Settlements and Billing

Configuration Guide: Real Time Congestion

Pre-Calculation

Version 5.9

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# Purpose of Document

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

# Introduction

## Background

Locational Marginal Prices will be used in principle to settle Energy transactions. Price Locations and Aggregated Price Locations are defined on collections of network nodes. A LMP will be calculated for each Price Location and each Aggregated Price Location.

The CAISO calculates and accounts for Imbalance Energy for each Dispatch Interval and settles Imbalance Energy for each Settlement Interval for each resource within the EIM Area and all System Resources Dispatched in Real-Time.

Imbalance Energy consists of following:

* IIE – instructed imbalance energy
  + FMM Instructed Imbalance Energy Settlement (CC 6460)
  + FMM Instructed Imbalance Energy EIM Settlement (CC 64600)
  + RTD Instructed Imbalance Energy Settlement (CC 6470)
  + RTD Instructed Imbalance Energy EIM Settlement (CC 64700)
* UIE – Uninstructed Imbalance Energy
  + Real Time Uninstructed Imbalance Energy Settlement (CC 6475)
  + Real Time Uninstructed Imbalance Energy EIM Settlement (CC 64750)
* UFE – Unaccounted for Energy
  + Real Time Unaccounted for Energy Settlement (CC 6474)
  + Real Time Unaccounted for Energy EIM Settlement (CC 64740)
* GHG - Greenhouse Gas Emission Cost Revenue (CC 491)

To the extent that the sum of the Settlement Amounts for IIE, UIE, and UFE does not equal zero within the CAISO Balancing Authority Area, the CAISO will assess Charges or make Payments in Real Time Imbalance Energy Offset (CC 6477) and in Real Time Imbalance Energy Offset EIM (CC 64770) for the resulting differences to all Scheduling Coordinators based on a pro rata share of their Measured Demand for the relevant Settlement Interval. To the extent that the sum of the Settlement Amounts for IIE, UIE, UFE, and GHG does not equal zero within the EIM Balancing Authority Area, the CAISO will assess Charges or make Payments in Real Time Imbalance Energy Offset EIM (CC 64770) for the resulting differences to EIM Entity Scheduling Coordinator ID, respectively.

In the Real-Time Market, the negative and positive Congestion Charges associated with a valid post-Day-Ahead TOR and ETC schedule change (including changes submitted to the Hour-Ahead Scheduling Process and changes submitted closer to Real-Time where allowed by the contract) will be reversed in CC 6788 RTM Congestion Credit Settlement. Because Congestion Charges are implicitly collected by the CAISO in the Real-Time settlement and there are no holders of rights to receive Real-Time Congestion revenues, all charges for Real-Time Congestion will be accumulated in special and separate Balancing Authority Area neutrality accounts. The CAISO Real-Time Congestion Charges less Virtual Bid Adjustment shall be distributed back to non-ETC Control Area metered Demand and exports in Real Time Congestion Offset (CC 6774). The EIM Balancing Authority Area Real-Time Congestion Charges shall be distributed to the applicable EIM Entity Scheduling Coordinator in Real Time Congestion Offset EIM (CC 67740).

## Description

This Charge Code calculates the RT Congestion Balancing Account or Offset for each BAA.

The RT Congestion Offset for ISO BAA, is then allocated to relevant Measured Demand in CC 6774, and for EIM BAA, it will be assigned to the EIM Entity SC in CC 67740.

