California ISO

Business Requirements Specification

Day-Ahead Market Enhancements

Document Version: ~~1.1~~1.2

Current Version Date: ~~12/22/2023~~4/25/2024

Revision History

Date	Version	Description
7/25/2023	1.0	Initial Document Release.
12/22/2023	1.1	Updated for the following • Clarified, corrected typos and cleaned up the document. • Moved some requirements from DAME BRS to EDAM BRS and vice versa. • Updated business requirement to match filed Tariff and/or clarified policy. ○ Restored back RCU/RCD bid caps to $250. ○ Set MSS-specific annual RUC participation flag to always Opt-In. ○ Netted RCU/RCD Overlapping RA Capacity from RUC BCR calculations. ○ Updated for not assessing RAAIM to IR and RC awards for generic and Flex RA. ○ Extended the DA and Base Schedule Forecast Movement to virtual supply and demand resources. ○ Extended the FMM deviation settlements to virtual supply and demand resources. ○ Accounted for virtual FM in allocation of residual Forecasted Movement Settlements. ○ Made the LSE-Resource Pair True-Up flag on LSE-Resource Pair instead of LSE-only and updated its logic and submission system from Master File to CIRA. ○ Set UEL to 0 for System Resources, if e-tag validation fails. ○ Required that resources with RCU Award that submitted a DA Energy Bid to export outside the EDAM Area must provide a decremental RT Energy Bid to dispatch down the export schedule in the FMM. ○ Updated for not mitigating RCU Bids that are submitted on behalf of imports from outside the EDAM Area. ○ Published IRU/IRD and RCU/RCD Overlapping RA Capacity in CMRI reports. ○ Changed calculation of ramp rate segment for IRU and IRD to correspond to DAES instead of DAES+IRU and DAES-IRD. ○ Removed the requirement of intertie congestion components being included in RCU/RCD marginal prices. ○ Updated AS SOC formulation constraints formulation. ○ Accounted for Imbalance Reserve Surplus in market optimization, Settlements and reporting. ○ Allowed bid daily min energy limit positive or negative in SIBR, consistent with market. ○ Expand Imbalance Reserve Requirement input model to cover Trading Day+1, +2 for market and reporting. ○ Added formulas for Certified Capacity for IRU and IRD. ○ Replaced Proxy RCU Flag with Proxy RCU MW, as applicable.

Date	Version	Description
		○ Marked all days as Weekdays Day Type for BARC's IR quantile regression model. ○ Updated formulation of: IRx BAA Average Price, IRx BAA Derived Price, Tier-2 IRx BAA Allocation Cost for Settlements.
4/25/2024	1.2	Updated for the following: ▫ Clarified, corrected typos and cleaned up the document. ▫ Updated business requirement to per feedback from CAISO SMEs and market participants. • DAME-BRQ-01160 ○ Added to define Surplus zones in a BAA. • DAME-BRQ-01180 ○ Deleted and moved to Internal ISO System (DAME-BRQ-02005) • DAME-BRQ-01200 ○ Added for EDAM participation Flag in MF. • DAME-BRQ-02010 ○ Updated to move the setting of sampling scheme parameters to separate BRQ (DAME-BRQ-02011) • DAME-BRQ-02011 ○ Added for the moved functionality of setting the sampling scheme parameters (moved from DAME-BRQ-02010). ○ Marked this BRQ for Production-Track implementation (ahead of DAME Go-Live date) • DAME-BRQ-02005 ○ Moved from MF (DAME-BRQ-01180). • DAME-BRQ-02040 ○ Updated to remove storing uncertainty. • DAME-BRQ-02060, DAME-BRQ-02070, DAME-BRQ-02090, DAME-BRQ-02100, DAME-BRQ-02110, DAME-BRQ-02120, DAME-BRQ-02130, DAME-BRQ-02140, DAME-BRQ-02150, DAME-BRQ-02310, DAME-BRQ-02320, DAME-BRQ-02340, DAME-BRQ-04140, DAME-BRQ-10280, DAME-BRQ-10300, DAME-BRQ-10320, DAME-BRQ-10340, DAME-BRQ-10360, DAME-BRQ-11420 ○ Updated to remove D+2 calculation, broadcast and consume for ISO-Internal System, DAM, OASIS, Internal ISO System (for IRR Thresholds, IRR Input Polynomials, IRR Uncertainty Histograms, IR

Date	Version	Description
		Forecasts, IR Demand Curves and only keep IRR, IRS and RC Awards). • DAME-BRQ-02300, DAME-BRQ-02310, DAME-BRQ-02320, DAME-BRQ-03070, DAME-BRQ-04080, DAME-BRQ-04090, DAME-BRQ-04134, DAME-BRQ-05002 o Updated to add "/MWh" for "$55, $247, $250, $150, $300, $0" to align with Tariff Compliance Filing. • DAME-BRQ-04030 o Updated the note about extension of RCU/RCD bid for VERs to clarify it is in RUC. • DAME-BRQ-04134A, DAME-BRQ-04135, DAME-BRQ-04136, DAME-BRQ-04137 o Added to model multiple IR zones in a BAA in the Market • DAME-BRQ-04150 o Updated to split calculations of IRUR/IRDR for D+2 and D+3 to a separate BRQ (DAME-BRQ-04155). • DAME-BRQ-04155 o Added for the calculations of IRUR/IRDR for D+2 and D+3 as a separate BRQ (split from DAME-BRQ-04150). • DAME-BRQ-10260, DAME-BRQ-11420 o Updated to add D+3. • DAME-BRQ-04331, DAME-BRQ-04331A o Updated to correct ASSOC formulas to replace $SOC_{i,t-1}$ index with $SOC_{i,t}$. • DAME-BRQ-04334, DAME-BRQ-04337, DAME-BRQ-06075 o Deleted from this BRS and moved to ESE3 project's BRS. • DAME-BRQ-04454 o Updated to clarify access of IR surplus zones and their associated Apnodes from MF. o Updated to clarify that IRU/IRD Surplus is on Apnode associated with each IR surplus zone and aggregated on BAA level on Imbalance Demand Hub Apnode. • DAME-BRQ-05000 o Updated to apply insertion logic to non-VERs and replaced UEL with VER forecast with lower of energy bid range and RCU Certified Capacity.

Date	Version	Description
		○ Updated to add extension logic for non-VERs. • DAME-BRQ-05005 ○ Updated to remove first two bullets regarding extension/insertion of RCU bids to Forecast output and change the system from SIBR to RUC. • DAME-BRQ-05090 ○ Updated to clarify the 2nd bullet to apply to online physical resources. • DAME-BRQ-05130 ○ Updated to clarify resource types applicability. • DAME-BRQ-05144 ○ Updated to remove the reference to DAME-BRQ-04334 • DAME-BRQ-06065 ○ Deleted. • DAME-BRQ-07860, DAME-MSIM-15020 ○ Updated to add IR Surplus Zone associated Apnodes to Imbalance Hub Demand Apnode. • DAME-BRQ-09160 ○ Updated logic/formula that calculates IRx BAA Average Price, and IRx BAA Derived Price. ○ Updated to add logic formula for IRx BAA Allocation Cost and replaced several terms with the defined IRx BAA Allocation Cost for clarity (contents moved and modified from DAME-BRQ-09530). ○ Updated to add formula for IRX Surplus Adjustment. ○ Updated Tier-2 IRx BAA Allocation Cost to remove “max (0)” to allow positive and negative values. • DAME-BRQ-09180 ○ Updated logic/formula that calculates RCx BAA Average Price, and RCx BAA Derived Price. ○ Updated to add logic formula for RCx BAA Allocation Cost and replaced several terms with the defined RCx BAA Allocation Cost for clarity. ○ Updated Tier 2 to remove the max (0,). • DAME-BRQ-09380

Date	Version	Description
		○ Updated to replace RA showing with monthly Generic and Flex (across all categories) RA showing in the pro-rata allocation. • DAME-BRQ-09530 ○ Deleted and moved the contents to DAME-BRQ-09160. • DAME-BRQ-09535 ○ Deleted as it is duplicate of contents within DAME-BRQ-09160. • DAME-BRQ-09540 ○ Updated logic to use separate MCC prices for IRx Requirement and Surplus. • DAME-BRQ-09610 ○ Added for Apply HASP Reversal to CAISO BAA IFM Intertie Schedule. • DAME-BRQ-10160, DAME-BRQ-11420 ○ Updated to clarify processing of nodal IRUMP/IRDMP prices for Apnodes associated with IR surplus zones. • DAME-BRQ-10160, DAME-BRQ-10180, DAME-BRQ-10200, DAME-BRQ-10220, DAME-BRQ-10260 ○ Split OASIS reports (one BRQ for each OASIS report). • DAME-BRQ-10160A, DAME-BRQ-10160B, DAME-BRQ-10180A, DAME-BRQ-10180B, DAME-BRQ-10200A, DAME-BRQ-10200B, DAME-BRQ-10200C, DAME-BRQ-10220A, DAME-BRQ-10260A ○ Added for Split OASIS BRQs into separate BRQs (one BRQ for each OASIS report). • DAME-BRQ-10260, DAME-BRQ-11420 ○ Updated to add publishing of IRUS/IRDS and associated Apnode on IR Surplus Zone level within each BAA. • DAME-BRQ-10380 ○ Deleted as OASIS report that publish aggregated BAA Forecasted Movement Data by resource category. • DAME-BRQ-10700 ○ Clarified publishing by IFM-MPM and RUC-MPM. • DAME-BRQ-10730 ○ Added to publish REN (aka RUC schedules) to Forecasted Generation report (existing). • DAME-BRQ-10810

Date	Version	Description
		○ Added for CMRI to publish nodal by SC DA Schedule Virtual Forecasted Movement. • DAME-BRQ-10880 ○ Added for MPP publishing Shift Factors (SF) for IRU/IRD. • DAME-BRQ-11420 ○ Updated to add publishing of monthly Generic RA Showing for each mapped LSE and monthly Flex (for all categories) RA Showing for each mapped LSE. ○ Updated to delete publishing Deployment Scenario Deliverability Inclusion Constraints Flag due RCU/RCD Awards since these flags does not apply to RCU/RCD. ○ Updated to add nodal by SC DA Schedule Virtual Forecasted Movement. ○ Updated to remove aggregated BAA Forecasted Movement Data by resource category. • DAME-MSIM-15020 ○ Updated to remove OASIS IFM Forecasted Movement. ○ Updated to add CMRI DA Schedule Virtual Forecasted Movement Data. ○ Updated OASIS, CMRI and MPP publishing lists.

Disclaimer and Understanding

All information contained in this draft Business Requirements Specification (BRS) as provided by the California Independent System Operator Corporation (ISO) is prepared for discussion and information purposes only. The draft BRS is provided “as is” without representation or warranty of any kind, including, without limitation, a representation or warranty as to accuracy, completeness, or appropriateness for any particular purpose. The draft BRS shall be revised as the development and review of the business requirements progresses. The ISO assumes no responsibility for the consequences of any errors or omissions. The ISO may revise or withdraw all or part of this information at any time at its discretion without notice.

