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|  | Settlements & Billing |
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| Configuration Guide:  | Day Ahead Imbalance Reserve Down Settlement |
|  |  |
|  |  8081 |
|  |  |
|  | Version 5.0 |

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# 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 8081 – Day Ahead Imbalance Reserve Down Settlement” 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.  |
|  | This charge code is applicable to resources with Imbalance Reserve Down awards in the Day-Ahead Market. It is also applicable to the positive net Imbalance Reserve Down quantities of transfer system resources (TSRs). |
|  | 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.) |
|  | **IFM IR Payments** For each Settlement Period, the resource payment is based on the product of the: (a) Locational IRD Price at the applicable PNode or Aggregated PNode; and (b) MW quantity of the awarded IRD.The resource price is derived from the applicable PNode or Aggregated Pnode prices. |
|  | **IRD Unavailability Non-Compliance Charges**A resource’s unavailable IRD quantity is the amount, if any, by which the resource’s Lower Economic Limit as adjusted by applicable Outages in the FMM exceeds the resource’s Day-Ahead Schedule for Supply minus the Ancillary Services Awards for Regulation Down minus the IRD award plus the Five-Minute Imbalance Reserve Quantity. The CAISO charges a resource with an unavailable IRD quantity the product of the unavailable quantity and the higher of the RTPD FRD price, or the resource’s Locational IRD Price. |
|  | Five-Minute Imbalance Reserve QuantityFor a resource with an Imbalance Reserves Award, the five-minute ramp capable portion of the award measured as the MW quantity of the resource’s ramp capability above the Day-Ahead hourly Energy schedule, in the case of IRU, or below that schedule, in the case of IRD. The ramp capability is determined based on the Master File-registered ramp rate used to optimize the day-ahead market. |
|  | Resources with an FMM Ex-post capacity range that does not support DA energy schedule minus the difference of the IRU award and five minute ramp capable capacity will be charged the resource-specific IRD No-Pay Penalty Price of Max (FMM FRD price, IRD price) for the undelivered MW quantity |
|  | IRD unavailibity charges do not apply to TSRs. |
|  | **IRD and RCD Unavailability Non-Compliance Charges Priority**Resources that have been awarded both a RCD and IRD and are not available, or only bid a portion of their combined award, shall have the unavailability charge applied first to RCD and then to IRD. |
|  | The **Overlapping RA Capacity for True-Up Settlements Mechanism** is provided below. |
|  | **IIRD Overlapping RA Capacity Amount**If an RA resource is mapped to one or more LSEs that have their *LSE RA True-Up Flag set to Opt-In for a trading day,* Sum over all 15-min within the hour { (15-min IRD Overlapping RA Capacity \* [Hourly IRD Marginal Price/4]) – 15-min IRD LOC for Overlapping RA Capacity} |
|  | **Hourly IRD Overlapping RA Capacity LSE Amount**Allocate the hourly IRD Overlapping RA Capacity Amount for that RA resource to the LSEs associated with it pro-rata to their monthly RA showing for LSEs that have Opted-In *LSE RA True-Up Flag.*SCs of LSEs that have their *LSE RA True-Up Flag opted-in shall be paid* Hourly IRD Overlapping RA Capacity LSE Amount for all RA resources that are associated with them. |
|  | SCs of resources shall be charged the Hourly IRD Overlapping RA Capacity LSE Amount for all LSEs that are associated with the resource. |
|  | There will be a transition period whereby CAISO will implement the above true-up mechanism and settle with both the LSE and the generator for any RA overlapping capacity with IRD award. |
|  | During the transitional period, and where the LSE has opted in, load serving entities (LSEs) in agreement with the RA supply resource to have RA capacity shown on the LSE monthly RA plan and procured through the day-ahead market for imbalance reserve, the IRD will be settled with both the LSE and the generator owner. |
|  | IRD RA Overlap capacity settlements do not apply to TSRs since these do not have RA awards nor real-time must offer obligations. |

## Predecessor Charge Codes

| Charge Code/ Pre-calc Name |
| --- |
| CC 8071 – Day Ahead Imbalance Reserve Up Settlement |
|  |

## Successor Charge Codes

| Charge Code/ Pre-calc Name |
| --- |
| CC 8086 – Day Ahead Imbalance Reserve Down Tier 1 Allocation |
| CC 7081 – Flexible Ramp Down Uncertainty Capacity Settlement |
| CC 4989 – Rounding Adjustment Settlement |
| PC IFM Net Amount |