# Charge Code Requirements

## Business Rules

| Bus Req ID | Business Rule |
| --- | --- |
| 1.0 | This Charge Code computes the Real Time Congestion Offset Amount per BAA for each Settlement Interval. |
| 1.1 | This Charge Code shall be calculated daily on a Settlement Interval basis. |
| 1.2 | Each resource is mapped to the appropriate Price Node, Aggregated Pricing Node location, or relevant scheduling point and intertie combination. |
| 2.0 | The Real Time Congestion Offset amount for CAISO BAA shall include   1. the total congestion revenues from Real-Time Energy including reduction from Virtual Bid Adjustment, 2. Real-Time Congestion Revenue Neutrality Load Amount, 3. Consideration of RTM Congestion Credits to transmission contracts, 4. Real-Time Ancillary Services congestion revenues from spin, non-spin, regulation up, and regulation down, and 5. Congestion revenues from virtual awards in Real Time |
| 2.1 | The Real Time Congestion Offset amount per EIM BAA shall be the total congestion revenues from Real-Time Energy including reduction from Virtual Bid Adjustment. |
| 3.0 | For each BAA, the total congestion revenues from Real-Time Energy including reduction from Virtual Bid Adjustment per Settlement Interval is  the sum of following congestion revenues:   1. FMM congestion revenues nodal amount, which is the product of (1) the sum of (a) Settlement Interval FMM Total IIE Part 1, (b) FMM Settlement Interval Exceptional Dispatch Energy excluding Voltage Support and Black Start, and (c) FMM Manual Dispatch Energy, and (2) FMM Real Time nodal MCC; 2. FMM congestion revenues MSS net amount, which is the product of (1) the sum of (a) Settlement Interval FMM Total IIE Part 1, (b) FMM Settlement Interval Exceptional Dispatch Energy excluding Voltage Support and Black Start, and (c) FMM Manual Dispatch Energy, and (2) applicable MSS net FMM Real Time MCC; 3. RTD congestion revenues nodal amount, which is the product of (1) the sum of (a) Settlement Interval Total IIE 1, (b) Settlement Interval Regulation Energy, (c) Settlement Interval MSS IIE, (d) Settlement Interval Exceptional Dispatch Energy excluding Voltage Support and Black Start, (e) Settlement Interval Operational Adjustment, (f) RTD Manual Dispatch Energy and (g) Residual Imbalance Energy, and (2) RTD Settlement Interval Real Time nodal MCC; 4. RTD congestion revenues MSS net amount, which is the product of (1) the sum of (a) Settlement Interval Total IIE 1, (b) Settlement Interval Regulation Energy, (c) Settlement Interval MSS IIE, (d) Settlement Interval Exceptional Dispatch Energy excluding Voltage Support and Black Start, (e) Settlement Interval Operational Adjustment, (f) RTD Manual Dispatch Energy, and (g) Residual Imbalance Energy, and (2) applicable MSS net RTD Real Time MCC; 5. for LAP Loads, the product of (i) Settlement Interval RT Uninstructed Imbalance Energy and (ii) Hourly RTM LAP MCC Price; 6. for UFE adjustments, the product of (i) the UFE quantity per UDC (obtained as the sum of all UFE quantities of BAs for that UDC) and (ii) the Hourly UFE UDC MCC 7. for virtual awards, the product of RT liquidation of DA virtual awards and the MCC for relevant virtual award nodal location   less   1. any Virtual Bid Adjustment |
| 4.0 | The Virtual Bid Adjustment is the virtual resource congestion contribution to the EIM BAA constraints and shall be calculated for each virtual schedule.and allocation:nterchanges, EIM load.ad.IM BAA lidate the transaction ID, at (Fact) |
| 4.1 | Each BAA, will receive virtual out-market uplift cost allocation, and will be a reduction to the BAA’s Real Time Congestion Balancing Account. |
| 4.2 | There shall be a claw back of the uplift cost allocation from each corresponding virtual schedule SC.  (Summarized in this charge code but actual settlement occurs in successor charge code, CC 6774) |
| 4.3 | The claw back shall not be less than zero. (Fact) |
| 5.0 | For CAISO BAA only, the Real-Time Congestion Revenue Neutrality Load Amount is the product of:  (1) Day Ahead Load Schedule, and  (2) the summed product of (i) Hourly Real Time Lap MCC normalized to the member PNodes based on metered demand, and (ii) the change in Day Ahead Load Distribution Factors and Real Time Load Distribution Factor. |
| 6.0 | For adjustments to the Charge Code that cannot be accomplished by correction of upstream data inputs, recalculation or operator override, Pass Through Bill Charge adjustment shall be applied. |
| 7.0 | The CAISO Will allow an EIM Entity using a load derivation approach the following two options: elect to settle Unaccounted for Energy (UFE), or elect not to settle UFE. |
| 8.0 | Settlements shall calculate the UFE amount but settle as zero value if an EIM entity elect not to settle UFE. |

## Predecessor Charge Codes

| Charge Code/ Pre-calc Name |
| --- |
| Measured Demand over Control Area Pre-calculation |
| MSS Netting Pre-calculation |
| Real Time Energy Quantity Pre-calculation |
| Real Time Price Pre-calculation |
| CC 6473 – Convergence Bidding Real-Time Energy, Congestion, Loss Settlement |
| CC 6474 – Real Time Unaccounted for Energy Settlement |
| CC 64740 – Real Time Unaccounted for Energy EIM Settlement |
| CC 6475 – Real Time Uninstructed Imbalance Energy Settlement |
| CC 6715 – Real Time Congestion – AS Spinning Reserve Import Settlement |
| CC 6725 – Real Time Congestion – AS Non-Spinning Reserve Import Settlement |
| CC 6755 – Real Time Congestion – AS Regulation Up Import Settlement |
| CC 6765 – Real Time Congestion – AS Regulation Down Import Settlement |
| CC 6788 – Real Time Market Congestion Credit Settlement |

## Successor Charge Codes

| Charge Code/ Pre-calc Name |
| --- |
| CC 6774 - Real Time Congestion Offset |
| CC 67740 - Real Time Congestion Offset EIM |
| CC 6477 - Real Time Imbalance Energy Offset |
| CC 64770 - Real Time Imbalance Energy EIM Offset |
| CC 6788 – Real Time Market Congestion Credit Settlement |