Table of Contents

1 Introduction

1.1 Purpose

The purpose of this document is to capture and record a description of what the Users and Business Stakeholders of the project wish to obtain, by providing high level business requirements. This document establishes the basis for the agreement between the initiators and implementers of the project. The information in this document serves as input to determine the scope of projects and all Business Process Modeling and System Requirements Specifications efforts.

Business requirements are what must be delivered to provide value for the Users and Business Stakeholders. Systems, software,- and processes are the ways (how) to deliver, satisfy or meet the business requirements (what).-

The objective of this initiative is to enhance the California ISO's (CAISO's) day-ahead market by: (BOG: May 2023, In production: Fall ~~2024~~2026)

- Introducing an imbalance reserve (IRU/IRD) product to provide flexible capacity to account for real-time ramping needs that are greater than accounted for in hourly day-ahead market schedules and to account for real-time net load uncertainty:
- Enhancing the residual unit commitment process to also ensure there is sufficient downward dispatch capability (RCU/RCD) in the event real-time load is less than scheduled in the integrated forward market.

The CAISO proposes to preserve the sequential integrated forward market and residual unit commitment process (IFM, RUC)

1.2 Conventions

- None

1.3 Scope

High level Impact analysis:

- **MF:** Define and consume IRU/IRD and RCU/RCD related data.
- **Market products IRU/IRD, RCU/RCD:** Suppliers will provide price and quantity bids for capacity availability in both the upward and downward direction that the market will use to award both imbalance reserves (IRU/IRD, 15-minute ramp dispatchable in IFM) and reliability capacity (RCU/RCD, hourly dispatchable in RUC). Set resource eligibility of IRU/IRD, RCU/RCD in MF.

- **IRU/IRD requirement:** An imbalance reserves up and down product to the integrated forward market with a requirement based on historical uncertainty between the day-ahead and real-time markets using quantile regression (Internal ISO System, DAM)
- **ISO Internal System:** Setting IR/RC DAB for Calculated and Negotiate Rate Ranking Option.
- **Co-optimization IRU/IRD** products with energy and ancillary services to schedule resources (MPM, IFM, SIBR)
    - Set up IRU/IRD procurement constraints
    - Apply market power mitigation to IRU in the same manner for energy
    - An imbalance reserve award will obligate a supplier to provide economic energy bids in the real-time market (RTM, SIBR)
    - Ensure imbalance reserves are deliverable using IRU/IRD deployment scenario.
    - Modeling these transmission constraints including IRU/IRD, using same DF as energy of the resource, no incremental transmission losses, have MP for IRU/IRD (MPM,IFM)
    - Publish IRU/IRD (CMRI, OASIS)
- **Optimize RCU/RCD** products in RUC with energy, IRU/IRD and ancillary services award/schedule from IFM (RUC)
    - Apply market power mitigation to RCU
    - RCU/RCD will obligate to provide economic energy bids in the real-time market (RTM, SIBR)
    - Modeling transmission constraints that have MP for RCU/RCD (MPM/RUC)
    - Publish RCU/RCD (CMRI, OASIS)
- Enhance the residual unit commitment (RUC) process to establish the binding configuration for multi-stage generating (MSG) resources. (RUC, CMRI)
- RTM run with IRU/IRD, RCU/RCD awards must offer obligation and price bid cap.

- **Settlement for IRU/IRD, RCU/RCD payment, cost allocation, Unavailability No Pay, BCR and GMC**
    - Resources awarded IRU/IRD, RCU/RCD will be paid a day-ahead payment at the marginal price for the relevant product.
    - Ramping provided by imbalance reserve awards and forecasted movement in the day-ahead market will be settled against forecasted movement and flexible ramping product in the real-time market.
    - Resource economic limit not support IRU/IRD, exclude 5 minute uncertainty, subject to No Pay,
    - Resource economic limit not support RCU/RCD subject to No Pay
    - The market will recover the costs of these products through a cost allocation that collects payments from entities based on their contribution to the need to procure the product.
    - BCR: IRU/IRD for DAM BCR, RCU/RCD for RTM BCR
    - GMC: GMC market service charge apply to IRU/IRD, RCU/RCD
- **CMRI/OASIS**: report IRU/IRD, RCU/RCD
- **FODD:** Publish IRU/IRD, RCU/RCD related data to FERC

1.4 Acronym and Terms Definitions

Refer to **Appendix-A – Acronym Definition**

2 Intellectual Property Ownership

Intellectual Property covers a broad array of information and materials, including written works, computer programs, software, business manuals, processes, symbols, logos and other work products. Determining ownership of Intellectual Property is very important in preserving the rights of the California ISO, and helps to avoid Intellectual Property infringement issues. In considering the business requirements or service requirements to be performed, the business owner of the project must determine Intellectual Property Ownership.

2.1 Checklist

All information in this document is the Intellectual Property (copyright, trademark, patent, and/or trade secret) of the California ISO.

3 Details of Business Need/Problem

3.1 Description

Business Opportunity/Problem Statement:	
What:	The objective of this initiative is to enhance the California ISO's (CAISO's) day-ahead market by: * Introducing an imbalance reserve (IRU/IRD) product to provide flexible capacity to account for real-time ramping needs * Enhancing the residual unit commitment process to also ensure there is sufficient downward dispatch capability (RCU/RCD) * Enhancing the day-ahead market to maximize benefits of greater West-wide diversity in the day-ahead optimization for Western Energy Imbalance Market participants
When:	Fall ~~2024~~2026
Why do we have this opportunity/problem:	Imbalance reserves will ensure the day-ahead market schedules sufficient real-time dispatch capability to meet net load imbalances and ramping needs that materialize between the day-ahead and real-time markets. These imbalances have increased in recent years because of increasing amounts of weather-dependent supply and load resources on the CAISO grid.
Who does this opportunity/problem impact:	• Real-Time Operations • MAF • Market Services • Market Participants • Customer Service • Policy • Legal

4 Business Impacts

4.1 Business Practice Manual (BPM)

BPM	Description of Impact(s)
Definitions and Acronyms	*Yes*
Market Instruments	Yes
Market Operations	Yes
Settlements and Billing	Yes

4.2 Other

Impact	Description (optional)
Market Simulation	Yes
Market Participant Impact	Yes
External Bid Publication	*Yes*
User Acceptance Testing (UAT)	*Yes*
Operational Procedures	*Yes*
Customer Readiness Impact	
1. External Communication Needed	*Yes*
2. External Onboarding and Maintenance	*No*
• **External Training**	*Yes*
• **External Computer Based Training**	*Yes*
Policy Initiative	*Yes*

5 Business Requirements

The sections below describe the Business processes and the associated business requirements involved in the project. These may represent high-level functional, non-functional, reporting, and/or infrastructure requirements. These business requirements directly relate to the high-level scope items determined for the project.

5.1 Business Process: Resource Management (Master File)

- Define Resource IRU and IRD eligibility
- Define Resource RCU and RCD eligibility
- Define and Consume IR and RC DAB Ranking Options
- Set MSS-Specific Annual RUC Participation Flag to Always Opt-In
- Define Imbalance demand Hub Apnode
- Define IR Surplus Zones and associated Apnodes
- Define EDAM BAA Participation and Date

5.1.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-01000	**Define Imbalance Reserve Up (IRU) and Imbalance Reserve Down (IRD) eligibility for the resource in DAM**: • Define resource and intertie eligibility for Imbalance reserve product (IR): o Separate flag for upper (IRU), down (IRD) for all upper eligible registered resources o Certified Capacity (MW) for IRU and IRD (IRU_{max} , IRD_{max}), calculated by System based on 30-minute ramp, capped by Pmax/Pmin, using the below formulas. o For NGR, the IRU eligibility and Certified Capacity are limited to positive (discharging) range, and the IRD eligibility and Certified Capacity are limited to the negative (charging) range.	Core	Master File RDT

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted

	• Pass the IRU, IRD flags and Certified Capacity MW to the downstream systems
	
	Formulas:
	• For IRU:
	  ○ If SUT <= 15':
	  ▪ IRU_{max} = Max{ Min[(Pmin + [(15' – SUT) * RR]), P_{max}] , Min[(30' * RR) , (P_{max} – P_{min})] }
	  ○ If SUT > 15':
	  ▪ IRU_{max} = Min{ (30' * RR), (P_{max} – P_{min})}
	• For IRD:
	  ○ IRD_{max} = Min{ (30' * RR) , (P_{max} – P_{min})}
	• Where RR is highest value among operational ramp rate segments in MW/min.
	
	Note:
	Resource provide the capacity product must register in MF
	The IRU/IRD eligibility flags and corresponding *Certified Capacity* MW quantities should be added to GRDT as read-only.
	Note:
	• Refer to **Resource Eligibility Table** in **Appendix-B: Formulas, Calculation Details, and Examples**		

DAME-BRQ-01010	**Define Reliability Capacity Up (RCU) and Reliability Capacity Down (RCD) eligibility:**
	• Define physical market resource eligibility for Reliability Capacity (RC):
	  ○ Separate flag for upper (RCU), down (RCD)
	  ○ Certified Capacity (MW) for RCU and RCD (RCU_{max} , RCD_{max}), calculated based on 60-minute ramp, capped by Pmax/Pmin, using the below formulas.
	  ○ For NGR, the RCU eligibility and Certified Capacity are limited to positive (discharging) range, and the RCD eligibility and Certified
		Core	Master File
			RDT

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Capacity are limited to the negative (charging) range • Pass the RCU, RCD flags and Certified Capacity MW to the downstream systems **Formulas:** • For RCU: o If SUT <= 60': ▪ RCU_{max} = Max{ Min[(Pmin + [(60' – SUT) * RR]), P_{max}] , Min[(60' * RR) , (P_{max} – P_{min})] } o If SUT > 60': ▪ RCU_{max} = Min{ (60' * RR), (P_{max} – P_{min})} • For RCD: o RCD_{max} = Min{ (60' * RR) , (P_{max} – P_{min})} • Where RR is highest value among operational ramp rate segments in MW/min. Note: The RCU/RCD eligibility flags and corresponding Certified Capacity MW quantities should be added to GRDT as read-only **Note:** • Resources/MSG configurations will only get awarded RCU or RCD, not both. • Long Start Units are eligible to participate in RUC and bid for RCU/RCD. • Refer to **Resource Eligibility Table** in **Appendix-B: Formulas, Calculation Details, and Examples**		
DAME-BRQ-01040	**Define IR and RC DAB Ranking Options** • System shall define the following separate resource-specific fields, for all resources, including NGRs:	Core	• MF

