Settlements & Billing

Configuration Guide: Flexible Ramp Down Uncertainty Capacity Settlement

CC 7081

Version 5.3

 Table of Contents

[1. Purpose of Document 3](#_Toc187741904)

[2. Introduction 3](#_Toc187741905)

[2.1 Background 3](#_Toc187741906)

[2.2 Description 3](#_Toc187741907)

[3. Charge Code Requirements 3](#_Toc187741908)

[3.1 Business Rules 3](#_Toc187741909)

[3.2 Predecessor Charge Codes 5](#_Toc187741910)

[3.3 Successor Charge Codes 5](#_Toc187741911)

[3.4 Inputs – External Systems 6](#_Toc187741912)

[3.5 Inputs - Predecessor Charge Codes or Pre-calculations 6](#_Toc187741913)

[3.6 CAISO Formula 6](#_Toc187741914)

[3.7 Outputs 9](#_Toc187741915)

[4. Charge Code Effective Dates 10](#_Toc187741916)

# Purpose of Document

The purpose of this document is to capture the business and functional requirements of a charge code in one document.

# Introduction

##  Background

The Flexible Ramping product (FRP) is designed to ensure that there is sufficient ramping capability available in the financially binding five-minute interval to meet the forecasted net load for interval t+5 and cover upwards and downwards forecast error uncertainty.

FRP will help the system to maintain and use dispatchable capacity, as well as provide the market more transparent and less volatile price signals when undergoing forecasted ramp-constrained conditions. It will be procured and dispatched to meet five minute to five minute net forecast (load forecast minus VER forecast) changes plus uncertainty and will be modeled as a ramping capability constraint.

The ISO will financially settle FRP for Forecasted Movement and Uncertainty Capacity in the fifteen-minute market and the five-minute market, with rescission of payments applied to resources with UIE (uninstructed imbalance energy) or OA (operational adjustment) amounts, positive or negative, which are imposed on reserved FRP capacity awards. Settlement and allocation of FRP costs will happen on a daily basis for forecasted movement portion and uncertainty movement portion. At the end of the month, the uncertainty movement allocation will be reversed and will be re-allocated based on the month’s net UIE or OA values.

As no economic bids are applied to FRP, FRU/FRD awards will be exempt from grid management charges (GMC). Additionally, dispatchable resources will have their FRP awards and forecasted movement assessments - ignoring rescission settlement - included as part of daily RTM bid cost recovery calculations.

## Description

For each Settlement Interval, this charge code will calculate the Flexible Ramp Down Uncertainty Award Settlement