## Inputs – External Systems

|  |  |  |
| --- | --- | --- |
| Row # | Variable Name | Description |
|  | FMMIntervalBAAMCCPriceQ’M’AA’Qpmdhc | FMM Interval Marginal Cost Of Congestion Price for Balancing Authority Area Q’  These are mapped from Pnode, APnode, or Pnode/APnode and Intertie combination MCC prices for Energy in the Fifteen Minute Market, where the APnode is not of type “DEFAULT” or “CUSTOM”.  ($/MWh) |
|  | DispatchIntervalBAAMCCPrice M’Q’AA’Qpmdhcif | Dispatch Interval Marginal Cost Of Congestion Price for Balancing Authority Area Q.  These are mapped from Pnode, APnode, or Pnode/APnode and Intertie combination MCC prices for Energy from the Real Time Dispatch, where the APnode is not of type “DEFAULT” or “CUSTOM”.  ($/MWh) |
|  | BAEIMBAAVirtualBidAdjustmentCongAmount BQ’AQpamdhc | Virtual schedule congestion revenue adjustment due to out-of-market congestion contribution, which impacted BAA constraints.  This is a claw back amount to virtual bidders and will not be less than zero. BA ID attribute B here is the virtual bidder, not the EIM Entity SC for the EIM BAA.  The BAA attribute is provided in the payload and represent the portion of congestion collected from constraints in the BAA. |
|  | BAEIMBAA\_APN\_ID\_PNODEVirtualBidAdjustmentCongAmount BQ’AQpamdhc | Virtual schedule congestion revenue adjustment.  The Balancing Authority Area attribute (Q’) will not be provided by the payload but will be derived based on Price Node or Aggregate Price Node (A) locations. BAA mapping will be constant for that apn-id/pnode.  BAA changes based upon which constraints are binding.Constraint is associated with Price Node or Aggregate Price Node |
|  | PTBBA5MFMMEnergyCongestionAdjustmentAmt BrtQ’Jmdhcif | PTB Congestion adjustment amount for FMM.  Defined for Q’ = ‘CISO’  For example, this can be used for interim circular schedule penalties, and this subject input represents the congestion portion penalty for circular schedules. |
|  | PTBBA5MRTEnergyCongestionAdjustmentAmt BrtQ’Jmdhcif | PTB Congestion adjustment amount after FMM  Defined for Q’ = ‘CISO’  This will capture any other congestion PTB amounts after FMM. |
|  | DALoadSchedule BrtuT’I’Q’M’AA’R’pW’F’S’vVL’mdh | DA Load Schedule is the energy scheduled in Day-Ahead Market to be consumed by End-Use Customer. (Load Schedule quantity is a negative value). |
|  | ResourceETSRElectSettlementFlag rmd | Flag (value defaults to be 1) that indicates that the specified ESTR resource is an EIM Transfer System Resource (ETSR) that is required to settle its ETSR IIE and OA at the real-time LMP. |
|  | HourlyRTMLAPMCCPrice Q’AA’mdh | Hourly RTM LAP MCC Price |
|  | BAAEIMEntityUFEElectSettlementFlag uQ’md | Flag (1/0) that indicates whether the specified EIM entity has elected to settle Unaccounted for Energy (UFE) or not. The flag value defaults to be 1, indicating that the EIM entity settles UFE. If the flag value is set to zero, it indicates that the EIM entity has elected not to settle UFE. (Note: do not suppress zero.) |