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	○ IRU DAB Options Ranking ○ IRD DAB Options Ranking ○ RCU DAB Options Ranking ○ RCD DAB Options Ranking • Supported possible numeric rankings are for: ○ Null (for IR/RC non-eligible resources) ○ (1 or 2) Calculated (for IR/RC eligible resources) ○ (1 or 2) Negotiated Rate (for IR/RC eligible resources)		
DAME-BRQ-01060	**Consume IR and RC DAB Ranking Options from Resources' SCs** • System shall consume the following separate resource-specific fields from resources' SCs, respectively, for all resources, including NGRs: ○ IRU DAB Options Ranking ○ IRD DAB Options Ranking ○ RCU DAB Options Ranking ○ RCD DAB Options Ranking • Supported possible numeric rankings are for: ○ Null (for IR/RC non-eligible resources) ○ (1 or 2) Calculated (for IR/RC eligible resources) ○ (1 or 2) Negotiated Rate (for IR/RC eligible resources) **Notes** • If Negotiated Rate Option is ranked as 1, but no Negotiated Rate process was in place, CAISO will revert to the next ranking option, which is the Calculated option. • For the first year from Go-Live, the Negotiated Rate option for IRU/IRD and RCU/RCD will not be supported, until CAISO gains more operational experience with associated bid and costs. • Rankings should be consistent across up and down products; i.e. if Calculated is ranked 1 for IRU, it should also be ranked 1 for IRD.	Core	• MF • RDT
DAME-BRQ-01080	**Default IR and RC DAB Ranking Options** System shall use the following default numeric values for resource-specific IRU/IRD and RCU/RCD DAB Options Ranking, for all resources, including NGRs: • Null (for non-eligible resources) • (1) Calculated (for eligible resources) • (2) Negotiated Rate (for eligible resources)	Core	• MF

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-01130	**Set MSS-Specific Annual RUC Participation Flag to Always Opt-In** • MSS-specific Annual RUC participation flag shall be set to always Opt-In, regardless of their MSS election type, starting from Tariff activation date. • This annual flag setting shall override the previous annual flag setting for the remainder of the year. **Notes** • For this project, Tariff activation date is same as Go-Live date.	Core	• MF
DAME-BRQ-01150	**Define Imbalance Demand Hub for each BAA** • Define Anode for the BAA Imbalance demand Hub, include load nodes, solar resource Cnodes and Wind resource Cnodes. The Anode associated APnode shall have type same as LAP. • Define default ~~Distribute~~Distribution factors for Imbalance Demand Hub, normalize the default LDF and Solar and Wind resource GDF based on Pmax.	Core	• MF
DAME-BRQ-~~01180~~01160	**Define IR surplus zones for an EDAM BAA, consistent with FRP surplus zones for the same BAA** • The IR/FRP Surplus Zones shall be used in the market to distribute IR Surplus variables in DAM and distribute FRP surplus variables in RTM. Each surplus zone shall have its associated Apnode. ~~**Mark all days as Weekdays Day Type for BARC's IR Quantile Regression Model**~~ • ~~Day Types calendar that are used by BARC for IR quantile regression model calculations shall mark all days starting from Go-Live date as one type (Weekday).~~	~~Business~~ Core~~Process~~	• MF
DAME-BRQ-01200	**Define EDAM BAA Participation and Date** • Define BAA with EDAM participation flag • Define activate date	Core	• MF

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Note: EDAM participation requirement also in EDAM-BRQ-02020 that link to the EDAM Tariff section.		

5.2 Business Process: Manage the Balancing Authority Requirements Calculator

For IRU/IRD requirement forecast parameters estimation use quantile regression model:

- Mark all days as Weekdays Day Type for IR Quantile Regression Model
- Calculate (DA-RTPD) forecast up/down extreme variation
- Calculate the second-order polynomial coefficients of the High/Low Percentile quadratic quantile regression for uncertainty of demand, solar, wind and MOSAIC
- Calculate High/Low Percentile forecast uncertainty histogram for Load, wind, Solar, net load *and maximum boundary for IRU/IRD*
- Calculate IRU/IRD demand price curve

