherwise, IRU cost will be split between Tier-1 and Tier-2. |
|  | This cost allocation does not apply to WEIM-Only BAAs. WEIM-Only BAAs do not participate in EDAM and will not be cost allocated for Imbalance Reserve. |

 **Tier-1 IRU Allocation Quantity:**

|  |  |
| --- | --- |
| **Component Type** | **Tier-1 IRU Allocation Quantity** |
| Generation(including ESR) | Max (0, DAES – FMMMaxExCap) as affected by de-rates and reduction in VER forecast between DAM and RTM (if applicable)) |
| Import | Max (0, DAES – FMMMaxExCap) as as affected by e-Tag transmission profile) |
| Load | ABS (Negative UIE) |
| Export | Max(0, FMMSelfSchedule – DAES) |
| MSS (on Load Following) | (-1)\*(MSS operator’s net negative portfolio uninstructed deviations) |
| MSS (NOT on Load Following, regardless of their Net versus Gross selection) | Same as non-MSS resources |

## Predecessor Charge Codes

| Charge Code/ Pre-calc Name |
| --- |
| PC Real Time Energy Quantity |
| PC MSS Netting |
| PC ETC TOR CVR Quantity |
| CC 6011 - Day Ahead Energy, Congestion, Loss Settlement |
| CC 8071 – Day Ahead Imbalance Reserve Up Settlement |

## Successor Charge Codes

| Charge Code/ Pre-calc Name |
| --- |
| CC 8077 – Day Ahead Imbalance Reserve Up Tier 2 Allocation |
| CC 8081 – Day Ahead Imbalance Reserve Down Settlement |

## Inputs – External Systems

| Row # | Variable Name | Description |
| --- | --- | --- |
|  | BA15MResFMMMaxExCap BrtQ’uT'I'M'VL'W'R'F'S'mdhc | Max Excap in FMM for a resource (MW)The maximum ex-post capacity limits of a resource reflect the Bid capacity and reported availability and define the operating levels to which the resource is considered dispatchable by CAISO. |
|  | 15MFMMSelfScheduleQuantity BrtuT'I'Q’M'F'S'VL'mdhc | 15 Minute Self Schedule submitted in FMM Market (MW) |
|  | WEIMOnlyBAAFlag Q’md | Flag indicating an EIM BAA that participates in the WEIM only, not EDAM. |
|  | MSSResourceInfo BrtuT’I’M’AA’VpLmd | A flag with a value of 1 when resource r is an MSS resource. This variable contains the information link between resource r and other MSS attributes.  |
|  | BAAHourlyIRUReqQty Q'AA’Qpmdh | The Hourly IRU requirement quantity for each BAA and APnode. (MW) |
|  | BAAHourlyIRUReqtPrc Q'AA’Qpmdh | The Hourly IRU requirement price for each BAA and APnode. ($/MW) |
|  | BAAHourlyIRUSurplusQty Q'AA’Qpmdh | The Hourly IRU surplus quantity for each BAA. (MW) |
|  | BAAHourlyIRUSurplusMarginalPrc Q'AA’Qpmdh | The Hourly IRU surplus marginal price for each BAA and APnode. ($/MW) |
|  | PTBAdjBAHourlyIRUTier1AllocAmtBQ’JM’mdh | PTB Adjustment for the Tier 1 IRU cost allocation amount portion |

## Inputs - Predecessor Charge Codes or Pre-calculations

| Row # | Variable Name | Predecessor Charge Code/ Pre-calc Configuration |
| --- | --- | --- |
|  |  |  |
|  | BAHourlyResIRU\_NonComplianceAmountBrtQ’mdh | CC 8071 – Day Ahead Imbalance Reserve Up Settlement |
|  |  |  |
|  |  |  |
|  | HourlyResourceDayAheadEnergy BrtuT’I’Q’M’F’S’mdh | CC 6011 – Day Ahead Energy, Congestion, Loss SettlementThis value will be negative for LOAD and ETIE resource types |
|  | SettlementIntervalRealTimeUIE BrtuT’I’Q’M’F’S’mdhcif  | PC Real Time Energy Quantity |
|  | BASettlementIntervalResourceFinalBalancedContractCRNFilteredQuantity Brtmdhcif | PC ETC TOR CVR QuantityThis value will be negative for LOAD and ETIE resource types |

## CAISO Formula

The daily settlement for this charge code for each Business Associate by Trading Day is derived according to the formulation below.