# Charge Code Requirements

## Business Rules

| **Bus Req ID** | **Business Rule** |
| --- | --- |
| 1.0 | For each Settlement Interval, this charge code will settle the Flexible Ramp Down Uncertainty Capacity at the relevant Flexible Ramp Down Price |
| 2.0 | For each Settlement Interval, the Total Flexible Ramp Down Settlement Amount is the sum total of the FMM Flexible Ramp Down Uncertainty Capacity Settlement Amount, the RTD Flexible Ramp Down Uncertainty Capacity Settlement Amount, the Flexible Ramp Down Uncertainty Capacity Rescission Amount and the Flexible Ramp Down Adjustment Amount |
| 3.0 | For a resource with an IRD Award, the CAISO applies a deviation settlement as the product of the Flexible Ramp Down Price and the difference between the downward Five-minute Imbalance Reserve Quantity and downward FMM Uncertainty Award. If a resource has no Imbalance Reserves Down Award, then the CAISO settles downward Uncertainty Awards as the product of the Uncertainty Down Award and the Flexible Ramp Down Price. |
| 3.1 | In each FMM Interval, the FMM Flexible Ramp Down Uncertainty Capacity will be converted from MW to MWhs prior to calculating the FMM Flexible Ramp Down Uncertainty Capacity Settlement Amount. |
| 3.2 | The market will procure FMM Flexible Ramp Down Uncertainty Capacity from resources that are able to be dispatched to resolve potential FMM net load variations when advisory intervals become binding.  |
| 3.3 | The FMM Flexible Ramp Down Uncertainty Capacity are procured at the FMM Flexible Ramp Down Constraint Price in which they resolve.  |
| 4.0 | The RTD Flexible Ramp Down Uncertainty Capacity Settlement Amount is calculated as the product of Incremental RTD Flexible Ramp Down Uncertainty Capacity and the relevant RTD Flexible Ramp Down Constraint Shadow Prices |
| 4.1 | In each Settlement Interval, the RTD Flexible Ramp Down Uncertainty Capacity will be converted from MW to MWhs prior to calculating the RTD Flexible Ramp Down Uncertainty Capacity Settlement Amount. |
| 4.2 | The market will procure RTD Flexible Ramp Down Uncertainty Capacity from resources that are able to be dispatched to resolve potential RTD net load variations when advisory intervals become binding |
| 4.3 | The Incremental RTD Flexible Ramp Down Uncertainty Capacity is the algebraic difference between the RTD Flexible Ramp Down Uncertainty Capacity and the relevant FMM Flexible Ramp Down Uncertainty Capacity. |
| 4.4 | The RTD Flexible Ramp Down Uncertainty Capacity are procured based RTD Flexible Ramp Down Constraint Price in which they resolve. |
| 5.0 | The Flexible Ramp Down Uncertainty Capacity Rescission Amount will be calculated for each resource who receives a FMM Flexible Ramp Down Uncertainty Capacity award or RTD Flexible Ramp Down Uncertainty Capacity award |
| 5.1 | The Flexible Ramp Down Uncertainty Capacity Rescission Amount by resource is calculated as the product of Flexible Ramp Down Uncertainty Capacity Rescission Quantity and the relevant RTD Flexible Ramp Down Constraint Shadow Prices |
| 5.2 | The Flexible Ramp Down Uncertainty Capacity Rescission Quantity by resource is minimum of the RTD Flexible Ramp Down Uncertainty Capacity and the Total Flexible Ramp Down Rescission Quantity  |
| 5.3 | The Total Flexible Ramp Down Rescission Quantity by resource is the minimum of the Total Flexible Ramp Down Quantity and Gross Negative Deviation Quantity |
| 5.3 | The Total Flexible Ramp Down Quantity by resource is the sum of the RTD Flexible Ramp Down Uncertainty Capacity award and the Gross RTD Flexible Ramp Down Forecasted Movement Quantity  |
| 5.4 | The Gross Negative Deviation Quantity by resource is absolute value of the minimum of sum of Uninstructed Imbalance Energy plus Operational Adjustment and zero. |
| 6.0 | The Flexible Ramp Down Forecasted Movement Rescission Quantity, by resource, is the difference between the Total Flexible Ramp Down Rescission Quantity and the Flexible Ramp Down Uncertainty Capacity Rescission |
| 7.0 | For adjustments to the Charge Code that cannot be accomplished by correction of upstream data inputs/recalculation or operator override, Pass Through Bill Charge logic will be applied. |
| 8.0 | When an eligible resource has an interval with a negative MWh meter, CAISO will not charge for the energy of those intervals. |
| 9.0 | Settlements shall settle uncertainty awards by FRUMP and FRDMP For each BAA, the host control area ID shall either be EIM Area or BAA specific depending upon the passing of the sufficiency test. |

## Predecessor Charge Codes

| **Charge Code/ Pre-calc Name** |
| --- |
| PC Real Time Energy PC |
| PC Flexible Ramp Product |
| CC 8081 – Day Ahead Imbalance Reserve Down Settlement |

## Successor Charge Codes

| **Charge Code/ Pre-calc Name** |
| --- |
| PC RTM Net Amount |
| PC Flexible Ramp Product |
| CC 7080 Flexible Ramp Down Forecasted Movement Settlement |
|  |