5.2.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-02000	**General statement:** Extend FRP requirements forecast quantile regression model to Imbalance Reserve requirement forecast and demand price curve The system stores the historical data and estimate the parameters of the statistic forecast model.	Process	Internal ISO System
DAME-BRQ-02005	**Mark all days as Weekdays Day Type for BARC's IR Quantile Regression Model** Day Types calendar that are used by BARC for IR quantile regression model calculations shall mark all days starting from Go-Live date as one type (Weekday).	Process	Internal ISO System
DAME-BRQ-02010	**Set the configurable parameters for the quantile regression for IR** The system shall have a set of system-wide **configurable** initialization parameters (separate set for FRP and IR) for Imbalance Requirement (IR) : o the High Percentile, initially set to 97.5% (0.975)	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	○ the Low Percentile, initially set to 2.5% (0.025) ○ for the High Percentile Threshold, initially set to 99% (0.99) ~~○ the Low Percentile Threshold, initially set to 1% (0.01)~~ ~~○ the Data Retention Period, initially set to 365 days Configurable parameter to select Sampling Scheme:~~ ~~○ Rolling sampling (current)~~ ~~○ Symmetrical sampling (backward/forward) for matching day and month (default option)~~ ○ ~~Set configurable sample days (if Symmetrical sampling option is selected, default this parameter to 90 days backward and 90 days forward)~~		
DAME-BRQ-02011 **(Production-Track)**	**Set Configurable Sampling Scheme Parameters for the Quantile Regression for IR** The system shall have a set of system-wide **configurable** sampling scheme parameters (separate set for FRP and IR) for Imbalance Requirement (IR) : ○ Data Retention Period, initially set to 365 days ○ Configurable parameter to select Sampling Scheme: ○ Rolling sampling (current) ○ Symmetrical sampling (backward/forward) for matching day and month (default option) ○ Set configurable sample days (if Symmetrical sampling option is selected, default this parameter to 90 days backward and 90 days forward)	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Note ○ This BRQ will be implemented in production track ahead of the DAME Go-Live.		
DAME-BRQ-02012	**Access EDAM BAAs** • Access DAM BAA definition from MF • Access the EDAM_AREA definition from MF	Core	Internal ISO System (from MF)
DAME-BRQ-02020	**Consume and store the trading day DAM forecast data of demand(d) /solar(s)/wind(w) for each BAA and aggregate for the entire DAM area** At the end of each DAM, the system shall consume the following data for each Trading Hour in the previous Trading Day for each BAA in the DAM Area: • DAM binding total demand forecast(d) • DAM binding total solar forecast(s) for each 60min interval • DAM binding total wind forecast(w) for each 60min interval The system shall store this hourly forecast for demand/solar/wind for the Data Retention Period by BAA, Trading Day, Day Type, Trading Hour and market DAM. **Notes** • lowercase (d, s, w) is for independent forecast data • uppercase (D,S,W) is the dependent uncertainty data • Refer to **DAME-BRQ-02010** for data retention business requirement.	Core	Internal ISO System (from IFM)
DAME-BRQ-02030	**Consume and store the demand(d)/solar(s)/wind(w) trading day RTPD forecast data**	**Existing System Functionality**	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	At the end of each Trading Day, the system shall consume the following data for each Trading Hour in that Trading Day for each BAA in the DAM area: • FMM binding demand forecast for each 15 min interval • FMM binding solar forecast for each 15 min interval • FMM binding wind forecast for each 15 min interval The system shall store this information for the Data Retention Period by Trading Day, Day Type, Trading Hour, and DAM/FMM Trading Interval.		
DAME-BRQ-02040	**Calculate ~~and store~~ uncertainty as hourly maximum and minimum differences (two samples) between RTPD and DAM for the demand/solar/wind binding forecasts** After each Trading Day, the system shall calculate the uncertainty for each 60min period of each Trading Hour in that Trading Day, for each BAA in the DAM Area, for the entire DAM Area: • the algebraic difference between the *maximum/minimum* **demand** forecast of the four binding 15 minute RTPD intervals in that 60min period and the corresponding DAM hourly forecast in that 60min period • the algebraic difference between the *maximum/minimum* **solar** forecast of the four binding 15 minute RTPD intervals in that 60min period and the corresponding DAM hourly forecast in that 60min period • the algebraic difference between the *maximum/minimum* **wind** forecast of the four binding 15 minute RTPD intervals in that 60min period and the corresponding DAM hourly forecast in that 60min period • The system shall ~~store~~calculate hourly maximum and minimum difference values of demand, solar	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	and wind for the Data Retention Period by Trading Day, Day Type, Trading Hour of DAM horizon.		
DAME-BRQ-02050	**Manage rolling day of retention period for DAM** The system shall roll the Data Retention Period at the end of each Trading Day by one Trading Day, deleting the data for the first Trading Day in the Data Retention Period.	Core	Internal ISO System
DAME-BRQ-02060	**Retrieve the total maximum capacity of solar/wind for each BAA and aggregate for the entire DAM area** After rolling the Data Retention Period, the system shall • Retrieve the maximum capacity of VER resources by solar/wind at any given Trading Day (D+1~~ as well as D+2~~) for each BAA and then aggregate for the entire DAM Area. • Store this information for the Data Retention Period by Trading Day and Day Type.	Existing	Internal ISO System (from MF)
DAME-BRQ-02070	**Adjust solar/wind forecast and uncertainty for each day in retention period:** After rolling the Data Retention Period, For each trading day in the Data Retention Period for the Day Type of the next Trading ~~Days~~Day (D+1~~ as well as D+2~~), for each BAA and DAM Area system shall calculate • The solar/wind capacity factor as the ratio of the total solar/wind capacity in the next Trading ~~Days~~Day (D+1 ~~as well as D+2~~) over the total solar/wind capacity in the Trading Day in the Data Retention Period. • Adjust the solar/wind forecast and uncertainty data by multiplying the data with the solar/wind capacity factor of the Trading ~~Days~~Day (D+1~~ as well as D+2~~) in the Data Retention Period.	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-02080	**Calculate and store net demand uncertainty as maximum/minimum net demand difference between RTPD and DAM for retention period** After rolling the Data Retention Period, For each Trading Hour in each Trading Day in the Data Retention Period for the Day Type of the next Trading Day~~,~~ (D+1), for each BAA and the DAM Area • Calculate the net demand forecast (nd) as the demand forecast minus the adjusted solar forecast minus the adjusted wind forecast for each hour in DAM and each binding 15 minute intervals in RTPD • Calculate the hourly net demand forecast uncertainty (ND) as the algebraic difference between the *maximum/minimum* net demand forecast of the 4 binding RTPD intervals and DAM in the corresponding hour (two samples).	Core	Internal ISO System
DAME-BRQ-02090	**Calculate and store the Hourly High/lower percentile of histogram(H) for uncertainty of Demand(*D*) /Solar(*S*) /Wind(*W*) /Net demand(*ND*)** After rolling the Data Retention Period, for each Trading Hour in the Data Retention Period for the Day Type of the next Trading ~~Days~~Day (D+1~~ as well as D+2~~), for each BAA and DAM Area Calculate and store: • the High/Low Percentile demand forecast uncertainty histogram ($D_{60}^{H97.5}$) /($D_{60}^{H2.5}$) • the High/Low Percentile adjusted solar forecast uncertainty histogram ($S_{60}^{H97.5}$) /($S_{60}^{H2.5}$) • the High/Low Percentile adjusted wind forecast uncertainty histogram ($W_{60}^{H97.5}$) /($W_{60}^{H2.5}$) • the High/Low Percentile net demand forecast uncertainty histogram ($ND_{60}^{H97.5}$) /($ND_{60}^{H2.5}$)	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-02100	**Calculate and store the hourly second-order polynomial coefficients of the High /Low Percentile quadratic quantile regression for uncertainty of Demand(D)/Solar(S)/Wind(W)** After rolling the Data Retention Period, for each Trading Hour in the Data Retention Period for the Day Type of the next Trading ~~Days~~Day (D+1~~ as well as D+2~~), for each BAA and DAM Area Calculate and store the second-order polynomial coefficients of the High/low Percentile quadratic quantile regression of uncertainty of forecast of: • Demand: $(A_{60}^{D97.5}, B_{60}^{D97.5}, C_{60}^{D97.5})/(A_{60}^{D2.5}, B_{60}^{D2.5}, C_{60}^{D2.5})$ through regression $D_{60}^{P97.5}(d) \equiv A_{60}^{D97.5}\ d^2 + B_{60}^{D97.5}\ d + C_{60}^{\mathrm{D}97.5}$ $D_{60}^{P2.5}(d) \equiv A_{60}^{D2.5}\ d^2 + B_{60}^{D2.5}\ d + C_{60}^{\mathrm{D}2.5}$ • Solar: $(A_{60}^{S97.5}, B_{60}^{S97.5}, C_{60}^{S97.5})/(A_{60}^{S2.5}, B_{60}^{S2.5}, C_{60}^{S2.5})$ through regression $S_{60}^{P97.5}(s) \equiv A_{60}^{S97.5}\ s^2 + B_{60}^{S97.5}\ s + C_{60}^{\mathrm{S}97.5}$ $S_{60}^{P2.5}(s) \equiv A_{60}^{S2.5}\ s^2 + B_{60}^{S2.5}\ s + C_{60}^{\mathrm{S}2.5}$ • Wind: $(A_{60}^{W97.5}, B_{60}^{W97.5}, C_{60}^{W97.5})/(A_{60}^{W2.5}, B_{60}^{W2.5}, C_{60}^{W2.5})$ through regression $W_{60}^{P97.5}(w) \equiv A_{60}^{W97.5}\ w^2 + B_{60}^{W97.5}\ w + C_{60}^{\mathrm{W}97.5}$ $W_{60}^{P2.5}(w) \equiv A_{60}^{W2.5}\ w^2 + B_{60}^{W2.5}\ w + C_{60}^{\mathrm{W}2.5}$ *Note:* *lowercase (d, s, w) is for independent variables for forecasts* *uppercase (D,S,W) is the dependent variables for calculated uncertainty data, difference between DAM and RTPD*	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	to estimate A,B,C, use historical forecast and uncertainty data (historical uncertainty data will have 2 samples for each hour with max/min) *2 samples of uncertainty will be used in both high/low percentile regression, meaning same sample set for High/low percentile parameter estimation.*		
DAME-BRQ-02110	**Construct input of mosaic for high/low percentile mosaic regression** After rolling the Data Retention Period, for each Trading Hour in the Data Retention Period for the Day Type of the next Trading ~~Days~~Day (D+1~~ as well as D+2~~), for each BAA and DAM Area Based on Histogram and quadratic Quantile Regression estimates uncertainty of load, wind, and solar *Calculate:* ○ *Input (m=uncertainty of net load) for High percentile mosaic regression:* $m_{60}^{P97.5}(nd,d,s,w) \equiv ND_{60}^{H97.5} - \left(D_{60}^{H97.5} - S_{60}^{H2.5} - W_{60}^{H2.5}\right) + \left(D_{60}^{P97.5}(d) - S_{60}^{P2.5}(s) - W_{60}^{P2.5}(w)\right)$ ○ *Input (m) for Low percentile mosaic regression:* $m_{60}^{P2.5}(nd,d,s,w) \equiv ND_{60}^{H2.5} - \left(D_{60}^{H2.5} - S_{60}^{H97.5} - W_{60}^{H97.5}\right) + \left(D_{60}^{P2.5}(d) - S_{60}^{P97.5}(s) - W_{60}^{P97.5}(w)\right)$ Note: *There will be 2 samples of variable m created for each hour.*	Core	Internal ISO System
DAME-BRQ-02120	**Calculate and store the hourly second-order polynomial coefficients of the High /Low Percentile quadratic quantile regression for mosaic (M)** After rolling the Data Retention Period, for each Trading Hour in the Data Retention Period for the Day Type of the	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	next Trading ~~Days~~Day (D+1~~ as well as D+2~~), for each BAA and DAM Area Calculate and store the second-order polynomial coefficients of the High/low Percentile quadratic quantile regression of uncertainty of forecast of: • Mosaic (Net Demand): $(A_{60}^{M97.5}, B_{60}^{M97.5}, C_{60}^{M97.5})/(A_{60}^{M2.5}, B_{60}^{M2.5}, C_{60}^{M2.5})$ through regression $M_{60}^{P97.5}(m) \equiv A_{60}^{M97.5}\, m^2 + B_{60}^{M97.5}\, m + C_{60}^{\mathrm{M97.5}}$ $M_{60}^{P2.5}(m) \equiv A_{60}^{M2.5}\, m^2 + B_{60}^{M2.5}\, m + C_{60}^{\mathrm{M2.5}}$ *Note:* *In Quantile regression for Mosaic* • *m include* $\mathrm{m}_{60}^{\mathrm{P97.5}}$ and $\mathrm{m}_{60}^{\mathrm{P2.5}}$ for each hour calculated for historical *data according to BRQ1110* • *M include calculation of Net Load uncertainty max/min for historical data according to BRQ1080* • *2 samples of m and 2 samples of M will be used in both high/low percentile regression for parameter A,B,C estimation for M*		
DAME-BRQ-02130	**Calculate High/low percentile threshold for uncertainty of net demand (ND)** After rolling the Data Retention Period, the system shall calculate and store the hourly High/low Percentile Threshold net demand forecast uncertainty histogram $(ND_{60}^{H99})/(ND_{60}^{H1})$ for each Trading Hour in the Data Retention Period for the Day Type of the next Trading ~~Days~~Day (D+1~~ as well as D+2~~), for each BAA and DAM Area.	Core	Internal ISO System
DAME-BRQ-02140	**By 6:00am of DAM each Trading Day, the system shall broadcast the following hourly data** For each Trading Hour in the next Trading Day for the Day Type of that Trading ~~Days~~Day (D+1~~ as well as D+2~~), for each BAA and DAM Area:	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• the High/low Percentile hourly forecast uncertainty histogram for: • net demand: $(ND_{60}^{H97.5})/(ND_{60}^{H2.5})$ • demand: $(D_{60}^{H97.5})/(D_{60}^{H2.5})$ • adjusted solar: $(S_{60}^{H97.5})/(S_{60}^{H2.5})$ • adjusted wind: $(W_{60}^{H97.5})/(W_{60}^{H2.5})$ • the second-order polynomial coefficients of the High/low Percentile quadratic quantile regression of hourly forecast uncertainty ○ demand: $(A_{60}^{D97.5}, B_{60}^{D97.5}, C_{60}^{D97.5})/(A_{60}^{D2.5}, B_{60}^{D2.5}, C_{60}^{D2.5})$ ○ Solar: $(A_{60}^{S97.5}, B_{60}^{S97.5}, C_{60}^{S97.5})/(A_{60}^{S2.5}, B_{60}^{S2.5}, C_{60}^{S2.5})$ ○ Wind: $(A_{60}^{W97.5}, B_{60}^{W97.5}, C_{60}^{W97.5})/(A_{60}^{W2.5}, B_{60}^{W2.5}, C_{60}^{W2.5})$ ○ Mosaic (net load) $(A_{60}^{M97.5}, B_{60}^{M97.5}, C_{60}^{M97.5})/(A_{60}^{M2.5}, B_{60}^{M2.5}, C_{60}^{M2.5})$ • the hourly High/low Percentile Threshold forecast uncertainty histogram ○ net demand $(ND_{60}^{H99})/(ND_{60}^{H1})$ Note: Market DAM will consume data to forecast the IRU and IRD requirements (IRUR/IRDR). CMRI or OASIS will report the data		
DAME-BRQ-02150	**Set, Store and broadcast IRU/IRD Requirement Threshold** • Set and store configurable threshold to allow settings of the max/min IRU/IRD requirement for each BAA and DAM_AREA. If the threshold value is not provided, then 9999/0 is assumed. • Broadcast max/min IRU/IRD requirement thresholds for the next Trade ~~Days~~Day (D+1~~ as well as D+2~~) $(IRUR_{60}^{max})/(IRUR_{60}^{min})$; $IRDR_{60}^{max})/(IRDR_{60}^{min})$	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	for each BAA and DAM area Note: • The threshold value will be used by DAM to cap the IRU/IRD requirement. • The threshold values should be positive.		
DAME-BRQ-02300	**Set configurable IRU and IRD price cap for the DAM** Set configurable parameters for capping IRU and IRD demand curve respectively apply to every BAA. These parameters are subject to be scaled just like other penalty prices. Default parameters for • IRU price cap is $55/MWh • IRD price cap is $55/MWh	Core	Internal ISO System
DAME-BRQ-02310	**Consume DAM hourly forecast for demand, solar and wind for each BAA after 9 am** Consume the hourly demand, solar and wind forecast for DAM time horizon, aggregated for each BAA for next Trade ~~Days~~Day (D+1~~ as well as D+2~~).	Core	Internal ISO System (from IFM [Pre-DAM])
DAME-BRQ-02320	**Calculate hourly demand price curve for IRU and IRD for each BAA using latest forecast following the completion of [IFM pre-DAM] run, with avoidance cost of $247/MWh for IRU and -$150/MWh for IRD, and an administration cap of $55/MWh for both IRU/IRD** At 10 am, calculate hourly demand price curve for IRU/IRD by BAA for next Trade ~~Days~~Day (D+1~~ as well as D+2~~), based on the latest hourly forecast data: Monotonically decreasing stepwise price curve with *N* segments. Equidistant percentile selection from P_0 to $P_N^{(-)}$ (0.025) and from P_0 to $P_N^{(+)}$ (0.975):	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	$\left\{P_n^{(-)} = P_{n-1}^{(-)} - \frac{P_0 - P_N^{(-)}}{N}, n = 1,2,\dots,N\right\}$ and $\left\{P_n^{(+)} = P_{n-1}^{(+)} + \frac{P_N^{(+)} - P_0}{N}, n = 1,2,\dots,N\right\}$, where $P_0 = P_0^{(-)} = P_0^{(+)}$. The price curve quantities are the quantiles of the selected percentiles: $Q\left(P_0 = P_0^{(-)} = P_0^{(+)}\right) \equiv 0$, $\left\{Q\left(P_n^{(-)}\right), n = 1,2,\dots,N\right\}$, and $\left\{Q\left(P_n^{(+)}\right), n = 1,2,\dots,N\right\}$. These can be determined from the MOSAIC polynomial evaluation grid via linear interpolation. The price curve segment prices are the products of the probability of uncertainty materializing beyond the start of each segment and the relevant energy price cap: $\left\{P_n^{(-)}\ ENPF, n = 0,1,\dots,N-1\right\}$ and $\left\{\left(1 - P_n^{(+)}\right)\ ENPC, n = 0,1,\dots,N-1\right\}$, where $ENPF$ is the avoidance cost floor (–$150/MWh) and $ENPC$ is the avoidance cost ceiling [$247/MWh for IRU and -$150/MWh for IRD]). • For IRU demand price curve for each hour interval for each BAA in the EDAM Area: $\left\{Q\left(P_n^{(+)}\right), \left(1 - P_n^{(+)}\right)\ ENPC, \right\}$ $n = 0,1,2,\dots,N-1$ Where: N is the Price Curve Segment Count $ENPC$ is the avoidance cost ceiling P_0 is the percentile with zero quantile P_N^+ is the high percentile		

