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|  | Settlements & Billing |
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|  |  |
| Configuration Guide:  | Day Ahead Imbalance Reserve Up Settlement |
|  |  |
|  |  CC 8071 |
|  |  |
|  | 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 8071 – Day Ahead Imbalance Reserve Up 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 Up awards in the Day-Ahead Market. It is also applicable to the positive net Imbalance Reserve Up 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 IRU Price at the applicable PNode or Aggregated PNode; and (b) MW quantity of the awarded IRU.The resource price is derived from the applicable PNode or Aggregated Pnode prices. |
|  | **IRU Unavailability Non-Compliance Charges**A resource’s unavailable IRU quantity is the amount, if any, by which the resource’s Day-Ahead Schedule for Supply plus Ancillary Services Awards other than for Regulation Down plus the IRU award minus the Five-Minute Imbalance Reserve Quantity exceeds the resource’s Upper Economic Limit as adjusted by applicable Outages in the FMM. The CAISO charges a resource with an unavailable IRU quantity the product of the unavailable quantity and the higher of the RTPD Flexible Ramp Up Price, or the resource’s Locational IRU 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 plus the IRU award less five minute ramp capable capacity will be charged the resource-specific IRU No-Pay Penalty Price of Max (FMM FRU price, IRU price) for the undelivered MW quantity after accounting for DA Spinning Reserve award and DA Non-Spinning Reserve award, in that respective order. |
|  | IRU unavailibity charges do not apply to TSRs. |
|  | **IRU and RCU Unavailability Non-Compliance Charges Priority**Resources that have been awarded both a RCU and IRU and are not available, or only bid a portion of their combined award, shall have the unavailability charge applied first to RCU and then to IRU.  |
|  | The **Overlapping RA Capacity for True-Up Settlements Mechanism** is provided below. |
|  | **IRU 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 IRU Overlapping RA Capacity \* [Hourly IRU Marginal Price/4]) – 15-min IRU LOC for Overlapping RA Capacity} |
|  | **Hourly IRU Overlapping RA Capacity LSE Amount**Allocate the hourly IRU 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 IRU Overlapping RA Capacity LSE Amount for all RA resources that are associated with them. |
|  | SCs of resources shall be charged the Hourly IRU 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 IRU 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 IRU will be settled with both the LSE and the generator owner. |
|  | IRU 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 |
| --- |
| None |
|  |

## Successor Charge Codes

| Charge Code/ Pre-calc Name |
| --- |
| CC 7071 – Flexible Ramp Up Uncertainty Capacity Settlement |
| CC 8076 – Day Ahead Imbalance Reserve Up Tier 1 Allocation |
| CC 8081 – Day Ahead Imbalance Reserve Down Settlement |
| CC 4989 – Rounding Adjustment Settlement |
| PC Day Ahead Congestion |
| PC IFM Net Amount |

## Inputs – External Systems

| Row # | Variable Name | Description |
| --- | --- | --- |
|  | BAHourlyResIRUSchedQty BrtuT'I'Q'AA’QpM'F'S'L'mdh | The Hourly IFM Imbalance Reserve Up Schedule Quantity for each Resource for every hour for each trading day. **(MW)** |
|  | BAHourlyResIRUPrc BrtQ’mdh | The Hourly IFM Imbalance Reserve Up Price for each Resource for every hour of each trading day. This is the locational IRU price. |
|  | BAHourlyResIRU5MRampCapableQty BrtQ’mdh | IRU Award 5-minute Ramp-Capable Portion**(MW)** |
|  | BA15MResIRUCapRangeQty BrtQ’mdhc | Imbalance Reserve Up allocated capacity range (FMM). **(MW)**Note: This data is coming in as an hourly MW value every 15-minutes per FMM market. |
|  | BA15ResourceFMMFlexRampUpBAAPrice BrtQ’uT’I’M’L’F’S’mdhc | FMM Flexible Ramp Up BAA Constraint price (in $/MWh) by Balancing Authority Area Q’ Note: This data is coming in as an hourly value every 15-minutes per FMM market. |
|  | BA15MResIRU\_RAOverlapCapQty BrtQ’mdhc | 15-min IRU Overlapping RA CapacityThis data is coming in as an hourly MW value every 15-min. **(MW)** |
|  | BA15MResIRU\_RAOverlapCapLOCAmt BrtQ’mdhc | 15-min IRU LOC Amount for Overlapping RA Capacity. **($)** |
|  | BAMonthlyResGenericRALSEShareQty BrtQ’t’’m | Generic RA Capacity share for resource r by LSE and the corresponding BA ID (B) for such LSE ID. (MW) |
|  | BAMonthlyResFlexRACatLSEShareQty BrtQ’j’t’’m | Flex RA Shown Capacity share for resource r, by flex RA category, by LSE and the corresponding BA ID (B) for such LSE ID. (MW) |
|  | 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 IRU 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\_IRUSchedQty BrtuT'I'Q'M'F'S'L'mdh | The Hourly IFM Imbalance Reserve Up Schedule Quantity for each Transfer System Resources for every hour for each trading day. |
|  | BAHourlyTSR\_IRUPrc Brmdh | The Hourly IFM Imbalance Reserve Up Price for each Resource for every hour of each trading day. |
|  | PTBChargeAdjustmentBAHourlyIRUAmt **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 |
| --- | --- | --- |
|  |  |  |