## Inputs – External Systems

| Row # | Variable Name | Description |
| --- | --- | --- |
|  | BAHourlyResIRDSchedQty BrtuT'I'Q'AA’QpM'F'S'L'mdh | The Hourly IFM Imbalance Reserve Down Schedule Quantity for each Resource for every hour for each trading day. **(MW)** |
|  | BAHourlyResIRDPrc BrtQ’mdh | The Hourly IFM Imbalance Reserve Down Price for each Resource for every hour of each trading day. This is the locational IRD price. **($/MWh)** |
|  | BAHourlyResIRD5MRampCapableQty BrtQ’mdh | IRD Award 5-minute Ramp-Capable Portion**(MW)** |
|  | BA15MResIRDCapRangeQty BrtQ’mdhc | Imbalance Reserve Down allocated capacity range (FMM). **(MW)**Note: This data is coming in as an hourly MW value every 15-minutes per FMM market. |
|  | BA15ResourceFMMFlexRampDownBAAPrice BrtQ’uT’I’M’L’F’S’mdhc | FMM Flexible Ramp Down BAA Constraint price (in $/MWh) by Balancing Authority Area Q’ Note: This data is coming in as hourly value every 15-minutes per FMM market. |
|  | BA15MResIRD\_RAOverlapCapQty BrtQ’mdhc | 15-min IRD Overlapping RA CapacityThis data is coming in as an hourly MW value every 15-min.**(MW)** |
|  | BA15MResIRD\_RAOverlapCapLOCAmt BrtQ’mdhc | 15-min IRD LOC Amount for Overlapping RA Capacity**($)** |
|  |  |  |
|  | RATrueUpMechanismOptInFlag BrtQ’t’’m | A flag with a value of 1 when the LSE (BA ID B) has opted into the RA true-up mechanism. This can only be applicable during the period where true up mechanism for RA overlapped capacity with IRD is active, indicated by another global flag.  |
|  | TransitionalRATrueUpMechanismPeriodFlag d | Transition period flag for the RA overlap capacity LSE true-up mechanismThis has a value of 1 during the period, 0 other wise. A value of 1 means true-up settlement with opted in LSEs is active. |
|  | BAHourlyTSR\_IRDSchedQty BrtuT'I'Q'M'F'S'L'mdh | The Hourly IFM Imbalance Reserve Down Schedule Quantity for each Transfer System Resources for every hour for each trading day. |
|  | BAHourlyTSR\_IRDPrc Brmdh | The Hourly IFM Imbalance Reserve Down Price for each Resource for every hour of each trading day. |
|  |  |  |
|  |  |  |
|  |  |  |
|  | PTBChargeAdjustmentBAHourlyIRDAmt **BQ’Jmdh** | PTB adjustment variable for this Charge Code per BA and per BAA. ($) |

## Inputs - Predecessor Charge Codes or Pre-calculations

| Row # | Variable Name | Predecessor Charge Code/ Pre-calc Configuration |
| --- | --- | --- |
|  | BADailyResRA\_LSEShareRateBrtQ’t’’md | CC 8071 – Day Ahead Imbalance Reserve Up Settlement |
|  |  |  |

## CAISO Formula

The daily settlement of Intertie Deviations 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.

**BAHourlyResIRDSettlementAmount BrtQ’M’F’S’L’mdh =**
BAHourlyResIRDAssessmentAmountBrtQ’M’F’S’L’mdh + BAHourlyResIRD\_RAOverlapLSESettlementAmountBrtQ’mdh

**BAHourlyResIRDAssessmentAmount BrtQ’M’F’S’L’mdh =**
Sum over (u,T’,I’,A,A’,Q,p)

{BAHourlyResIRDPaymentAmount BrtQ’mdh + BAHourlyResIRD\_NonComplianceAmount BrtQ’mdh + [TransitionalRATrueUpMechanismPeriodFlag d \*(BAHourlyResIRD\_RAOverlapCapAssessmentAmountBrtQ’mdh

+ BAHourlyResIRD\_RAOverlapLSEShareUnallocAmountBrtQ’mdh )]

}

This will be calculated whenever BAHourlyResIRDSchedQty  BrtuT'I'Q'AA’QpM'F'S'L'mdh exists.

BAHourlyResIRD\_RAOverlapLSESettlementAmountBrtQ’mdh **=**
Sum over (t’’) {TransitionalRATrueUpMechanismPeriodFlag d \*BAHourlyResIRD\_RAOverlapLSEShareAmountBrtQ’t’’mdh }

**BAHourlyResIRDScheduleQuantity** **BrtQ’mdh =**

Sum over (u,T’,I’, A, A’, Q, p,M’,F’,S’,L’)