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	$Q\left(P_n^{(+)}\right) = A_{60}^{MP_n^+}\ \left(M_{60}^{PP_n^+}\right)^2 + B_{60}^{MP_n^+}\ M_{60}^{PP_n^+} + C_{60}^{MP_n^+}$ Where: $M_{60}^{PP_n^+} \equiv ND_{60}^{HP_n^+} - \left(D_{60}^{HP_n^+} - S_{60}^{H\left(1-P_n^+\right)} - W_{60}^{H\left(1-P_n^+\right)}\right) + \left(D_{60}^{PP_n^+}(d) - S_{60}^{P\left(1-P_n^+\right)}(s) - W_{60}^{P\left(1-P_n^+\right)}(w)\right)$ • For IRD demand price curve for each hour interval for each BAA in the EDAM Area: $\left\{Q\left(P_n^{(-)}\right), P_n^{(-)}\ ENPF\ , \atop n = 0,1,2,\ldots,N-1\right\}$ Where: ENPF is the avoidance cost floor P_0 is the percentile with zero quantile $P_N^{(-)}$ is the low percentile • no steps of the demand curve will exceed the administrative ceiling of $55/MWh for the imbalance reserve product Note $d - latest\ demand\ forecast\ for\ each\ BAA$ $w - latest\ wind\ forecast\ for\ each\ BAA$ $s - latest\ solar\ forecast\ for\ each\ BAA$		
DAME-BRQ-02340	**Broadcast IRU and IRD demand price curve before 10 am** Broadcast demand price curve for • IRU each hour each EDAM BAA for the DAM horizon (D+1~~ as well as D+2~~) before 10 am $\left\{Q\left(P_n^{(+)}\right), \left(1 - P_n^{(+)}\right)\ ENPC, \atop n = 0,1,2,\ldots,N-1\right\}$	Core	Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• IRD each hour each EDAM BAA for the DAM horizon before 10 am $\left\{Q\left(P_n^{(-)}\right), P_n^{(-)}\ ENPF\ , \atop n = 0,1,2,\ldots,N-1\right\}$		

5.3 Business Process: Calculate & Monitor Energy Costs & Indices

- Setting IR/RC DAB for Calculated Ranking Option
- Negotiated Rate IR/RC DAB (NDAB)
- Process for Establishing an NDAB for IRU or RCU
- Setting IR/RC DAB for Negotiated Option (NDAB)

5.3.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-03040	**Setting IR/RC DAB for Calculated Ranking Option** • For resources (including NGRs) that have market product DAB Options Ranking set to "Calculated" as first option, System shall automatically set the DAB for these resources for that market product to a configurable values (initially set as below): **Market Product** / **DAB** IRU / $55/MWh IRD / $55/MWh RCU / $55/MWh RCD / $55/MWh • There shall be separate DAB for IRU, IRD, RCU and RCD. • The IRU/IRD and RCU/RCD DAB shall have single segment. • The x-axis of all DABs shall be set to the entire Registered MW Capacity of the eligible resource, specifically calculated as: o Registered Max Capacity (Pmax) minus Registered Min Capacity (Pmin). • The IRU/IRD and RCU/RCD DAB shall be resource-specific daily granularity.	Core	• Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• The DAB value shall be applied to all the EDAM resources, include CASIO and EDAM BAAs. **Note:** • The resource-specific daily DAB for IRU and RCU market products are needed for market power mitigation of IRU and RCU bids, respectively, as well as IRU and RCU bid insertion/creation in SIBR, respectively. • The resource-specific daily DAB for IRD and RCD market products are needed for IRD and RCD bid insertion/creation in SIBR, respectively. • Registered Pmin is negative for NGRs.		
DAME-BRQ-03060	**Negotiated Rate IR/RC DAB (NDAB)** System shall process IRU, IRD, RCU, and RCD DAB if all the following conditions are met: • Their resources elect Negotiated Rate DAB (NDAB) (for IRU, IRD, RCU, and RCD, respectively) as rank "1" • If the requested Negotiated Rate DAB (NDAB) is greater than the corresponding Calculated DAB (currently defaulted at $55/MWh) (business process). **Notes** • Resources' SCs shall be responsible of negotiating the IRU/IRD and RCU/RCD NDAB if that option is applicable and will initiate the negotiation process. • The ability for an SC to negotiate for an NDAB is suspended until CAISO issues a market notice it has gained the required operational experience about IR and RC NDAB. • If CAISO does not issue market notice, the suspension period will end after 18 months from Tariff activation date (Go-Live date).	Core	• Internal ISO System
DAME-BRQ-03070	**Process for Establishing an NDAB for IRU or RCU** The following process shall be adhered to for establishing NDAB for IRU or RCU:	Business Process	• Internal ISO System • CIDI

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted

	• SC submits proposed NDAB along with supporting documentation via CIDI.
	• CAISO will provide written response within 10 business days of the SC's submitted application.
	• If CAISO accepts the SC-proposed NDAB, it will be effective within 11 business days of the date of acceptance until:
	  ○ FERC modifies NDAB
	  ○ CAISO and SC mutually agree to modify NDAB.
	  ○ NDAB expires, get terminated, or modified by FERC order.
	• If CAISO rejected the SC-proposed NDAB, CAISO and SC will negotiate agreeable NDAB within 60 days negotiation period and it will become effective within 11 business days of the date of acceptance. If no agreement by end of 60 days, SC can file proposed NDAB with FERC and the DAB for IRU and RCU will be set to $55/MWh until negotiation between SC and FERC is completed.
	• CAISO may require renegotiation the NDAB if the negotiated values become outdated, or erroneous, or if the SC has changed and may request the SC to provide more information.
	• CAISO shall make informational filing with FERC for any NDAB no later than 7 days after the end of the month in which CAISO approved the NDAB.		

DAME-BRQ-03080	**Setting IR/RC DAB for Negotiated Option (NDAB)** For resources (including NGRs) that have market product DAB Options Ranking set to "Negotiated" as first option, System shall automatically set the NDAB for these resources based on the value or formulation that was negotiated with the SC. • There shall be separate NDAB for IRU, IRD, RCU and RCD. • The IRU/IRD and RCU/RCD NDAB shall have single segment. • The IRU/IRD and RCU/RCD NDAB shall be resource-specific daily granularity.	Core	• Internal ISO System

5.4 Business Process: Manage DAM – IFM

- Setup the configurable set of transmission constraints activate in IRU/IRD deployment scenarios
- Set up the configurable parameter for specify the IRU/IRD deployment scenarios percentage of contribution towards the transmission constraint
- Accept and validate IRU/IRD bids, MOO apply to Flex RA
- Accept and validate RCU/RCD bids, MOO apply to RA
- Consume hourly Histogram and second-order polynomial coefficients for IRU/IRD
- Calculate/broadcast 6&9 am hourly IRU/IRD requirements (IRUR/IRDR)
- Set IRU demand price curve
- Distribute IRUR/IRDR to load and VER nodes
- Include IRU/IRD deployment scenarios, use same SF as case cases
- Apply LMPM for energy bid by Including IRU and IRD deployment scenario in DCPA counter flow calculation and Energy LMP calculation
- Apply LMPM for IRU bid by including IRU deployment scenario in DCPA counter flow calculation and IRU nodal price calculation
- Procure IRU/IRD through co-optimization with energy and AS
- Calculate LMP for energy and IRU/IRD

5.4.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted

DAME-BRQ-04004	**Specify the set of transmission constraints for IRU/IRD deployment scenarios**
	• Setup the configurable set of transmission constraints activate in IRU or IRD deployment scenarios
	  ○ By individual constraint: enable or disable the constraints in IRU/IRD deployment scenarios, provide ability to group the constraints
	  ○ The changes should persistent , default is to enforce all critical constraints
	  ○ A constraint can't be activated for deployment scenarios only; if the constraint is not activated in base scenario, the activation in deployment scenario won't be in effect.
	• Build Operator display for control the activate transmission constraint in deployment scenarios
		Core	DAM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• The same set of constraints in deployment scenarios apply to all the IFM passes, in MPM,GHG pass, IFM		
DAME-BRQ-04005	**Specify configurable IRU and IRD deployment factors (DIRU/DIRD) configure portion of power flow related the IRU and IRD deployment scenarios** • Set up the configurable deployment factors between 0 to 1 for specify the IRU/IRD deployment scenarios percentage of contribution on power flow towards the transmission constraint. Default value is 1 **Note:** • The deployment factors (DIRU/DIRD) will affect IR MCC, consider the deployment factor in MPM, CRR 1B • The product of DIRU/DIRD and shift factor should be higher than Shift Factor tolerance	Core	DAM
DAME-BRQ-04008	**Allow eligible resource to submit one-segment bid for Imbalance Reserve upward and downward: IRU, IRD** • Access MF defined resource eligibility for IR, each flag for each corresponding product: IRU,IRD, • Access MF defined resource Certified Capacity MW for IRU and IRD • Access MF defined BAA-Specific EDAM Participation Flag. • Allow the eligible resource, include intertie resource, with resource ID defined in MF to submit one-segment bid of the IRU and/or IRD for the resource associated eligible flag • Transaction ID (not pre-registered in MF) are not allowed to bid for IRU/IRD • Not allow the following resource types to bid for IRU/IRD. o The non-participating load o Virtual supply/demand o Hourly block import/export o 60-minute PDR o 60-minute RDRR **Note:** • Refer to **Resource Eligibility Table** in **Appendix-B: Formulas, Calculation Details, and Examples**	Core	SIBR (from MF)

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-04010	**Set up configurable value for ramp intervals eligible for IRU/IRD , initial 30 minute** • System shall allow the market engineer to configure the ramp intervals eligible for IRU/IRD, initial value is 30 minute. • System shall use the latest configured the ramp interval in DAM.	Core	DAM

DAME-BRQ-04020	**Allow eligible resource to submit one-segment bid for Reliability Capacity (RC) upward and downward: RCU, RCD**
	• Access MF defined resource eligibility in RUC each flag for each corresponding product: RCU, RCD.
	• Access MF defined resource Certified Capacity MW for RCU and RCD.
	• Allow the resource with resource ID defined, include intertie resource in MF to submit one-segment bid of the RCU and/or RCD product that is associated eligible flag
	• Not allow 15 minute and 60 minute dispatch-able intertie import/export resources with transaction ID (not pre-registered in MF) to bid for RCU/RCD
	• Not allow the following resource type to bid for RCU/RCD.
	  ○ The non-participating load
	  ○ Virtual supply/demand
	Note:
	• Refer to **Resource Eligibility Table** in **Appendix-B: Formulas, Calculation Details, and Examples**
		Core	SIBR
			(from MF)

DAME-BRQ-04030	**Allow eligible VER to bid for IRU, IRD, RCU, RCD** • Allow VERs with relevant IR and RC eligibility flags to bid IRU and/or IRD same as other resources • Allow VERs with eligible flags to bid RCU and RCD, ○ VER can bid any price for RCU/RCD, same as other resource • If VER is RA, RA resource SIBR rule apply **Notes**	Core	SIBR