## 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.

* + 1. **BAHourlyResIRUSettlementAmount BrtQ’M’F’S’L’mdh =**
		BAHourlyResIRUAssessmentAmountBrtQ’M’F’S’L’mdh + BAHourlyResIRU\_RAOverlapLSESettlementAmountBrtQ’mdh
		2. **BAHourlyResIRUAssessmentAmount BrtQ’M’F’S’L’mdh =**
		Sum over (u,T’,I’,A,A’,Q,p)

{BAHourlyResIRUPaymentAmount BrtQ’mdh + BAHourlyResIRU\_NonComplianceAmount BrtQ’mdh + [TransitionalRATrueUpMechanismPeriodFlag d \*(BAHourlyResIRU\_RAOverlapCapAssessmentAmountBrtQ’mdh

+ BAHourlyResIRU\_RAOverlapLSEShareUnallocAmountBrtQ’mdh )]

}

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

* + 1. **BAHourlyResIRU\_RAOverlapLSESettlementAmount BrtQ’mdh =**
		Sum over (t’’) {TransitionalRATrueUpMechanismPeriodFlag d \*BAHourlyResIRU\_RAOverlapLSEShareAmountBrtQ’t’’mdh }
		2. **BAHourlyResIRUScheduleQuantity** **BrtQ’mdh =**

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

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

* + 1. **BAHourlyResIRUPaymentAmount BrtQ’mdh =**

		(-1)\*BAHourlyResIRUScheduleQuantity BrtQ’mdh **\*** BAHourlyResIRUPrc BrtQ’mdh
		2. **BA15MResIRU\_NonComplianceQuantity BrtQ’mdhc =**(-1) \* Min{0, BA15MResIRUCapRangeQty BrtQ’mdhc – [INTDUPLICATE(BAHourlyResIRUScheduleQuantity BrtQ’mdh ) –INTDUPLICATE(BAHourlyResIRU5MRampCapableQty BrtQ’mdh )] }
		3. **BAHourlyResIRU\_NonComplianceQuantity Brtmdh =**Sum over (Q’, c ) {BA15MResIRU\_NonComplianceQuantityBrtQ’mdhc}
		4. **BA15MResFMM\_FRUFilteredPrice BrtQ’mdhc =**Average over (u,T’,I’,M’,L’, F’, S’) { BA15ResourceFMMFlexRampUpBAAPrice BrtQ’uT’I’M’L’F’S’mdhc}
		5. **BA15MResIRU\_NonCompliancePrice BrtQ’mdhc =**Max ( BA15MResFMM\_FRUFilteredPriceBrtQ’mdhc , INTDUPLICATE(BAHourlyResIRUPrc BrtQ’mdh ))

Implementation Note: Formula will be created only when BA15MResIRU\_NonComplianceQuantityBrtQ’mdhc exists.