{BAHourlyResIRDSchedQty BrtuT'I'Q'AA’QpM'F'S'L'mdh}

**BAHourlyResIRDPaymentAmount BrtQ’mdh =**

(-1)\*BAHourlyResIRDScheduleQuantity BrtQ’mdh **\*** BAHourlyResIRDPrc BrtQ’mdh

**BA15MResIRD\_NonComplianceQuantity BrtQ’mdhc =**(-1) \* Min{0, BA15MResIRDCapRangeQty BrtQ’mdhc – [INTDUPLICATE(BAHourlyResIRDScheduleQuantity BrtQ’mdh ) –INTDUPLICATE(BAHourlyResIRD5MRampCapableQty BrtQ’mdh )] }

**BAHourlyResIRD\_NonComplianceQuantity Brtmdh =**Sum over (Q’,c ) {BA15MResIRD\_NonComplianceQuantityBrtQ’mdhc}

**BA15MResFMM\_FRDFilteredPrice BrtQ’mdhc =**Average over (u,T’,I’,M’,L’, F’, S’)

{ BA15ResourceFMMFlexRampDownBAAPrice BrtQ’uT’I’M’L’F’S’mdhc}

**BA15MResIRD\_NonCompliancePrice BrtQ’mdhc =**Max ( BA15MResFMM\_FRDFilteredPriceBrtQ’mdhc , INTDUPLICATE(BAHourlyResIRDPrc BrtQ’mdh ))

Implementation Note: Formula will be created only when BA15MResIRD\_NonComplianceQuantityBrtQ’mdhc exists.

**BA15MResIRD\_NonComplianceAmount BrtQ’mdhc =**0.25 \* BA15MResIRD\_NonComplianceQuantityBrtQ’mdhc \* BA15MResIRD\_NonCompliancePriceBrtQ’mdhc

**BAHourlyResIRD\_NonComplianceAmount BrtQ’mdh =**Sum over (c ) {BA15MResIRD\_NonComplianceAmountBrtQ’mdhc}

**BAHourlyResIRD\_RAOverlapCapGrossAmount** BrtQ’mdh =0.25\* BA15MResIRD\_RAOverlapCapQty BrtQ’mdhc **\*** BAHourlyResIRDPrc BrtQ’mdh

**BAHourlyResIRD\_RAOverlapCapAssessmentAmount** BrtQ’mdh =Sum over (c)

{ BAHourlyResIRD\_RAOverlapCapGrossAmountBrtQ’mdh **-** BA15MResIRD\_RAOverlapCapLOCAmt BrtQ’mdhc}

**HourlyResIRD\_RAOverlapCapAssessmentAmount** rmdh =Sum over (B, t, Q’)

{BAHourlyResIRD\_RAOverlapCapAssessmentAmountBrtQ’mdh }

**Calculations for LSE:**

**BAHourlyResIRD\_RAOverlapLSEToBeAllocatedAmount** BrtQ’t’’mdh =INTDUPLICATE(BADailyResRA\_LSEShareRateBrtQ’t’’md )\* HourlyResIRD\_RAOverlapCapAssessmentAmountrmdh

Implementation Note: Daily rates will be duplicated into each hour.

**BAHourlyResIRD\_RAOverlapLSEShareAmount** BrtQ’t’’mdh =(-1)\* RATrueUpMechanismOptInFlag BrtQ’t’’m \* BAHourlyResIRD\_RAOverlapLSEToBeAllocatedAmountBrtQ’t’’mdh

**Calculations for RA Resource SC:**

**HourlyResIRD\_RAOverlapLSEToBeAllocatedAmount** rtQ’t’’mdh =Sum over (B) {BAHourlyResIRD\_RAOverlapLSEToBeAllocatedAmountBrtQ’t’’mdh }

Note: This data will be provided to the supply resource BA\_ID, which had the IRD award.

**HourlyResIRD\_RAOverlapLSEAllocatedShareAmount** rtQ’t’’mdh =Sum over (B) {BAHourlyResIRD\_RAOverlapLSEShareAmountBrtQ’t’’mdh }

Note: This data will be provided to the supply resource BA\_ID, which had the IRD award.

**HourlyResIRD\_RAOverlapTotalAllocatedShareAmount** rtQ’mdh =Sum over (t’’) {HourlyResIRD\_RAOverlapLSEAllocatedShareAmount rtQ’t’’mdh }

Note: This data will be provided to the supply resource BA\_ID, which had the IRD award.