## Inputs - Predecessor Charge Codes or Pre-calculations

| Row # | Variable Name | Predecessor Charge Code/ Pre-calc Configuration |
| --- | --- | --- |
|  | NodalTotalFMMIIEQuantity AA’Qpmdhcif | Real Time Energy Pre-calculation |
|  | NodalTotalRTDIIEQuantity AA’Qpmdhcif | Real Time Energy Pre-calculation |
|  | NodalTotalUIEQuantity AA’Qpmdhcif | Real Time Energy Pre-calculation |
|  | NodalTotalFMMNETMSSIIEQuantity M’mdhcif | Real Time Energy Pre-calculation |
|  | NodalTotalRTDNETMSSIIEQuantity M’mdhcif | Real Time Energy Pre-calculation |
|  | NodalNETMSSUIEQuantity M’mdhcif | Real Time Energy Pre-calculation |
|  | NodalTotalLAPLoadUIEQuantity AA’mdhcif | Real Time Energy Pre-calculation |
|  | UDCSettlementIntervalUFEQuantity uQ’M’mdhcif | CC 6474 - Real Time Unaccounted for Energy Settlement |
|  | EIMBAASettlementIntervalUFEQuantity uQ’mdhcif | CC 64740 - Real Time Unaccounted for Energy EIM Settlement |
|  | HourlyUFEUDCMCC uQ‘mdh | Real Time Price Pre-calculation |
|  | FMMIntervalMSSMCCPrice Q’M’mdhc | Real Time Price Pre-calculation |
|  | SettlementIntervalRealTimeMSSMCC Q’M’mdhcif | Real Time Price Pre-calculation |
|  | SettlementIntervalRealTimePNodeMCC M’pmdhcif | Real Time Price Pre-calculation |
|  | CAISOSettlementIntervalTotalRTMCongestionCreditSettlementAmount mdhcif | CC 6788 – RTM Congestion Credit Settlement |
|  | CAISOHourlyTotalRTCongestionSpinAmount mdh | CC 6715 – Real Time Congestion – AS Spinning Reserve Import Settlement |
|  | CAISOHourlyTotalRTCongestionNonSpinAmount mdh | CC 6725 – Real Time Congestion – AS Non-Spinning Reserve Import Settlement |
|  | CAISOHourlyTotalRTCongestionRegUpAmount mdh | CC 6755 – Real Time Congestion – AS Regulation Up Import Settlement |
|  | CAISOHourlyTotalRTCongestionRegDownAmount mdh | CC 6765 – Real Time Congestion – AS Regulation Down Import Settlement |
|  | RTVirtualSupplyOrDemandAwardCongestionAmount Q’mdh | CC 6473 - Convergence Bidding Real –Time Energy, Congestion, Loss Settlement |
|  | HourlyNodalLDFChangeDAtoRT uM’AA’pmdh | CC 6475 – RT Uninstructed Imbalance Energy Settlement |
|  | BAResEntitySettlementIntervalMeteredCAISODemandQuantity BrtuT’I’Q’M’AA’F’R’pPW’QS’d’Nz’VvHn’L’mdhcif | MSS Netting Pre-calculation |
|  | SettlementIntervalNodalMeteredCAISODemandQuantity\_MDOverCA uM’AA’mdhcif | Measured Demand over Control Area Pre-calculation |
|  | BAAUDCNodalQuantityFlag uQ’mdhcif | Real Time Energy Pre-Calculation |
|  | TotalVirtualAwardNodalQuantity AA’Qpmdh | CC 6473 – Convergence Bidding Real Time Energy Congestion and Loss Settlement |
|  | HourlyFMMNodalMCC Q’AA’Qpmdh | CC 6473 – Convergence Bidding Real Time Energy Congestion and Loss Settlement |
|  | TotalVirtualAwardLAPQuantity AA’mdh | CC 6473 – Convergence Bidding Real Time Energy Congestion and Loss Settlement |
|  | HourlyAverageBAAFMMMCCPrice Q’AA’mdh | Real Time Price Pre-calculation |
|  | BAANodalQuantityFlag Q’AA’Qpmdhcif | Real Time Energy Pre-Calculation |
|  | BAANodalTotalFMMIIEQuantityQ’AA’Qpmdhcif | Real Time Energy Pre-Calculation |
|  | BAANodalTotalRTDIIEQuantityQ’AA’Qpmdhcif | Real Time Energy Pre-Calculation |
|  | BAANodalTotalRTDIIEandETSRQuantity Q’AA’Qpmdhcif | Real Time Energy Pre-Calculation |
|  | BAANodalTotalFMMIIEandETSRQuantity Q’AA’Qpmdhcif | Real Time Energy Pre-Calculation |
|  | BAANodalTotalUIEQuantityQ’AA’Qpmdhcif | Real Time Energy Pre-Calculation |
|  | BAAResourceSettlementIntervalRTDTransferFromQuantityrQ’AA’Qpmdhcif | Real-Time Energy Pre-calculation |
|  | BAAResourceSettlementIntervalRTDTransferToQuantity rQ’AA’Qpmdhcif | Real-Time Energy Pre-calculation |
|  | BAAResourceSettlementIntervalFMMEIMTransferFromQuantityrQ’AA’Qpmdhcif | Real-Time Energy Pre-calculation |
|  | BAAResourceSettlementIntervalFMMEIMTransferToQuantity rQ’AA’Qpmdhcif | Real-Time Energy Pre-calculation |

## CAISO Formula

CAISOHourlyRTCongestionOffsetAmt mdh =

CAISOHourlyTotalRTEnergyCongestionAmt mdh + (CAISOSettlementIntervalTotalRTMCongestionCreditSettlementAmount mdhcif) + CAISOHourlyTotalRTCongestionSpinAmount mdh + CAISOHourlyTotalRTCongestionNonSpinAmount mdh + CAISOHourlyTotalRTCongestionRegUpAmount mdh + CAISOHourlyTotalRTCongestionRegDownAmount mdh

CAISOHourlyTotalRTEnergyCongestionAmt mdh =

 (CAISOSettlementIntervalTotalRTEnergyCongestionAmt mdhcif

+ RTCongRevenueNeutralityLoadAmount mdhcif )

CAISOSettlementIntervalTotalRTEnergyCongestionAmt mdhcif =

BAASettlementIntervalTotalRTEnergyCongestionAmount Q'mdhcif

where Q’ = ‘CISO’

EIMBAARTCongestionOffsetAmount Q’mdhcif =

BAASettlementIntervalTotalRTEnergyCongestionAmount Q'mdhcif

where Q’ <> ‘CISO’

**RT Energy Congestion Revenues:**

BAASettlementIntervalTotalRTEnergyCongestionAmount Q'mdhcif =

(FMMCongRevenueNodalAmount Q’mdhcif

+ FMMCongRevenueNetMSSAmount Q’mdhcif

+ RTDCongRevenueNodalAmount Q’mdhcif

+ RTDCongRevenueNetMSSAmount Q’mdhcif

+ RTCongRevenueUFEAmount Q’mdhcif

+ RTCongRevenueLAPLoadUIEAmount Q’mdhcif

+ BAASettlementIntervalRTEnergyCongPTBAdjustmentAmount Q’mdhcif

+ ((1/12)\*RTVirtualSupplyOrDemandAwardCongestionAmount Q’mdh)