##  Inputs – External Systems

| **Input Req ID** | **Variable Name** | **Description** |
| --- | --- | --- |
|  | BA15mResourceFMMFlexRampDownUncertaintyCapacityQty BrtQ’uT’I’M’L’F’S’mdhc | Resource Specific FMM Flexible Ramp Down Uncertainty Capacity quantity (in MW) |
|  | BA5mResourceRTDFlexRampDownUncertaintyCapacityQty BrtQ’uT’I’M’L’F’S’mdhcif | Resource Specific RTD Flexible Ramp Down Uncertainty Capacity quantity (in MW) |
|  | BA15ResourceFMMFlexRampDownBAAPrice BrtQ’uT’I’M’L’F’S’mdhc | FMM Flexible Ramp Down BAA Constraint price (in $/MWh) by Balancing Authority Area Q’  |
|  | BA5mResourceRTDFlexRampDownBAAPrice BrtQ’uT’I’M’L’F’S’mdhcif | RTD Flexible Ramp Down BAA Constraint price (in $/MWh) by Balancing Authority Area Q’  |
|  | PTB\_BAFRDUncertaintyCapacityAdjustmentAmount BrtJQ’Q’’mdhcif | PTB charge adjustment (in $) |
|  |  |  |
|  | BAHourlyResIRD5MRampCapableQty BrtQ’mdh | IRD Award 5-minute Ramp-Capable Portion (MW) |

## Inputs - Predecessor Charge Codes or Pre-calculations

|  |  |  |
| --- | --- | --- |
| **Input Req ID** | **Variable Name** | **Predecessor Charge Code/ Pre-calc Configuration** |
|  | SettlementIntervalRealTimeUIE BrtuT’I’Q’M’F’S’mdhcif | Real-Time Energy PC |
|  | SettlementIntervalOAEnergy BrtuT’I’Q’M’F’S’mdhcif | Real-Time Energy PC |
|  | ResourceWholesaleExemptionFlag *rmdhcif* | Real-Time Energy PC |
|  | BA5mResourceRTDFlexRampForecastedMovementMWFilteredQuantity BrtQ’uT’I’M’L’F’S’mdhcif | Flexible Ramp Product PC |
|  | BAHourlyResIRDScheduleFilterQuantityBrtuT'I'Q'M'F'S'L'mdh | CC 8081 – Day Ahead Imbalance Reserve Down Settlement  |

## CAISO Formula

### *Flex Ramp Down Settlement Amount*:

### BA5mResTotalFRDUncertaintySTLMTAmount BrtQ’uT’I’M’L’F’S’mdhcif =

 ((BA5mResRTDFRDUncertaintyAmount BrtQ’uT’I’M’L’F’S’mdhcif + BA15mResFMMFRDUncertaintyAmount BrtQ’uT’I’M’L’F’S’mdhc + BA5mResFRDUncertaintySTLMTAdjustmentAmount BrtQ’mdhcif ) + (BA5mResFRDUncertaintyRescissionAmount BrtQ’uT’I’M’L’F’S’mdhcif )

### BA5mResFRDUncertaintySTLMTAdjustmentAmount BrtQ’mdhcif =

Sum (J, Q’’) PTB\_BAFRDUncertaintyCapacityAdjustmentAmount BrtJQ’Q’’mdhcif

### BA5mResRTDFRDUncertaintyAmount BrtQ’uT’I’M’L’F’S’mdhcif =

(-1) \* (BA5mResRTDIncFRDUncertaintyQuantity BrtQ’uT’I’M’L’F’S’mdhcif \* BA5mResourceRTDFlexRampDownBAAPrice BrtQ’uT’I’M’L’F’S’mdhcif)

### BA5mResRTDIncFRDUncertaintyQuantity BrtQ’uT’I’M’L’F’S’mdhcif =

((BA5mResourceRTDFlexRampDownUncertaintyCapacityQty BrtQ’uT’I’M’L’F’S’mdhcif) – Intduplicate (BA15mResourceFMMFlexRampDownUncertaintyCapacityQty BrtQ’uT’I’M’L’F’S’mdhc))/12

### BA15mResFMMFRDUncertaintyAmount BrtQ’uT’I’M’L’F’S’mdhc =

(-1) \* (BA15mResFMMFRDUncertaintyQuantity BrtQ’uT’I’M’L’F’S’mdhc \* BA15ResourceFMMFlexRampDownBAAPrice BrtQ’uT’I’M’L’F’S’mdhc)

### BA15mResFMMFRDUncertaintyQuantity BrtQ’uT’I’M’L’F’S’mdhc =

IF BAHourlyResIRDScheduleFilterQuantityBrtuT'I'Q'M'F'S'L'mdh > 0

THEN

BAHourlyResIRD5MRampCapableQty BrtQ’mdh –0.25\*BA15mResourceFMMFlexRampDownUncertaintyCapacityQty BrtQ’uT’I’M’L’F’S’mdhc

ELSE

 0.25\*BA15mResourceFMMFlexRampDownUncertaintyCapacityQty BrtQ’uT’I’M’L’F’S’mdhc

END IF

Implementation Note: Both BAHourlyResIRDScheduleFilterQuantityBrtuT'I'Q'M'F'S'L'mdh and BA15mResourceFMMFlexRampDownUncertaintyCapacityQty BrtQ’uT’I’M’L’F’S’mdhc are business drivers.