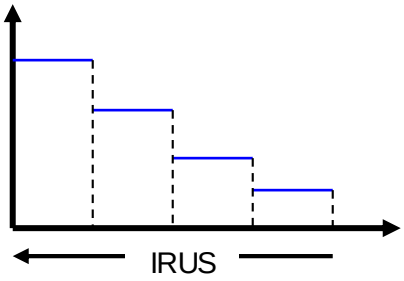
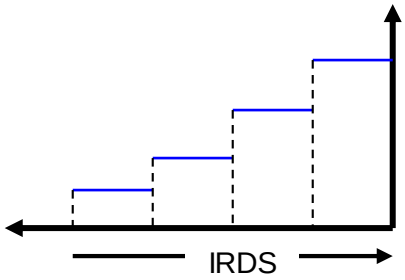
ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• Restrict all VERs upper economic limit in IFM/RUC to their VER forecast • Extending the RCU/RCD bid in RUC up to VER forecast • In settlement remove VERs from RCU/RCD cost allocation. • RMR resources shall be treated as generating resources.		
DAME-BRQ-04031	**Apply VER bid obligation for RCU up to certified capacity** • Inserting a RCU bid using DAB for VERs up to their certified RCU capacity if they do not bid • Extending a submitted RCU bid for VERs up to their certified RCU capacity if bid not cover the applicable capacity.	Core	SIBR

DAME-BRQ-04040	**Enforce Flex RA resource Must Offer Obligation (MOO) for Energy**
	• Only allow Flex RA to submit self-schedule energy at Pmin
	• For Flex RA capacity, MOO and bid insertion for energy:
	  ○ resource shall submit both economic energy bids for full flex RA capacity in DAM
	  ○ Insert DEB for energy for the flex RA capacity without economic bids
	  ○ Extend the last bid segment for energy if the economic bids not cover the full flex RA capacity
	Note:
	Any resources that are awarded IRU/IRD shall be subject to MOO in RTM.
		Core	SIBR
			(from CIRA)

DAME-BRQ-04060	**All the RA resources have MOO for RCU, optional for RCD and allow non-zero bid** • Resource adequacy resources (Generic and Flex) will be able to bid non-zero prices for reliability capacity RCU/RCD. ○ **Note:** This shall also apply to NGRs without REM too. • For all RA capacity, MOO and bid insertion for RCU apply up to UEL. • Resource can optional bid for RCD.	Core	SIBR

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• If RA capacity has no economic RCU bids, system shall insert RCU DABs for RCU in DAM ○ **Note:** RMR resources shall be treated as generating resources. ○ If RA capacity has no energy bids or self-schedule insert default energy bid (DEB) (existing)		
DAME-BRQ-04070	**Supporting supply resource bid for RCU for PT-Export** Incorporate Summer readiness 2021 rule for supporting the PT-export for RCU • Non-RA supply resources designated to support a PT export shall bid for RCU to the quantity being used to support the PT export, resource is allowed to bid non-zero prices • If the supporting supply resource has no RCU bid, system shall insert DAB to cover the range that that supports sum of PT-exports associate with the supporting resource	Core	SIBR
DAME-BRQ-04072	**Supporting supply resource submit positive or negative bid component for Daily Minimum Energy Limit** System shall support supply resource submittal of positive or negative bid component for Daily Minimum Energy Limit.	Core	SIBR
DAME-BRQ-04080	**Accept and validate IRU/IRD bid** • Market participants will submit separate IR bids for IRU, IRD • IRU/IRD bids shall be a single segment ($/MWh) of capacity products. IRU/IRD bids can have different hourly bids. • IRU/IRD bids shall have energy bids cover the IRU/IRD range • The IRU, IRD bids will subject to corresponding IRU, IRD bid price configurable Caps $55/MWh as default , floor $0/MWh as default • The capacity bid MW quantity must be greater than zero and will be capped by the minimum of associated registered quantities from MF and Pmax, forecast • Modify the Raw Bids and Clean Bids include market product type IRU and IRD	Core	SIBR
DAME-BRQ-04090	**Accept and validate RCU/RCD capacity bids** • Market participants will submit separate bids for RCU, RCD	Core	SIBR

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• A single segment ($/MWh) for capacity products RCU, RCD. RCU/RCD bids can have different hourly bids. • Energy bids shall be required to cover for RCU/RCD bids range (except for VER, since they don't have to bid En for RCU). • RCU/RCD will subject bid cap $250/MWh, floor $0/MWh • The capacity bid MW quantity must be greater than zero and will be capped by the minimum of associated certification quantities and Pmax • Modify the Raw Bids and Clean Bids replace market product RUC with RCU and RCD **Notes** • In SIBR, no forecast is consumed in current design, so the VER forecast limit will be enforced in IFM and RUC. • Reliability capacity up and down bid prices will be capped at $250/MWh.		
DAME-BRQ-04130	**Set configurable parameters for Imbalance Reserve Penalty Prices in DAM** • For IRU, define single penalty cost for that higher than the LPT self-schedule export in schedule run and price run separately Note: use penalty cost in EDAM DA RSE for IRU/IRD resource sufficiency evaluation of the BAA.	Core	[IFM pre-DAM]
DAME-BRQ-04131	**IRU/IRD Requirements (IRUR/IRDR) subjects to demand price curve** • Apply the demand price curve to the relax variable for the IRU/IRD Requirement (IRUR/IRDR). Note: no calculation change for demand price curve for ISO and other EDAM BAAs	Core	DAM
DAME-BRQ-04132	**Consume and Display IRU/IRD demand price curve**	Core	DAM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	At 10 am, the system shall consume and display the IRU and IRD demand price curves $\{Q_k, P_k, k = 1,2,\dots, n\}$ for each hour interval of the DAM market horizon for each BAA in the EDAM Area. Note: Same as FRU, the IRU demand price curve has increasing positive quantities (an ascending ordering shall be performed on the quantities to ensure the MW quantities monotonically increasing) and decreasing positive prices:  Same as FRD, the IRD demand price curve has decreasing negative quantities (a descending ordering shall be performed on the quantities to ensure the MW quantities monotonically decreasing) and decreasing positive prices  		(from Internal ISO System)
DAME-BRQ-04134	**Apply IRU/ IRD demand price curve on IRU/IRD surplus variables in optimization to procure IRU/IRD** • Cover the IRUR/IRDR range: system shall extend or prune the end of the IRU/IRD demand price curve for each BAA	Core	DAM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	in the EDAM Area to match the corresponding IRU/IRD Requirement (IRUR/IRDR) distributed to that BAA: $Q_n = IRUR$ for IRU $Q_n = -IRDR$ for IRD • Transform **demand price curve** to monotonic increase price curve for surplus variables for IRU/IDR for each hour each BAA ○ Flip the monotonically decreasing IRU demand price curve form the monotonically increasing price curve for the IRU surplus that varies from zero to $IRUR$. All Q_i capped by Q_n. ○ Offset the IRD demand price curve by $+IRDR$ to form the monotonically increasing price curve for the IRD surplus that varies from zero to $IRDR$. All Q_i shall be capped by Q_n • Limit from above all segments of the IRU/IRD price curve by the IRU/IRD configurable cap price $55 • /MWh.		
DAME-BRQ-04134A	**Apply IRU/IRD demand price curve to IRU/IRD surplus in proportion to IRUR/IRDR in that surplus zone** The system shall allocate the IRU/IRD demand price curve for each interval of the market horizon for each BAA in the EDAM Area to the IRUS/IRDS of Surplus Zones of that BAA in proportion to the distributed IRU/IRD requirement in that zone. $\sum_{t=1}^{N}\sum_{j\in EIM} IRUSP_{j,t}\sum_{z\in Z_j} IRUS_{z,j,t} + \sum_{t=1}^{N}\sum_{j\in EIM} IRDSP_{j,t}\sum_{z\in Z_j} IRDS_{z,j,t}$	Core	DAM
DAME-BRQ-04135	**BAA IRU/IRD Procurement constraints include IRU/IRD surplus in the BAA IR surplus zones** • The system shall retrieve all defined IR Surplus Zones and their BAA association from Master File	Core	DAM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• BAA IRU/IRD procurement constraints include multiple IRUS/IRDS for multiple IR surplus zones in the BAA $$\sum_{i \in BAA_j} IRU_{i,t} + \sum_{z \in Z_j} IRUS_{z,j,t} = IRUR_{j,t}$$ $$0 \leq IRUS_{z,j,t}, \forall z \in Z_j$$ $$\sum_{i \in BAA_j} IRD_{i,t} + \sum_{z \in Z_j} IRDS_{z,j,t} = IRDR_{j,t}$$ $$0 \leq IRDS_{z,j,t}, \forall z \in Z_j$$ • The system shall distribute the IRU/IRD surplus in each interval of the market horizon in the IRU/IRD deployment scenario as negative load to the load and VER nodes in the respective IR Surplus Zone with the same distribution factors used for distributing the IRU/IRD requirement in that zone. $$IRUS_{i,z,j,t} = \frac{\Delta L_{i,t}^{(u)}}{\sum_{i \in S_z} \Delta L_{i,t}^{(u)}} IRUS_{z,j,t}, \forall i \in S_z, \forall z \in Z_j$$ $$IRDS_{i,z,j,t} = \frac{\Delta L_{i,t}^{(d)}}{\sum_{i \in S_z} \Delta L_{i,t}^{(d)}} IRDS_{z,j,t}, \forall i \in S_z, \forall z \in Z_j$$ • The IRU/IRD surplus in each surplus zone within each BAA in the EDAM Area shall be limited to the distributed IRU requirement in that surplus zone $$\sum_{z \in Z_j} IRUS_{z,j,t} \leq \widehat{IRUR}_{j,t} \equiv \sum_{z \in Z_j} \sum_{i \in S_z} \Delta L_{i,t}^{(u)}$$ $$\sum_{z \in Z_j} IRDS_{z,j,t} \leq \widehat{IRDR}_{j,t} \equiv -\sum_{z \in Z_j} \sum_{i \in S_z} \Delta L_{i,t}^{(d)}$$		
DAME-BRQ-04136	**Transmission Constraints with IR surplus zones** Include the IRUS/IRDS nodal contribution on constraint, using IRUS nodal shift factor for the IR surplus zone $$\widetilde{LFL}_{m,t} \leq \tilde{F}_{m,t} + \sum_i \left(\Delta EN_{i,t} + DFIRU\ IRU_{i,t} + \Delta VS_{i,t} - \Delta VD_{i,t} - \Delta L_{i,t}\right) SF_{i,m,t} + DFIRU \left(\sum_{j \in EDAM} \sum_{z \in Z_j} IRUS_{z,j,t}\, SF_{z,j,m,t}^{(u)} - IRUR_t SF_{m,t}^{(u)} \right) \leq \widetilde{UFL}_{m,t}$$	Core	DAM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	$\widetilde{LFL}_{m,t} \leq \tilde{F}_{m,t} + \sum_i \left(\Delta EN_{i,t} - DFIRD\ IRU_{i,t} + \Delta VS_{i,t} - \Delta VD_{i,t} - \Delta L_{i,t}\right) SF_{i,m,t}$ $- DFIRD \left(\sum_{j \in EDAM} \sum_{z \in Z_j} IRDS_{z,j,t}\ SF^{(d)}_{z,j,m,t} - IRDR_t SF^{(d)}_{m,t} \right) \leq \widetilde{UFL}_{m,t}$		
DAME-BRQ-04137	**Include the APnode of surplus zones shift factors in shift factor set in each market pass** System shall include the APnode of surplus zones shift factors in shift factor set in each market pass.	Core	DAM
DAME-BRQ-04140	**Consume Histogram and the second-order polynomial coefficients for DAM hourly (60min) IRU and IRD** for each Trading Hour of the next Trading ~~Days~~Day (D+1~~ as well as D+2~~), for each BAA and DAM Area: • the High/low Percentile hourly forecast uncertainty histogram for: • net demand: $(ND_{60}^{H97.5})/(ND_{60}^{H2.5})$ • demand: $(D_{60}^{H97.5})/(D_{60}^{H2.5})$ • adjusted solar: $(S_{60}^{H97.5})/(S_{60}^{H2.5})$ • adjusted wind: $(W_{60}^{H97.5})/(W_{60}^{H2.5})$ • the second-order polynomial coefficients of the High/low Percentile quadratic quantile regression of hourly forecast uncertainty ○ demand: $(A_{60}^{D97.5}, B_{60}^{D97.5}, C_{60}^{D97.5})/(A_{60}^{D2.5}, B_{60}^{D2.5}, C_{60}^{D2.5})$ ○ Solar: $(A_{60}^{S97.5}, B_{60}^{S97.5}, C_{60}^{S97.5})/(A_{60}^{S2.5}, B_{60}^{S2.5}, C_{60}^{S2.5})$ ○ Wind: $(A_{60}^{W97.5}, B_{60}^{W97.5}, C_{60}^{W97.5})/(A_{60}^{W2.5}, B_{60}^{W2.5}, C_{60}^{W2.5})$ ○ Mosaic (net load) $(A_{60}^{M97.5}, B_{60}^{M97.5}, C_{60}^{M97.5})/(A_{60}^{M2.5}, B_{60}^{M2.5}, C_{60}^{M2.5})$ • the hourly High/low Percentile Threshold forecast uncertainty histogram ○ net demand $(ND_{60}^{H99})/(ND_{60}^{H1})$ • Threshold value of IRU and IRD requirements $(IRUR_{60}^{max})/(IRUR_{60}^{min})$; $IRDR_{60}^{max})/(IRDR_{60}^{min})$ Note:	Core	DAM [pre-DAM close] (from Internal ISO System)