+ RTCongRevenueVirtualBidAdjAmount Q’mdhcif)

FMMCongRevenueNodalAmount Q’mdhcif =

** FMMBAACongRevenueNodalAmount Q’AA’pQmdhcif

FMMBAACongRevenueNodalAmount Q’AA’pQmdhcif =

(-1)\*NodalTotalFMMIIEQuantity AA’Qpmdhcif \* INTDUPLICATE(FMMIntervalBAANodalMCCPriceQ’AA’Qpmdhc)

FMMIntervalBAANodalMCCPriceQ’AA’Qpmdhc =

Sum (M’) Average(FMMIntervalBAAMCCPriceQ’M’AA’Qpmdhc)

FMMCongRevenueNetMSSAmount Q’mdhcif =

Sum (M’) FMMBAACongRevenueNetMSSAmount Q’M’mdhcif

FMMBAACongRevenueNetMSSAmount Q’M’mdhcif =

(-1)\* NodalTotalFMMNETMSSIIEQuantity M’mdhcif \* INTDUPLICATE(FMMIntervalMSSMCCPrice Q’M’mdhc)

RTDCongRevenueNodalAmount Q’mdhcif =

** RTDBAACongRevenueNodalAmount Q’AA’pQmdhcif

RTDBAACongRevenueNodalAmount Q’AA’pQmdhcif =

(-1)\*(NodalTotalRTDIIEQuantity AA’Qpmdhcif + NodalTotalUIEQuantity AA’Qpmdhcif) \* DispatchIntervalBAANodalMCCPrice Q’AA’Qpmdhcif

DispatchIntervalBAANodalMCCPrice Q’AA’Qpmdhcif =

Sum (M’) Average(DispatchIntervalBAAMCCPrice Q’M’AA’Qpmdhcif)

RTDCongRevenueNetMSSAmount Q’mdhcif =

Sum (M’) RTDBAACongRevenueNetMSSAmount Q’M’mdhcif

RTDBAACongRevenueNetMSSAmount Q’M’mdhcif =

(-1)\* (NodalTotalRTDNETMSSIIEQuantity M’mdhcif + NodalNETMSSUIEQuantity M’mdhcif ) \* SettlementIntervalRealTimeMSSMCC Q’M’mdhcif

CAISOTotalUFEQuantity umdhcif =

 UDCSettlementIntervalUFEQuantity uQ’M’mdhcif

where Q’ = ‘CISO’

EIMBAATotalUFEQuantity umdhcif =

 BAAEIMEntityUFEElectSettlementFlag uQ’md \* EIMBAASettlementIntervalUFEQuantity uQ’mdhcif

EIMAreaTotalUFEQuantity umdhcif =

(CAISOTotalUFEQuantity umdhcif + EIMBAATotalUFEQuantity umdhcif)

RTCongRevenueUFEAmount Q'mdhcif =

 (EIMAreaTotalUFEQuantity umdhcif \* INTDUPLICATE(HourlyUFEUDCMCC uQ'mdh))

RTCongRevenueLAPLoadUIEAmount Q’mdhcif =

** RTBAACongRevenueLAPLoadUIEAmount Q’AA’mdhcif

RTBAACongRevenueLAPLoadUIEAmount Q’AA’mdhcif =

(-1)\* (NodalTotalLAPLoadUIEQuantity AA’mdhcif ) \* INTDUPLICATE(HourlyRTMLAPMCCPrice Q’AA’mdh)

**Virtual bid adjustment:**

RTVirtualBidAdjustmentSettlement Bmdhcif =

**(1/3) \* (.25) \*

BAEIMBAA\_APN\_ID\_PNODEVirtualBidAdjustmentCongAmount BQ’AQpamdhc

)

Note: Division by 3 will be done automatically through frequency conversion by the system and will not be shown in configuration output file.

RTCongRevenueVirtualBidAdjAmount Q’mdhcif =

** (1/3)\*(.25 \* BAEIMBAAVirtualBidAdjustmentCongAmount BQ’AQpamdhc)

Note: Division by 3 will be done automatically through frequency conversion by the system and will not be shown in configuration output file.

**CAISO Load Neutrality Congestion Revenue:**

RTCongRevenueNeutralityLoadAmount mdhcif =

BAResourceRTCongRevenueNeutralityLoadAmount BrtuT’I’M’F’S’mdhcif

Where Resource type (t) = ‘LOAD’ and Entity Component Subtype (S’) = ‘NPL’ OR ’GL’

BAResourceRTCongRevenueNeutralityLoadAmount BrtuT’I’M’F’S’mdhcif *=*  (RTCongRevenueNeutralityAllocation uM’AA’mdhcif \*

(BAResEntitySettlementIntervalMeteredCAISODemandQuantity BrtuT’I’Q’M’AA’F’R’pPW’QS’d’Nz’VvHn’L’mdhcif / SettlementIntervalNodalMeteredCAISODemandQuantity\_MDOverCA uM’AA’mdhcif))