### BA5mResFRDUncertaintyRescissionAmount BrtQ’uT’I’M’L’F’S’mdhcif =

BA5mResFRDUncertaintyCapacityRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif \* BA5mResourceRTDFlexRampDownBAAPrice BrtQ’uT’I’M’L’F’S’mdhcif

### *Flex Ramp Down Rescission Quantity*:

### BA5mResFRDForecastedMovementRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif =

BA5mResourceTotalFRDRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif - BA5mResFRDUncertaintyCapacityRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif

### BA5mResFRDUncertaintyCapacityRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif =

Min ((BA5mResourceRTDFlexRampDownUncertaintyCapacityQty BrtQ’uT’I’M’L’F’S’mdhcif /12), BA5mResourceTotalFRDRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif )

### BA5mResourceTotalFRDRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif =

Min (BA5mResTotalFlexRampDownQuantity BrtQ’uT’I’M’L’F’S’mdhcif, BA5mResourceGrossNegativeDeviationQuantity BrtuT’I’Q’M’F’S’mdhcif)

### BA5mResourceGrossNegativeDeviationQuantity BrtuT’I’Q’M’F’S’mdhcif =

If

ResourceWholesaleExemptionFlag *rmdhcif* = 0

THEN

ABS(Min(SettlementIntervalRealTimeUIE BrtuT’I’Q’M’F’S’mdhcif + SettlementIntervalOAEnergy BrtuT’I’Q’M’F’S’mdhcif, 0))

Else

ABS(Min(SettlementIntervalOAEnergy BrtuT’I’Q’M’F’S’mdhcif, 0))

Where Resource type (t) in ‘GEN’, ‘ITIE’, ‘ETIE’

### BA5mResTotalFlexRampDownQuantity BrtQ’uT’I’M’L’F’S’mdhcif =

(BA5mResourceRTDFlexRampDownUncertaintyCapacityQty BrtQ’uT’I’M’L’F’S’mdhcif + BA5mResGrossFRDForecastedMovementQuantity BrtQ’uT’I’M’L’F’S’mdhcif)/12

### BA5mResGrossFRDForecastedMovementQuantity BrtQ’uT’I’M’L’F’S’mdhcif =

ABS(Min(BA5mResourceRTDFlexRampForecastedMovementMWFilteredQuantity BrtQ’uT’I’M’L’F’S’mdhcif, 0))

*Flex Ramp Down Uncertainty Assessment Amount:*

### BA5mResFlexRampDownUncertaintyAwardAssessmentAmount BrtQ’uT’I’M’L’F’S’mdhcif =

(BA5mResRTDFRDUncertaintyAmount BrtQ’uT’I’M’L’F’S’mdhcif + BA15mResFMMFRDUncertaintyAmount BrtQ’uT’I’M’L’F’S’mdhc + BA5mResFRDUncertaintySTLMTAdjustmentAmount BrtQ’mdhcif )

### *Flex Ramp Down Uncertainty BAA Constraint Amount:*

### BAA5mFlexRampDownUncertaintyAmount Q’mdhcif =

Sum (Brt uT’I’M’L’F’S’) BA5mResTotalFRDUncertaintySTLMTAmount BrtQ’uT’I’M’L’F’S’mdhcif