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	General rule: For IRU, using P97.5 for load, P2.5 for solar and wind, for IRD, using P2.5 for load P97.5 for solar and wind		
DAME-BRQ-04150	**Calculate the hourly IRU/IRD requirements (IRUR/IRDR) every time [IFM pre-DAM] runs for D+1** For each Trading Hour of the next Trading ~~Days (D+1 as well as~~ Day (D+~~2~~1) of the day type, for each BAA and DAM Area use the corresponding parameters from D+1 to calculate: • Imbalance reserve upper requirement (IRUR): $IRUR_{60} = A_{60}^{M97.5} (M_{60}^{P97.5})^2 + B_{60}^{M97.5} M_{60}^{P97.5} + C_{60}^{M97.5}$ Where: $M_{60}^{P97.5}(nd,d,s,w) \equiv ND_{60}^{H97.5} - (D_{60}^{H97.5} - S_{60}^{H2.5} - W_{60}^{H2.5}) + (D_{60}^{P97.5}(d) - S_{60}^{P2.5}(s) - W_{60}^{P2.5}(w))$ $D_{60}^{P97.5}(d) \equiv A_{60}^{D97.5} d^2 + B_{60}^{D97.5} d + C_{60}^{D97.5}$ $S_{60}^{P2.5}(s) \equiv A_{60}^{S2.5} s^2 + B_{60}^{S2.5} s + C_{60}^{S2.5}$ $W_{60}^{P2.5}(w) \equiv A_{60}^{W2.5} w^2 + B_{60}^{W2.5} w + C_{60}^{W2.5}$ • Imbalance reserve down requirement (IRDR): $IRDR_{60} = A_{60}^{M2.5} (M_{60}^{P2.5})^2 + B_{60}^{M2.5} M_{60}^{P2.5} + C_{60}^{M2.5}$ Where: $M_{60}^{P2.5}(nd,d,s,w) \equiv ND_{60}^{H2.5} - (D_{60}^{H2.5} - S_{60}^{H97.5} - W_{60}^{H97.5}) + (D_{60}^{P2.5}(d) - S_{60}^{P97.5}(s) - W_{60}^{P97.5}(w))$ $D_{60}^{P2.5}(d) \equiv A_{60}^{D2.5} d^2 + B_{60}^{D2.5} d + C_{60}^{D2.5}$ $S_{60}^{P97.5}(s) \equiv A_{60}^{S97.5} s^2 + B_{60}^{S97.5} s + C_{60}^{S97.5}$ $W_{60}^{P97.5}(w) \equiv A_{60}^{W97.5} w^2 + B_{60}^{W97.5} w + C_{60}^{W97.5}$ **Notes** • $d - latest\ demand\ forecast\ for\ each\ BAA\ and\ DAM\ Area$ • $w - latest\ wind\ forecast\ for\ each\ BAA\ and\ DAM\ Area$ • $s - latest\ solar\ forecast\ for\ each\ BAA\ and\ DAM\ Area$	Core	IFM [pre-DAM close]

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• There shall be no dependency between DAME and EDAM; the IRU/IRD Requirements (IRUR/IRDR) shall be calculated even if EDAM RSE is not yet available.		
DAME-BRQ-04155	**Calculate the hourly IRU/IRD requirements (IRUR/IRDR) for D+2 and D+3** For each Trading Hour of the next Trading Days (D+2 and D+3) of the day type, for each BAA and DAM Area use the corresponding parameters from D+1 to calculate: • Imbalance reserve upper requirement (IRUR): • Imbalance reserve down requirement (IRDR): **Notes** • IRUR/IRDR shall be calculated for D+2 and D+3 using same formulation as the ones used for D+1 (refer to DAME-BRQ-04150). • There shall be no dependency between DAME and EDAM; the IRU/IRD Requirements (IRUR/IRDR) shall be calculated even if EDAM RSE is not yet available.	Core	IFM [pre-DAM close]
DAME-BRQ-04160	**The system shall bound the hourly IRU/IRD Requirements (IRUR/IRDR)** for each Trading Hour of the next Trading Day, for each BAA and DAM Area $$IRUR_{60} = max\begin{pmatrix} IRUR_{60}^{min}, ND_{60}^{H1}, \\ min\left((ND_{60}^{H99}, IRUR_{60}, IRUR_{60}^{max}\right)) \end{pmatrix}$$ $$IRDR_{60} = min\begin{pmatrix} -1 * IRDR_{60}^{min}, ND_{60}^{H99}, \\ max\left((ND_{60}^{H1}, IRDR_{60}, -1 * IRDR_{60}^{max})\right) \end{pmatrix}$$	Core	~~DAM~~ ~~[~~IFM [IFM pre-DAM close]
DAME-BRQ-04180	**The system shall calculate the IRU requirement allocation factors to demand, solar, and wind for each hour of the trading day for ISO BAA:**	Core	DAM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• $IRUDF_{60}(d,s,w) \equiv \frac{\lvert D_{60}^{P97.5}(d)\rvert}{\lvert D_{60}^{P97.5}(d)\rvert+\lvert S_{60}^{P2.5}(s)\rvert+\lvert W_{60}^{P2.5}(w)\rvert}$ • $IRUSF_{60}(d,s,w) \equiv \frac{\lvert S_{60}^{P2.5}(s)\rvert}{\lvert D_{60}^{P97.5}(d)\rvert+\lvert S_{60}^{P2.5}(s)\rvert+\lvert W_{60}^{P2.5}(w)\rvert}$ • $IRUWF_{60}(d,s,w) \equiv \frac{\lvert W_{60}^{P2.5}(w)\rvert}{\lvert D_{60}^{P97.5}(d)\rvert+\lvert S_{60}^{P2.5}(s)\rvert+\lvert W_{60}^{P2.5}(w)\rvert}$		
DAME-BRQ-04190	**The system shall calculate the IRD requirement allocation factors to demand, solar, and wind for each hour of the trading day for ISO BAA**, • $IRDDF_{60}(d,s,w) \equiv \frac{\lvert D_{60}^{P2.5}(d)\rvert}{\lvert D_{60}^{P2.5}(d)\rvert+\lvert S_{60}^{P97.5}(s)\rvert+\lvert W_{60}^{P97.5}(w)\rvert}$ • $IRDSF_{60}(d,s,w) \equiv \frac{\lvert S_{60}^{P97.5}(s)\rvert}{\lvert D_{60}^{P2.5}(d)\rvert+\lvert S_{60}^{P97.5}(s)\rvert+\lvert W_{60}^{P97.5}(w)\rvert}$ • $IRDWF_{60}(d,s,w) \equiv \frac{\lvert W_{60}^{P97.5}(w)\rvert}{\lvert D_{60}^{P2.5}(d)\rvert+\lvert S_{60}^{P97.5}(s)\rvert+\lvert W_{60}^{P97.5}(w)\rvert}$	Core	DAM
DAME-BRQ-04200	**The system shall distribute the IRU/IRD Requirement (IRUR/IRDR) allocated to demand nodes, superimposed on the load schedule** For each hour of the trading day in the IR deployment scenario, with the same distribution factors (LDF) used for distributing the demand forecast in RUC • Allocate IRU as positive load to the load nodes: $\Delta L_{i,t}^{(u)} = (LDF_{i,t} * IRUR_{60} * IRUDF_{60}(d,s,w))$ • Allocate IRD as negative load to the load nodes: $\Delta L_{i,t}^{(d)} = (-LDF_{i,t} * IRDR_{60} * IRDDF_{60}(d,s,w))$	Core	DAM
DAME-BRQ-04210	**Calculate solar and wind distribution Factors of each VER nodes proportion to the forecasts:** Solar Resource distribution factor: $SDF_{i,t} = \frac{FS_{i,t}}{\sum_i FS_{i,t}}$ Wind Resource distribution factor: $WDF_{i,t} = \frac{FW_{i,t}}{\sum_i FW_{i,t}}$	Core	DAM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-04220	**Distribute the IRU/IRD Requirement (IRUR/IRDR) to VER nodes, superimposed on the VER schedule** • Distribute IRU as positive load to the Solar and wind VER nodes: $\Delta L_{i,t}^{(u)} = (SDF_{i,t} * IRUR_{60} * IRUSF_{60}(d,s,w))$ $\Delta L_{i,t}^{(u)} = (WDF_{i,t} * IRUR_{60} * IRUWF_{60}(d,s,w))$ • Distribute IRD as negative load to the solar and wind VER nodes: $\Delta L_{i,t}^{(d)} = (-SDF_{i,t} * IRDR_{60} * IRDSF_{60}(d,s,w))$ $\Delta L_{i,t}^{(d)} = (-WDF_{i,t} * IRDR_{60} * IRDWF_{60}(d,s,w))$	Core	DAM
DAME-BRQ-04230	**IRU/IRD additional deployment scenarios use same topology as base case and base with contingencies in NA, apply DIRU/DIRD on the specified set of transmission constraints** • No additional AC power flow runs for IRU/IRD deployment scenarios, instead use same base cases and contingencies cases shift factors set to calculate the transmission constraints for IRU, and for IRD deployment scenarios for each intervals (DAME-BRQ-04310) • Apply the DIRU/DIRD contribution of IRU/IRD deployment scenarios (parameter defined in DAME-BRQ-04005) in the transmission constraints • Only enforce the set transmission constraints (specified in DAME-BRQ-04004) in IRU/IRD deployment scenarios	Core	DAM
DAME-BRQ-04232	**Identify the critical constraints for IRU/IRD deployment scenarios** Determine the critical set in the deployment scenarios superimposing the linear IR flows from UC **Note** • Refer to DAME-BRQ-06070 for RTM.	Core	DAM
DAME-BRQ-04235	**Calculate Shift Factors for base case and base case with contingencies** Calculate Shift factor based on AC power flow runs: • Shift Factor $SF_{i,m,t}$ for the node i on transmission m and hour t of base case • Shift Factor $SF_{i,m,t}^{(k)}$ for N-1 preventive transmission contingencies	Core	DAM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• Shift Factor $SF_{i,m,t}^{(g)}$ for GCARM generation/transmission contingencies • Adjusted Shift Factor $SF'_{i,m,t}^{(g)}$ for GCARM generation/transmission contingencies with post-contingency correction • Store the calculated the shift factors. Note: The same Shift factors will apply to the base scenario, IRU/IRD deployment scenarios in IFM, and RUC RCU/RCD procurement		
DAME-BRQ-04240	**Apply LMPM for energy bid by Including IRU and IRD deployment scenario in DCPA counter flow calculation and Energy LMP calculation** • For IRU deployment scenario: To calculate counter flow for the binding transmission constraint from the resource shall be the product of negative shift factor and energy schedule plus IRU award • For IRD deployment scenario: To calculate counter flow for the binding transmission constraint from the resource shall be the product of negative shift factor and energy schedule minus IRD award; no mitigation for IRD bid, but still should be considered for En bid mitigation • To calculate the Energy competitive LMP for each node, o Calculate LMP's congest cost MCC that include energy, IRU deployment scenario and IRD deployment scenario o Break the LMP congestion cost MCC into two components: non-competitive component (based on DCPA uncompetitive paths that include IRU/IRD deployment scenarios in the counter-flow) and a competitive component. o Calculate the nodal competitive LMP that exclude the non-competitive MCC.	Core	IFM-MPM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• Apply the LMPM for the applicable resource's energy bid mitigate it to the higher of the default energy bid (DEB) and its competitive LMP		
DAME-BRQ-04250	**Apply LMPM for IRU bid by Including IRU deployment scenario in DCPA counter flow calculation and IRU nodal price calculation** • Build Activation switch for turn on/off of IR LMPM function • In DCPA process, the counter flow calculation, to determine the uncompetitive paths: • For IRU deployment scenario: same uncompetitive paths as in DCPA with IRU deployment for energy LMPM • To calculate the IRU competitive nodal price for each node, o Calculate IRU nodal price congest cost MCC that include energy, IRU deployment scenario o Break the IRU nodal price congestion cost MCC into two components: non-competitive component (based on DCPA uncompetitive paths that include IRU deployment scenarios in the counter-flow) and a competitive component. o Calculate the nodal competitive IRU price that exclude the non-competitive MCC. • Apply the existing LMPM for the applicable resource's IRU bid mitigate it to greater of (its nodal competitive IRU price and IRU DAB) if it below submitted bid. Note: LMPM applies to IRU only, not for IRD.	Core	IFM-MPM
DAME-BRQ-04260	**System shall procure IRU/IRD through co-optimization with energy and AS** **Objective function:** • Include IRU/IRD bid costs in Objective function. • IRU can be provided by offline 15min-start units • IRD can only be provided by online resources • MSG configuration in transition cannot provide IRU/IRD	Core	IFM, IFM-MPM
DAME-BRQ-04280	**Procurement constraints for IRU/IRD in co-optimization energy, AS and IR**	Core	IFM, IFM-MPM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• Keep power balance constraint unchanged, include losses • Keep ancillary services procurement constraints unchanged • Add IRU/IRD procurement constraints to meet IRU/IRD Requirements (IRUR/IRDR) for each hour for each BAA and for EDAM area in DAM.		
DAME-BRQ-04290	**Capacity constraints for IRU/IRD in co-optimization energy, AS and IR** • Include IRU/IRD upper/lower bound constraints for each resource by certified quantities. • Include IRU/IRD with energy and AS in resource upper/lower bound capacity constraint • Include IRU/IRD with AS capacity awards in resource upper/lower bound adjusted economic limit constraint For VER: • VER for IRU/IRD, UOL/UEL limited by VER forecast	Core	IFM, IFM-MPM