RTCongRevenueNeutralityAllocation uM’AA’mdhcif =

(-1) \* (1/12) \* HourlyDefaultLAPDALoadSchedule uM’AA’mdh \* SettlementIntervalDefaultLAPNeutralityMCCPrice AA’mdhcif

Where Entity Component Subtype (S’) = ‘NPL’ OR ‘GL’

HourlyDefaultLAPDALoadSchedule uM’AA’mdh =  DALoadSchedule BrtuT’I’Q’M’AA’R’pW’F’S’vVL’mdh

SettlementIntervalDefaultLAPNeutralityMCCPrice AA’mdhcif =

SettlementIntervalRealTimePNodeMCC M’pmdhcif \* HourlyNodalLDFChangeDAtoRT uM’AA’pmdh

**PTB Congestion Revenue:**

BAASettlementIntervalRTEnergyCongPTBAdjustmentAmount Q’mdhcif =

** (PTBBA5MFMMEnergyCongestionAdjustmentAmt BrtQ’Jmdhcif+ PTBBA5MRTEnergyCongestionAdjustmentAmt BrtQ’Jmdhcif )

**Real Time Energy Offset Congestion Calc:**

RTBAACongestionRevenueAmount

RTBAACongestionRevenueAmount Q’mdhcif = RTUFEMSSNETCongestionRevenue Q’mdhcif + RTMBAALCTNCongestionRevenueAmount Q’mdhcif - RTCongRevenueVirtualBidAdjAmount Q’mdhcif

+ BAASettlementIntervalRTEnergyCongPTBAdjustmentAmount Q’mdhcif

RTUFEMSSNETCongestionRevenue

RTUFEMSSNETCongestionRevenue Q’mdhcif = ** CAISORTMUDCUFEMCCAmount umdhcif + EIMRTMUDCUFEMCCAmount umdhcif + FMMMSSNetCongRevenueAmount M’mdhcif + RTDNetMSSCongRevenueAmount M'mdhcif + RTLAPNeutralityCongRevenueAmount umdhcif

Where BAAUDCNodalQuantityFlag uM’Q’mdhcif exists

RTMBAALCTNCongestionRevenueAmount

RTMBAALCTNCongestionRevenueAmount Q’mdhcif = ** (FMMNodalCongRevenueAmount Q’AA’pQmdhcif + RTDNodalCongRevAmount Q’AA’pQmdhcif + RTLAPUIECongRevenueAmount Q’AA’mdhcif )

CAISORTMUDCUFEMCCAmount

CAISORTMUDCUFEMCCAmount umdhcif = CAISOTotalUFEQuantity umdhcif \* TotalHourlyUFEUDCMCCPrice umdh

EIMRTMUDCUFEMCCAmount

EIMRTMUDCUFEMCCAmount umdhcif = (** BAAEIMEntityUFEElectSettlementFlag uQ’md \* EIMBAASettlementIntervalUFEQuantity uQ’mdhcif )\* TotalHourlyUFEUDCMCCPrice umdh

TotalHourlyUFEUDCMCC

TotalHourlyUFEUDCMCCPrice umdh = **HourlyUFEUDCMCC uQ'mdh

FMMNodalCongRevenueAmount

FMMNodalCongRevenueAmount Q’AA’pQmdhcif = (-1) \* (BAANodalTotalFMMIIEandETSRQuantityQ’AA’Qpmdhcif \* FMMIntervalTotalNodalMCCPrice AA’Qpmdhc)

FMMIntervalTotalNodalMCCPrice

FMMIntervalTotalNodalMCCPrice AA’Qpmdhc = sum (** (FMMIntervalBAANodalMCCPriceQ’AA’Qpmdhc)

RTDNodalCongRevAmount

RTDNodalCongRevAmount Q’AA’pQmdhcif = (-1)\*( BAANodalTotalRTDIIEandETSRQuantity Q’AA’Qpmdhcif + BAANodalTotalUIEQuantityQ’AA’Qpmdhcif) \* DispatchIntervalTotalNodalMCCPrice AA’Qpmdhcif

DispatchIntervalTotalNodalMCCPrice AA’Qpmdhcif

DispatchIntervalTotalNodalMCCPrice AA’Qpmdhcif = sum ( DispatchIntervalBAANodalMCCPrice Q’AA’Qpmdhcif)

FMMMSSNetCongRevenueAmount

FMMMSSNetCongRevenueAmount M’mdhcif = (-1)\* NodalTotalFMMNETMSSIIEQuantity M’mdhcif \* INTDUPLICATE(FMMIntervalMSSMCCPrice Q’M’mdhc)

RTDNetMSSCongRevenueAmount

RTDNetMSSCongRevenueAmount M’mdhcif =  (-1)\* (NodalTotalRTDNETMSSIIEQuantity M’mdhcif + NodalNETMSSUIEQuantity M’mdhcif ) \* SettlementIntervalRealTimeMSSMCC Q’M’mdhcif