**Note:** The following calculation is listed starting with the final charge calculation and progressively detailing the intermediate calculations and Settlement input.

**BAHourlyIRUTier1AllocAmount BQ’M’mdh =**

BAHourlyIRUTier1AllocQuantityBQ’M’mdh\* BAAHourlyIRUTier1AllocPrice Q’mdh + PTBAdjustmentBAHourlyIRUTier1AllocAmountBQ’M’mdh

**PTBAdjustmentBAHourlyIRUTier1AllocAmount BQ’M’mdh =**

Sum (J) { PTBAdjBAHourlyIRUTier1AllocAmt BQ’JM’mdh }

**BAATotalHourlyIRUTier1AllocAmount Q’mdh =**

Sum (B, M’) {BAHourlyIRUTier1AllocAmountBQ’M’mdh }

**BAAHourlyIRUTier2CostAmount Q’mdh =**

BAAHourlyIRUAllocationCost Q’mdh - BAATotalHourlyIRUTier1AllocAmountQ’mdh

**A. Resource and MSS LF Tier 1 IRU Allocation Quantities**

**BAHourlyIRUTier1AllocQuantity BQ’M’mdh =**

{BAHourlyTotalResIRUTier1AllocQuantityBQ’M’mdh

+ BAHourlyMSSLF\_IRUTier1AllocQuantityBQ’M’mdh }

**BAHourlyTotalResIRUTier1AllocQuantity BQ’M’mdh =**

Sum (r, t)

{BAHourlyGenResIRUTier1AllocQuantity BrtQ’M’mdh + BAHourlyImportResIRUTier1AllocQuantity BrtQ’M’mdh + BAHourlyLoadResIRUTier1AllocQuantity BrtQ’M’mdh + BAHourlyExportResIRUTier1AllocQuantity BrtQ’M’mdh }

**BAHourlyResFMMMaxExCapQuantity BrtQ’uT'I'M'F'S'mdh =**
Sum (V, L’, W’, R’)
{0.25 \* BA15MResFMMMaxExCap BrtQ’uT'I'M'VL'W'R'F'S'mdhc }

Implementation Note: The inputs are coming in as MW every 15 minutes, and thus divided by divided by 4. This calculation further sums up those 15-minute values into an hourly value as part of an automatic frequency conversion.

**BAMSSLoadFollowingFlag BM'md =**

Max (r, t, u, T’, I’, A, A’, V, p, L) { MSSResourceInfo BrtuT’I’M’AA’VpLmd }

Where Load Following Resource (L’) = “YES”

Implementation: This will be a flag with a value of 1 for an MSS that is load following.

**BAHourlyResBalancedContractQuantity Brtmdh =**

Sum (c, i, f)

{BASettlementIntervalResourceFinalBalancedContractCRNFilteredQuantity Brtmdhcif }

**BAHourlyGenResIRUTier1AllocQuantity** **BrtQ’M’mdh =**

Sum (u, T’, I’, F’, S’,)

{Max (0, [(HourlyResourceDayAheadEnergy BrtuT’I’Q’M’F’S’mdh - BAHourlyResFMMMaxExCapQuantityBrtQ’uT'I'M'F'S'mdh) - BAHourlyResBalancedContractQuantityBrtmdh])}

where Resource\_Type (t) = ‘GEN’

Excluding records where these variables exists WEIMOnlyBAAFlag Q’md, and BAMSSLoadFollowingFlagBM'md

**BAHourlyImportResIRUTier1AllocQuantity** **BrtQ’M’mdh =**

Sum (u, T’, I’, F’, S’ )

{Max (0, [(HourlyResourceDayAheadEnergy BrtuT’I’Q’M’F’S’mdh - BAHourlyResFMMMaxExCapQuantityBrtQ’uT'I'M'F'S'mdh) - BAHourlyResBalancedContractQuantityBrtmdh])}

where Resource\_Type (t) = ‘ITIE’

Excluding records where these variables exists WEIMOnlyBAAFlag Q’md, and BAMSSLoadFollowingFlagBM'md

BASettlementIntervalResCompEntityUIEQuantity BrtQ’M’F’S’mdhcif **=**

Sum (u, T’, I’)

{ SettlementIntervalRealTimeUIE BrtuT’I’Q’M’F’S’mdhcif–BASettlementIntervalResourceFinalBalancedContractCRNFilteredQuantity Brtmdhcif }

**BASettlementIntervalResUIEQuantity** **BrtQ’M’mdhcif =**

Sum (u, T’, I’, F’, S’)