* + 1. **BA15MResIRU\_NonComplianceAmount BrtQ’mdhc =**0.25 \* BA15MResIRU\_NonComplianceQuantityBrtQ’mdhc \* BA15MResIRU\_NonCompliancePriceBrtQ’mdhc
		2. **BAHourlyResIRU\_NonComplianceAmount BrtQ’mdh =**Sum over (c ) {BA15MResIRU\_NonComplianceAmountBrtQ’mdhc}
		3. **BAHourlyResIRU\_RAOverlapCapGrossAmount** BrtQ’mdh =0.25\* BA15MResIRU\_RAOverlapCapQty BrtQ’mdhc **\*** BAHourlyResIRUPrc BrtQ’mdh
		4. **BAHourlyResIRU\_RAOverlapCapAssessmentAmount** BrtQ’mdh =Sum over (c)

{ BAHourlyResIRU\_RAOverlapCapGrossAmountBrtQ’mdh **-** BA15MResIRU\_RAOverlapCapLOCAmt BrtQ’mdhc]}

* + 1. **HourlyResIRU\_RAOverlapCapAssessmentAmount** rmdh =Sum over (B, t, Q’)

{BAHourlyResIRU\_RAOverlapCapAssessmentAmountBrtQ’mdh }

**Calculations for LSE:**

* + 1. BADailyResTotalRALSEShareQuantityBrtQ’t’’md =BADailyResGenericRALSEShareQuantity BrtQ’t’’md + BADailyResFlexRALSEShareQuantity BrtQ’t’’md
		2. BADailyResGenericRALSEShareQuantity BrtQ’t’’md =INTDUPLICATE(BAMonthlyResGenericRALSEShareQty BrtQ’t’’m )
		3. BADailyResFlexRALSEShareQuantityBrtQ’t’’md =Sum (j’) {INTDUPLICATE(BAMonthlyResFlexRACatLSEShareQtyBrtQ’j’t’’m )}
		4. **ResourceBAADailyResTotalRAShownCapacityQuantity** rtQ’md =Sum (B, t’’) { BADailyResTotalRALSEShareQuantityBrtQ’t’’md}
		5. **BADailyResRA\_LSEShareRate** BrtQ’t’’md ={ BADailyResTotalRALSEShareQuantityBrtQ’t’’md **/** ResourceBAADailyResTotalRAShownCapacityQuantityrtQ’md }
		6. **BAHourlyResIRU\_RAOverlapLSEToBeAllocatedAmount** BrtQ’t’’mdh =BADailyResRA\_LSEShareRateBrtQ’t’’md \* HourlyResIRU\_RAOverlapCapAssessmentAmountrmdh
		7. **BAHourlyResIRU\_RAOverlapLSEShareAmount** BrtQ’t’’mdh =(-1)\* RATrueUpMechanismOptInFlag BrtQ’t’’m \* BAHourlyResIRU\_RAOverlapLSEToBeAllocatedAmountBrtQ’t’’mdh

**Calculations for RA Resource SC:**

* + 1. **HourlyResIRU\_RAOverlapLSEToBeAllocatedAmount** rtQ’t’’mdh =Sum over (B) {BAHourlyResIRU\_RAOverlapLSEToBeAllocatedAmountBrtQ’t’’mdh }

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

* + 1. **HourlyResIRU\_RAOverlapLSEAllocatedShareAmount** rtQ’t’’mdh =Sum over (B) {BAHourlyResIRU\_RAOverlapLSEShareAmountBrtQ’t’’mdh }

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

* + 1. **HourlyResIRU\_RAOverlapTotalAllocatedShareAmount** rtQ’mdh =Sum over (t’’) {HourlyResIRU\_RAOverlapLSEAllocatedShareAmount rtQ’t’’mdh }

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

* + 1. **BAHourlyResIRU\_RAOverlapLSEShareUnallocAmount** BrtQ’mdh =(-1)\*(BAHourlyResIRU\_RAOverlapCapAssessmentAmountBrtQ’mdh + HourlyResIRU\_RAOverlapTotalAllocatedShareAmountrtQ’mdh )

**Calculation for TSRs:**

* + 1. **BAHourlyTSR\_IRUAdvisoryAmount BrtQ’M’F’S’L’mdh**=Sum over (u,T’,I’)

{ BAHourlyTSR\_IRUSchedQty BrtuT'I'Q'M'F'S'L'mdh **\*** BAHourlyTSR\_IRUPrc Brmdh }

**Miscellaneous calculations:**

* + 1. BAHourlyResIRUScheduleFilterQuantityBrtuT'I'Q'M'F'S'L'mdh  **=**

Sum over (A, A’, Q, p)