RTLAPUIECongRevenueAmount

RTLAPUIECongRevenueAmount Q’AA’mdhcif = (-1)\* (NodalTotalLAPLoadUIEQuantity AA’mdhcif ) \* INTDUPLICATE(HourlyRTMTotalLAPMCCPrice AA’mdh)

Where BAANodalQuantityFlag Q’AA’Qpmdhcif exists

HourlyRTMTotalLAPMCCPrice

HourlyRTMTotalLAPMCCPrice AA’mdh = (**HourlyRTMLAPMCCPrice Q’AA’mdh)

RTVirtualAwardNodalCongestionAmount

RTVirtualAwardNodalCongestionAmount mdhcif = ** (TotalVirtualAwardNodalQuantity AA’Qpmdh **\*** HourlyFMMNodalMCC Q’AA’Qpmdh)

RTVirtualAwardLAPCongestionAmount

RTVirtualAwardLAPCongestionAmount mdhcif = ** ( TotalVirtualAwardLAPQuantity AA’mdh **\*** HourlyAverageBAAFMMMCCPrice Q’AA’mdh)

RTLAPNeutralityCongRevenueAmount

RTLAPNeutralityCongRevenueAmount umdhcif = BAResourceRTCongRevenueNeutralityLoadAmount BrtuT’I’M’F’S’mdhcif

## Outputs

| Output Req ID | Name | Description |
| --- | --- | --- |
|  | In addition to any outputs listed below, all inputs shall be included as outputs. | All inputs. |
|  | CAISOHourlyRTCongestionOffsetAmt mdh | The Real-Time Congestion Offset Amount for the hour to be allocated to SCs. |
|  | CAISOHourlyTotalRTEnergyCongestionAmt mdh | Hourly Congestion revenue from RT Energy ($) |
|  | CAISOSettlementIntervalTotalRTEnergyCongestionAmt mdhcif | Settlement Interval Congestion revenue from RT Energy ($)  Note: This amount contains portion of congestion charges to ETC/TOR holders reversed in CC 6788. |
|  | EIMBAARTCongestionOffsetAmount Q’mdhcif | The congestion offset amount for an EIM BAA. |
|  | BAASettlementIntervalTotalRTEnergyCongestionAmount Q'mdhcif | RT energy congestion revenue amount for each BAA. |
|  | FMMCongRevenueNodalAmount Q’mdhcif | BAA-wide congestion revenue. |
|  | FMMBAACongRevenueNodalAmount Q’AA’pQmdhcif | BAA congestion revenue by node from resources having FMM IIE or UIE, and not part of any MSS entity which elected net settlement. |
|  | FMMIntervalBAANodalMCCPriceQ’AA’Qpmdhc | BAA Nodal MCC Price for FMM. |
|  | FMMCongRevenueNetMSSAmount Q’mdhcif | BAA-wide congestion revenue from MSS Areas which elected net settlement |
|  | FMMBAACongRevenueNetMSSAmount Q’M’mdhcif | BAA-wide congestion revenue by MSS from resources having FMM IIE or UIE, and part of any MSS entity which elected net settlement. |
|  | RTDCongRevenueNodalAmount Q’mdhcif | BAA-wide congestion revenue from resources having RTD IIE or UIE, |
|  | RTDBAACongRevenueNodalAmount Q’AA’pQmdhcif | BAA-wide congestion revenue from resources having RTD IIE or UIE, and not part of MSS entity which elected net settlement. |
|  | DispatchIntervalBAANodalMCCPrice Q’AA’Qpmdhcif | BAA Nodal MCC Price for RTD. |
|  | RTDCongRevenueNetMSSAmount Q’mdhcif | BAA-wide congestion revenue from MSS Areas which elected net settlement. |
|  | RTDBAACongRevenueNetMSSAmount Q’M’mdhcif | BAA-wide congestion revenue from MSS resources having RTD IIE or UIE, and part of any MSS entity which elected net settlement. |
|  | CAISOTotalUFEQuantity umdhcif | Total UFE quantity for CAISO BAA. |
|  | EIMBAATotalUFEQuantity umdhcif | Total UFE quantity for EIM BAA. |
|  | EIMAreaTotalUFEQuantity umdhcif | UFE quantity for UDC independent of BAA. |
|  | RTCongRevenueUFEAmount Q’mdhcif | BAA-wide congestion revenue from UDC UFE |
|  | RTCongRevenueLAPLoadUIEAmount Q’mdhcif | Congestion revenue from LAP Load UIE |
|  | RTBAACongRevenueLAPLoadUIEAmount Q’AA’mdhcif | Congestion revenue by LAP based upon Load UIE |
|  | RTCongRevenueVirtualBidAdjAmount Q’mdhcif | Per BAA, virtual bid adjustment for out-of-market congestion contribution from virtual awards within EIM Area. |
|  | RTVirtualBidAdjustmentSettlement Bmdhcif | The BA total virtual bid adjustment for out-of-market congestion contribution from virtual awards within EIM Area.  This will be settled in CC 6774 and will be applicable only to a BA with virtual schedule. |
|  | BAASettlementIntervalRTEnergyCongPTBAdjustmentAmount Q’mdhcif | Total PTB congestion adjustment amount per BAA.  Currently, will be defined only for Q’ = ‘CISO’ |
|  | RTCongRevenueNeutralityLoadAmount mdhcif | Total congestion revenue/charge associated with Default LAP Day-Ahead Load Schedule, and change in load distribution factos between DA and RT. |
|  | BAResourceRTCongRevenueNeutralityLoadAmount BrtuT’I’M’F’S’mdhcif | Resource level congestion revenue/charge associated with Default LAP Day-Ahead Load Schedule |
|  | RTCongRevenueNeutralityAllocation M’AA’mdhcif | Congestion revenue associated with Default LAP Day-Ahead Load Schedule |
|  | HourlyDefaultLAPDALoadSchedule uM’AA’mdh | Default LAP Day-Ahead Load Schedule |
|  | SettlementIntervalDefaultLAPNeutralityMCCPrice AA’mdhcif | Default LAP neutrality MCC price |
|  | RTBAACongestionRevenueAmount Q’mdhcif | Congestion revenue amount for each BAA as computed from UDC and node location. |
|  | CAISORTMUDCUFEMCCAmount umdhcif | CAISO Real Time UDC UFE MCC Amount |
|  | EIMRTMUDCUFEMCCAmount umdhcif | EIM BAA Real Time UDC UFE MCC Amount |
|  | TotalHourlyUFEUDCMCCPrice umdh | Total Hourly UDC UFE MCC Price |
|  | FMMNodalCongRevenueAmount Q’AA’pQmdhcif | FMM Congestion Revenue at node level |
|  | RTDNodalCongRevAmount Q’AA’pQmdhcif | RTD Congestion Revenue at node level |
|  | FMMMSSNetCongRevenueAmount M’mdhcif | FMM MSS Net Congestion Revenue at UDC level |
|  | RTDNetMSSCongRevenueAmount M’mdhcif | RTD MSS Net Congestion Revenue at UDC level |
|  | RTLAPUIECongRevenueAmount Q’AA’mdhcif | Real Time LAP UIE congestion revenue amount at APnode level |
|  | RTVirtualAwardNodalCongestionAmount mdhcif | Real Time Virtual Award congestion revenue at node level, exclusive of LAP.  Reasoning behind why the Q’ attribute had been summed over for the Total Virtual Award Nodal Quantity before being utilized as an input in this equation.  Since that input is not the business driver in this equation it is correct for it not to carry Q’ into this equation.This is specific to congestion related formulas where price is the driver. |
|  | RTVirtualAwardLAPCongestionAmount mdhcif | Real Time Virtual Award congestion revenue at LAP level |
|  | RTLAPNeutralityCongRevenueAmount umdhcif | Real Time LAP Neutrality congestion revenue at UDC level |
|  | RTUFEMSSNETCongestionRevenue Q’mdhcif | Real Time UFE and MSS Net Congestion Revenue for Balancing Authority Area Q’ |
|  | RTMBAALCTNCongestionRevenueAmount Q’mdhcif | Real Time Nodal Locational Congestion Revenue for Balancing Authority Area Q’ |
|  | FMMIntervalTotalNodalMCCPrice AA’Qpmdhc | Total Nodal MCC Price for FMM by APnode A or Pricing Node p. |
|  | DispatchIntervalTotalNodalMCCPrice AA’Qpmdhcif | Total Nodal MCC Price for RTD by APnode A or Pricing Node p |
|  | HourlyRTMTotalLAPMCCPrice AA’mdh | Total Hourly Real Time Market LAP Marginal Cost of Congestion Price by APnode A |