## Outputs

| **Output ID** | **Name** | Description |
| --- | --- | --- |
|  | In addition to the outputs below, all inputs are required to be accessible for review by analysts and report on Settlement statements. |  |
|  | BA5mResTotalFRDUncertaintySTLMTAmount BrtQ’uT’I’M’L’F’S’mdhcif | Total Flexible Ramp Down Uncertainty Settlement Amount by Resource, BAA for Settlement Interval f **($)** |
|  | BA5mResFRDUncertaintySTLMTAdjustmentAmount BrtQ’mdhcif | Total Flexible Ramp Down Uncertainty Settlement Adjustment Amount by Resource, BAA for Settlement Interval f **($)** |
|  | BA5mResRTDFRDUncertaintyAmount BrtQ’uT’I’M’L’F’S’mdhcif | RTD Flexible Ramp Down Uncertainty Settlement Amount by Resource, BAA for Settlement Interval f **($)** |
|  | BA5mResRTDIncFRDUncertaintyQuantity BrtQ’uT’I’M’L’F’S’mdhcif | RTD Incremental Flexible Ramp Down Uncertainty Settlement Quantity by Resource for Settlement Interval f **(MWh)** |
|  | BA15mResFMMFRDUncertaintyAmount BrtQ’uT’I’M’L’F’S’mdhc | FMM Flexible Ramp Down Uncertainty Settlement Amount by Resource, BAA Constraint for FMM Interval c **($)** |
|  | BA15mResFMMFRDUncertaintyQuantity BrtQ’uT’I’M’L’F’S’mdhc | FMM Flexible Ramp Down Uncertainty Quantity by Resource, BAA Constraint for FMM Interval c **(MWh)** |
|  | BA5mResFRDUncertaintyRescissionAmount BrtQ’uT’I’M’L’F’S’mdhcif | Flexible Ramp Down Uncertainty Rescission Amount by Resource and BAA Constraint for Settlement Interval f **($)** |
|  | BA5mResFRDForecastedMovementRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif | Flexible Ramp Down Forecasted Movement Rescission Quantity by Resource and BAA Constraint for Settlement Interval f **(MWh)** |
|  | BA5mResFRDUncertaintyCapacityRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif | Flexible Ramp Down Uncertainty Rescission Quantity by Resource and BAA Constraint for Settlement Interval f **(MWh)** |
|  | BA5mResourceTotalFRDRescissionQuantity BrtQ’uT’I’M’L’F’S’mdhcif | Total Flexible Ramp Down Rescission Quantity by Resource and BAA Constraint for Settlement Interval f **(MWh)** |
|  | BA5mResourceGrossNegativeDeviationQuantity BrtuT’I’Q’M’F’S’mdhcif | Gross Negative Deviation Energy Quantity by Resource for Settlement Interval f **(MWh)** |
|  | BA5mResTotalFlexRampDownQuantity BrtQ’uT’I’M’L’F’S’mdhcif | Total Flexible Ramp Down Quantity by Resource for Settlement Interval f (MWh)Represents the sum of Flexible Ramp Down Forecasted Movement plus Flexible Ramp Uncertaity Awarded Capacity  |
|  | BA5mResFlexRampDownUncertaintyAwardAssessmentAmount BrtQ’uT’I’M’L’F’S’mdhcif | Total Flexible Ramp Down Uncertainty Award Assessment Amount by Resource r and Balancing Authority Area Q’ for Settlement Interval f **($)** |
|  | BAA5mFlexRampDownUncertaintyAmount Q’mdhcif | Total Flexible Ramp Down Uncertainty Settlement Amount by BAA for Settlement Interval f **($)** |
|  | BAAConstraint5mFlexRampDownUncertaintyAmount Q’Q’’mdhcif | Total Flexible Ramp Down Uncertainty Award Assessment Amount by BAA Constraint and Balancing Authority Area Q’ for Settlement Interval f **($)** |
|  | BA5mResGrossFRDForecastedMovementQuantity BrtQ’uT’I’M’L’F’S’mdhcif | The Gross Flexible Ramp Down Forecasted Movement Quantity by resource r and Balancing Authority Area Q’ |

# Charge Code Effective Dates

| Charge Code/Pre-calc Name | Document Version | Effective Start Date | Effective End Date | Version update Type |
| --- | --- | --- | --- | --- |
| Flexible Ramp Down Uncertainty Capacity Settlement | 5.0 | 11/01/16 | 9/30/2020 | Configuration Impacted |
| Flexible Ramp Down Uncertainty Capacity Settlement | 5.1 | 10/1/2020 | 10/31/2022 | Configuration Impacted |
| Flexible Ramp Up Uncertainty Capacity Settlement | 5.2 | 11/1/2022 | 4/30/2026 | Configuration Impacted |
| Flexible Ramp Up Uncertainty Capacity Settlement | 5.3 | 5/1/2026 | Open | Configuration Impacted |