{ SettlementIntervalRealTimeUIE BrtuT’I’Q’M’F’S’mdhcif–BASettlementIntervalResourceFinalBalancedContractCRNFilteredQuantity Brtmdhcif }

**BASettlementIntervalResNegUIEQuantity** **BrtQ’M’mdhcif =**

Min(0, BASettlementIntervalResUIEQuantity BrtQ’M’mdhcif)

**BASettlementIntervalResPosUIEQuantity** **BrtQ’M’mdhcif =**

Max(0, BASettlementIntervalResUIEQuantity BrtQ’M’mdhcif)

**BAHourlyLoadResIRUTier1AllocQuantity** **BrtQ’M’mdh =**

Sum (c, i, f)

{Abs(BASettlementIntervalResNegUIEQuantity BrtQ’M’mdhcif)}

where Resource\_Type (t) = ‘LOAD’

Excluding records where these variables exists WEIMOnlyBAAFlag Q’md, and BAMSSLoadFollowingFlagBM'md

**BAHourlyExportResIRUTier1AllocQuantity** **BrtQ’M’mdh =**

Sum (u, T’, I’, F’, S’, V, L’)

{Max (0, [0.25\*(15MFMMSelfScheduleQuantity BrtuT'I'Q’M'F'S'VL'mdhc ) – Abs(INTDUPLICATE(HourlyResourceDayAheadEnergy BrtuT’I’Q’M’F’S’mdh )) – Abs(BAHourlyResBalancedContractQuantityBrtmdh)])}

where Resource\_Type (t) = ‘ETIE’

Excluding records where these variables exists WEIMOnlyBAAFlag Q’md, and BAMSSLoadFollowingFlagBM'md

**BAHourlyMSSLF\_IRBaseAllocQuantity BQ’M’mdh =**

Sum (r, t, c, i, f)

{ BAMSSLoadFollowingFlagBM'md **\*** BASettlementIntervalResUIEQuantity BrtQ’M’mdhcif }

Excluding records where these variables exists WEIMOnlyBAAFlag Q’md

**BAHourlyMSSLF\_IRUTier1AllocQuantity BQ’M’mdh =**

(-1)\*Min(0,BAHourlyMSSLF\_IRBaseAllocQuantity BQ’M’mdh )

**B. Tier 1 Price Calculations**

**BAAHourlyIRUTier1AllocPrice** **Q’mdh =**

Min ( BAAHourlyIRUTier1ReqtPrice Q’mdh, BAAHourlyIRUTier1DerivedPrice Q’mdh)

**BAAHourlyIRUAllocationCost** **Q’mdh =**

Max (0, BAAHourlyIRUReqtCost Q’mdh - BAAHourlyIRUSurplusAdjustment Q’mdh) - BAAHourlyIRUNoPayRevenue Q’mdh

**BAAHourlyTotalIRUTier1AllocQuantity Q’mdh** =

Sum (B, M’) {BAHourlyTotalResIRUTier1AllocQuantityBQ’M’mdh }

**BAAHourlyIRUTier1DerivedPrice** **Q’mdh =**

BAAHourlyIRUAllocationCost Q’mdh */* BAAHourlyTotalIRUTier1AllocQuantityQ’mdh

BAAHourlyIRUReqtCost Q’mdh=Sum (A,A’,Q,p) { BAAHourlyIRUReqQty Q'AA’Qpmdh \* BAAHourlyIRUReqtPrc Q'AA’Qpmdh }

BAAHourlyIRUSurplusAdjustment Q’mdh=Sum (A,A’,Q,p) { BAAHourlyIRUSurplusQty Q'AA’Qpmdh \* BAAHourlyIRUSurplusMarginalPrc Q'AA’Qpmdh }

BAAHourlyIRUNoPayRevenue Q’mdh=Sum (B,r,t) { BAHourlyResIRU\_NonComplianceAmountBrtQ’mdh }

BAAHourlyIRUTier1ReqtPrice Q’mdh=BAAHourlyIRUAllocationCost Q’mdh/ BAAHourlyIRUTier1AdjustedReqtQuantity Q’mdh

BAAHourlyIRUTier1AdjustedReqtQuantity Q’mdh=Sum (A,A’,Q,p) {BAAHourlyIRUReqQty Q'AA’Qpmdh - BAAHourlyIRUSurplusQty Q'AA’Qpmdh}