# Charge Code Effective Date

| Charge Code/  Pre-calc Name | Document Version | Effective Start Date | Effective End Date | Version Update Type |
| --- | --- | --- | --- | --- |
| Real-Time Congestion Pre-Calculation | 5.7 | 11/1/21 | 10/31/21 | Configuration Changes |
| Real-Time Congestion Pre-Calculation | 5.2.0b | 10/01/14 | 4/03/18 | Documentation Edits Only |
| Real-Time Congestion Pre-Calculation | 5.3.0b | 4/04/18 | 7/31/18 | Documentation Edits Only |
| Real-Time Congestion Pre-Calculation | 5.3.5a | 8/1/18 | 10/31/18 | Documentation Edits Only |
| Real-Time Congestion Pre-Calculation | 5.4.1a | 11/1/18 | 1/31/21 | Documentation Edits Only |
| Real-Time Congestion Pre-Calculation | 5.5.1a | 2/1/21 | 4/30/21 | Documentation Edits Only |
| Real-Time Congestion Pre-Calculation | 5.6.0a | 5/1/21 | 10/31/21 | Documentation Edits Only |
| Real-Time Congestion Pre-Calculation | 5.7.0a | 11/1/21 | 5/31/24 | Documentation Edits Only |
| Real-Time Congestion Pre-Calculation | 5.8 | 6/1/24 | 4/30/2026 | Configuration Changes |
| Real-Time Congestion Pre-Calculation | 5.9 | 5/1/2026 | Open | Configuration Changes |