**BAHourlyResIRD\_RAOverlapLSEShareUnallocAmount** BrtQ’mdh =(-1)\*(BAHourlyResIRD\_RAOverlapCapAssessmentAmountBrtQ’mdh + HourlyResIRD\_RAOverlapTotalAllocatedShareAmountrtQ’mdh )

**Calculation for TSRs:**

**BAHourlyTSR\_IRDAdvisoryAmount BrtQ’M’F’S’L’mdh**=Sum over (u,T’,I’)

{ BAHourlyTSR\_IRDSchedQty BrtuT'I'Q'M'F'S'L'mdh **\*** BAHourlyTSR\_IRDPrc Brmdh }

**Miscellaneous calculations:**

BAHourlyResIRDScheduleFilterQuantityBrtuT'I'Q'M'F'S'L'mdh  **=**

Sum over (A, A’, Q, p)

{BAHourlyResIRDSchedQty BrtuT'I'Q'AA’QpM'F'S'L'mdh}

## 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. |
|  | BAHourlyResIRDSettlementAmountBrtQ’M’F’S’L’mdh | Settlement period amount for this charge code. Non-compliance charge, has been factored in, if any.This charge type also settles with the LSE or CPE as the BA\_ID for its RA overlap share for IRD award for the resource.It also includes settlement of positive net Imbalance Reserve Down quantities for TSRs. |
|  | BAHourlyResIRDAssessmentAmountBrtQ’M’F’S’L’mdh | Assessment of IRD per settlement period for resources excluding TSRs. Non-compliance charge, has been factored in, if any.This charge type also includes the settlement with the LSE or CPE as the BA\_ID for its RA overlap share for IRD award for the resource. |
|  | BAHourlyResIRD\_RAOverlapLSESettlementAmountBrtQ’mdh | Settlement amount for the LSE for valid RA Overlap with IRD. |
|  | BAHourlyResIRDScheduleQuantity BrtQ’mdh | IRD award with select attributes. |
|  | BAHourlyResIRDPaymentAmountBrtQ’mdh | Hourly payment for IRD awards (prior to non-compliance assessment). |
|  | BA15MResIRD\_NonComplianceQuantityBrtQ’mdhc | Computed unavailable IRD award, subject to non-compliance charges. **(MW)** |
|  | BAHourlyResIRD\_NonComplianceQuantityBrtmdh | Hourly computed unavailable IRD award, subject to non-compliance charges. |
|  | BA15MResFMM\_FRDFilteredPriceBrtQ’mdhc | FMM FRD resource price |
|  | BA15MResIRD\_NonCompliancePriceBrtQ’mdhc | Non-compliance price for unavailable IRD award |
|  | BA15MResIRD\_NonComplianceAmountBrtQ’mdhc | Non-compliance amount per fifteen minutes due to unavailable IRD award |
|  | BAHourlyResIRD\_NonComplianceAmountBrtQ’mdh | Non-compliance amount per hour due to unavailable IRD award |
|  | BAHourlyResIRD\_RAOverlapCapGrossAmountBrtQ’mdh | Gross amount for RA overlap prior to lost opportunity cost (LOC) reduction. |
|  | BAHourlyResIRD\_RAOverlapCapAssessmentAmountBrtQ’mdh | RA overlap capacity assessment subject to settlement with opted in LSE for transitional RA true-up. All or portion of this amount will be taken out from supplying IRD resource settlement, depending on option selected by LSE(s) for an RA resource. |
|  | HourlyResIRD\_RAOverlapCapAssessmentAmountrmdh | Intermediate calc, dropping the BA\_ID attribute for the resource.  |
|  | BAHourlyResIRD\_RAOverlapLSEToBeAllocatedAmount BrtQ’t’’mdh | Potential RA overlap allocation to LSE. Still subject to opt in. |
|  | BAHourlyResIRD\_RAOverlapLSEShareAmountBrtQ’t’’mdh | Transitional RA true-up settlement with opted in LSE for an RA resource with IRD award. |
|  | HourlyResIRD\_RAOverlapLSEToBeAllocatedAmount rtQ’t’’mdh | Potential RA overlap allocation to LSE\_ID. Still subject to opt in. Info only provided to resource SC. |
|  | HourlyResIRD\_RAOverlapLSEAllocatedShareAmount rtQ’t’’mdh | Transitional RA true-up settlement with opted in LSE for an RA resource with IRU award. Info only provided to resource SC. |
|  | HourlyResIRD\_RAOverlapTotalAllocatedShareAmountrtQ’mdh | Total settlement with LSEs for the RA resource. |
|  | BAHourlyResIRD\_RAOverlapLSEShareUnallocAmountBrtQ’mdh | Unallocated amount (no remaining LSEs to true-up with) that goes back to the original SC with IRD award. |
|  | BAHourlyTSR\_IRDAdvisoryAmount BrtQ’M’F’S’L’mdh | Advisory (non-binding) assessment amount of positive net Imbalance Reserve Down quantities for TSRs. |
|  | BAHourlyResIRDScheduleFilterQuantityBrtuT'I'Q'M'F'S'L'mdh | Hourly IRD schedule with select attribute set. |
|  |  |  |
|  |  |  |

# Charge Code Effective Dates

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