{BAHourlyResIRUSchedQty 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. |
|  | BAHourlyResIRUSettlementAmountBrtQ’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 IRU award for the resource.It also includes settlement of positive net Imbalance Reserve Up quantities for TSRs. |
|  | BAHourlyResIRUAssessmentAmountBrtQ’M’F’S’L’mdh | Assessment of IRU 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 IRU award for the resource. |
|  | BAHourlyResIRU\_RAOverlapLSESettlementAmount BrtQ’mdh | Settlement amount for the LSE for valid RA Overlap with IRU. |
|  | BAHourlyResIRUScheduleQuantity BrtQ’mdh | IRU Schedule quantity with select attributes. |
|  | BAHourlyResIRUPaymentAmountBrtQ’mdh | Hourly payment for IRU awards (prior to non-compliance assessment). |
|  | BA15MResIRU\_NonComplianceQuantityBrtQ’mdhc | Computed unavailable IRU award, subject to non-compliance charges. **(MW)** |
|  | BAHourlyResIRU\_NonComplianceQuantityBrtmdh | Hourly computed unavailable IRU award, subject to non-compliance charges. |
|  | BA15MResFMM\_FRUFilteredPriceBrtQ’mdhc | FMM FRU resource price |
|  | BA15MResIRU\_NonCompliancePriceBrtQ’mdhc | Non-compliance price for unavailable IRU award |
|  | BA15MResIRU\_NonComplianceAmountBrtQ’mdhc | Non-compliance amount per fifteen minutes due to unavailable IRU award |
|  | BAHourlyResIRU\_NonComplianceAmountBrtQ’mdh | Non-compliance amount per hour due to unavailable IRU award |
|  | BAHourlyResIRU\_RAOverlapCapGrossAmountBrtQ’mdh | Gross amount for RA overlap prior to lost opportunity cost (LOC) reduction. |
|  | BAHourlyResIRU\_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 IRU resource settlement, depending on option selected by LSE(s) for an RA resource. |
|  | HourlyResIRU\_RAOverlapCapAssessmentAmountrmdh | Intermediate calc, dropping the BA\_ID attribute for the resource.  |
|  | BADailyResTotalRALSEShareQuantityBrtQ’t’’md | Daily LSE share quantity total of generic and flex RA per resource. |
|  | BADailyResGenericRALSEShareQuantity BrtQ’t’’md | LSE share quantity of generic RA capacity per resource, per day. |
|  | BADailyResFlexRALSEShareQuantityBrtQ’t’’md | LSE share quantity of flex RA capacity per resource, over all flex RA categories, per day. |
| 1. u
 | ResourceBAADailyResTotalRAShownCapacityQuantity rtQ’md | Total RA shown capacity for the resource, across all LSEs. |
|  | BADailyResRA\_LSEShareRateBrtQ’t’’md | Share of each LSE to Total RA shown capacity for the resource. |
|  | BAHourlyResIRU\_RAOverlapLSEToBeAllocatedAmount BrtQ’t’’mdh | Potential RA overlap allocation to LSE. Still subject to opt in. |
|  | BAHourlyResIRU\_RAOverlapLSEShareAmountBrtQ’t’’mdh | Transitional RA true-up settlement with opted in LSE for an RA resource with IRU award. |
|  | HourlyResIRU\_RAOverlapLSEToBeAllocatedAmount rtQ’t’’mdh | Potential RA overlap allocation to LSE\_ID. Still subject to opt in. Info only provided to resource SC. |
|  | HourlyResIRU\_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. |
|  | HourlyResIRU\_RAOverlapTotalAllocatedShareAmountrtQ’mdh | Total settlement with LSEs for the RA resource. |
|  | BAHourlyResIRU\_RAOverlapLSEShareUnallocAmountBrtQ’mdh | Unallocated amount (no remaining LSEs to true-up with) that goes back to the original SC with IRU award. |
|  | BAHourlyTSR\_IRUAdvisoryAmount BrtQ’M’F’S’L’mdh | Advisory (non-binding) assessment amount of positive net Imbalance Reserve Up quantities for TSRs. |
|  | BAHourlyResIRUScheduleFilterQuantityBrtuT'I'Q'M'F'S'L'mdh | Hourly IRU 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 Up Settlement | 5.0 | 05/01/2026 | Open | Configuration Impacted |