## Outputs

| ID | Name | Description |
| --- | --- | --- |
| -- | In addition to any outputs listed below, all inputs shall be included as outputs.  | All inputs. Refer to section 3.6 and 3.7 above for input descriptions. |
|  | BAHourlyIRUTier1AllocAmount BQ’M’mdh | Tier 1 allocation of IRU costs |
|  | PTBAdjustmentBAHourlyIRUTier1AllocAmount BQ’M’mdh | PTB for Tier 1 IRU cost allocation component |
|  | BAATotalHourlyIRUTier1AllocAmount Q’mdh | Total Tier 1 IRU cost allocation per BAA |
|  | BAAHourlyIRUTier2CostAmount Q’mdh | Total Tier 2 IRU costs to be allocated per BAA |
|  | BAHourlyIRUTier1AllocQuantity BQ’M’mdh | Total Tier 1 IRU allocation quantity. Combines total resource level or MSS level (if load following) per BA and MSS. |
|  | BAHourlyTotalResIRUTier1AllocQuantity BQ’M’mdh | Tier 1 IRU allocation quantity for all resources per BA |
|  | BAHourlyResFMMMaxExCapQuantity BrtQ’uT'I'M'F'S'mdh | Hourly MW FMM Max Expost Capacity, average of the four 15-minute MW values within each hour |
|  | BAMSSLoadFollowingFlag BM'md | Flag, with a value of 1, for a load following MSS |
|  | BAHourlyResBalancedContractQuantityBrtmdh | Hourly balanced contract quantity per resource  |
|  | BAHourlyGenResIRUTier1AllocQuantity BrtQ’M’mdh | Tier 1 IRU cost allocation quantity contribution for GEN resource type |
|  | BAHourlyImportResIRUTier1AllocQuantity BrtQ’M’mdh | Tier 1 IRU cost allocation quantity contribution for import (ITIE) resource type |
|  | BASettlementIntervalResCompEntityUIEQuantity BrtQ’M’F’S’mdhcif | Interim UIE quantity with component type attributes |
|  | BASettlementIntervalResUIEQuantity BrtQ’M’mdhcif | Interim UIE quantity |
|  | BASettlementIntervalResNegUIEQuantity BrtQ’M’mdhcif | Negative UIE quantity values |
|  | BASettlementIntervalResPosUIEQuantity BrtQ’M’mdhcif | Positive UIE quantity values |
|  | BAHourlyLoadResIRUTier1AllocQuantity BrtQ’M’mdh | Tier 1 IRU cost allocation quantity contribution for LOAD resource type |
|  | BAHourlyExportResIRUTier1AllocQuantity BrtQ’M’mdh | Tier 1 IRU cost allocation quantity contribution for export (ETIE) resource type |
|  | BAHourlyMSSLF\_IRBaseAllocQuantity BQ’M’mdh | Base IR cost allocation quantity at MSS level (if load following) |
|  | BAHourlyMSSLF\_IRUTier1AllocQuantity BQ’M’mdh | Tier 1 IRU cost allocation quantity at MSS level (if load following) |
|  | BAAHourlyIRUTier1AllocPrice Q’mdh | Tier 1 IRU cost allocation price |
|  |  |  |
|  |  |  |
|  | BAAHourlyIRUAllocationCost Q’mdh | IRU cost to be allocated. Could be split between Tier 1 and Tier 2. |
|  |  |  |
|  |  |  |
|  | BAAHourlyTotalIRUTier1AllocQuantity Q’mdh | Total IRU Tier 1 allocation quantity |
|  | BAAHourlyIRUTier1DerivedPrice Q’mdh | IRU Tier 1 derived price |
|  | BAAHourlyIRUReqtCost Q’mdh | Hourly IRU requirement cost by BAA |
|  | BAAHourlyIRUSurplusAdjustment Q’mdh | Total IRU Surplus Adjustment over all surplus zones in the BAA |
|  | BAAHourlyIRUNoPayRevenue Q’mdh | Hourly IRU No Pay revenue by BAA |
|  | BAAHourlyIRUTier1ReqtPrice Q’mdh | Hourly IRU Tier 1 requirement price by BAA |
|  | BAAHourlyIRUTier1AdjustedReqtQuantity Q’mdh | Hourly IRU requirement less surplus across all zones in BAA |

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |

# Charge Code Effective Dates

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Charge Code/Pre-calc Name | Document Version  | Effective Start Date | Effective End Date | Version Update Type |
| Day Ahead Imbalance Reserve Up Tier 1 Allocation | 5.0 | 05/01/2026 | Open | Configuration Impacted |