DAME-BRQ-04300	**Ramp capability constraints for IRU/IRD in co-optimization energy, AS and IR**
	• Include IRU/IRD with energy and AS in resource ramp capability constraint
	• The ramp capability constraint for offline start up at beginning of the hour to support IRU and upward AS
	• The ramp capability constraint for the resource shut down at the end of hour to support IRD and downward AS
	• Use dynamic ramp capability on IRU/IRD awards.
	  ○ For resource remain on-line, AS and IRU/IRD Capacity awards and day ahead energy schedule changes across hours share the resource dynamic ramp capability, use granularity adjustment factor 2 converts 30-min IRU/IRD awards to the hourly.
	  ○ For resource start up use configurable granularity adjustment factor (defaulted to 2) for IRU
	  ○ For resource shut down use configurable granularity adjustment factor (defaulted to 2) for IRD. (same factor as the one used for IRU)
	Note:
		Core	IFM, IFM-MPM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	With the adjustment factor, there is no need to develop 15min dynamic ramp for IRU/IRD		
DAME-BRQ-04310	**Transmission constraints in co-optimization energy, AS and IRU/IRD** From base case • Enforce transmission constraints for energy and virtual energy base case, the incremental energy injections are multiplied by the corresponding shift factors $SF_{i,m,t}$ for the relevant network constraint to account for changes in the active power flow from the AC power flow solution From base case with contingencies • Enforce transmission constraints for energy and virtual energy base case with N-1 transmission contingencies using shift factor $SF_{i,m,t}^{(k)}$ • Enforce transmission constraints for energy and virtual energy base case with GCARM generation/transmission contingencies using adjusted shift factor $SF'^{(g)}_{i,m,t}$ From IRU/IRD deployment scenarios • Enforce additional transmission constraints that add IRU deployment scenario in upper active power limits • Enforce additional transmission constraints that add IRD deployment scenario in lower active power limits • The shift factors in the IRU/IRD deployment scenarios are the same as the ones in the base scenario $SF_{i,m,t}$. From IRU/IRD deployment scenarios with contingencies • Enforce transmission constraints in IRU/IRD deployment scenarios with contingencies: • The shift factors in the IRU/IRD deployment scenarios with N-1 transmission contingencies using shift factor $SF_{i,m,t}^{(k)}$ • The shift factors in the IRU/IRD deployment scenarios with GCARM generation/transmission contingencies using adjusted shift factor $SF'^{(g)}_{i,m,t}$ Note:	Core	IFM, IFM-MPM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• Critical transmission constraints will be different in general for Base scenario, with/without contingencies and IRU/IRD deployment scenarios, with/without contingencies. • ACPF will determine CCS in IRU/IRD deployment scenarios by evaluating power flow with deployment of IRU/IRD awards with relevant deployment factor		
DAME-BRQ-04320	**Scheduling Limit constraints in co-optimization energy, AS and IR** • Include IRU in ITC/ISL upper limit (import) constraints for energy plus upward AS (EA type) • Include IRU in ITC/ISL upper limit constraints for upward AS without energy (AS type) • Include IRD in ITC/ISL lower limit (export) constraints for energy plus downward AS (EA type) • Include IRD in ITC/ISL lower limit constraints for downward AS without energy (AS type) **Notes** • Import and export Netting is allow for the energy, not allowed between energy and capacity (AS,IR). • AS Type: AS Only • EA Type: Energy + AS	Core	IFM, IFM-MPM
DAME-BRQ-04330	**Energy limit, Gas-burn, pump and other constraints in co-optimization energy, AS and IR** • Gas-Burn Nomogram: Add IRU, in addition to Energy, in the Gas-Burn nomograms • Daily Energy limit: Add IRU, in addition to Energy, in the Daily Energy limit constraint • Pump-storage Hydro (PSH): Add IRU, in addition to Energy, in the PSH positive limit (generating mode) constraint; minus IRD, in addition to Energy, in the PSH negative limit (pumping mode) constraint.	Core	IFM, IFM-MPM
DAME-BRQ-04331	**Include IRU/IRD in storage resource ASSOC constraint** Include IRU in the ASSOC constraint that SOC be able to discharge to support minimum SOC plus upward AS and IRU;	Core	IFM, IFM-MPM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Include IRD, in the ASSOC constraint that SOC be able to charge to support downward AS and IRD with charge efficiency that not exceed the maximum SOC. **Notes** ~~$SOC_{i,t-1} - RU_{i,t} - SR_{i,t} - NR_{i,t} - \frac{IRU_{i,t} + IRU_{i,t+1}}{2} \geq \underline{SOC_{i,t}}$~~ $SOC_{i,t} - RU_{i,t} - SR_{i,t} - N$ ~~$\overline{SOC_{i,t-1}} + \eta_i \left(RD_{i,t} + \frac{IRD_{i,t} + IRD_{i,t+1}}{2}\right) \leq \overline{SOC_{i,t}}$~~ $SOC_{i,t} + \eta_i \left(RD_{i,t} +$ $, \forall i \in S_{LESR} \wedge t = 1,2, \dots, T$ • ASSOC constraints of LESR shall be consistent with Energy Storage Enhancements initiative, model attenuation and coverage factor to have SOC to support AS, and IRU/IRD provided by storage resource.		
DAME-BRQ-04331A	**Include IRU/IRD and RCU/RCD in storage resource ASSOC constraint** Include IRU and RCU in the ASSOC constraint that SOC be able to discharge to support minimum SOC plus upward AS and IRU/RCU; Include IRD and RCD in the ASSOC constraint that SOC be able to charge to support downward AS and IRD/RCD with charge efficiency that not exceed the maximum SOC. **Notes** ~~$SOC_{i,t-1} - RU_{i,t} - SR_{i,t} - NR_{i,t} - \frac{IRU_{i,t} + IRU_{i,t+1}}{2} - \frac{RCU_{i,t} + RCU_{i,t+1}}{2} \geq \underline{SOC_{i,t}}$~~ $SOC_{i,t} - RU_{i,t} - SR_{i,t} - NR_{i,t}$ ~~$\overline{SOC_{i,t-1}} + \eta_i \left(RD_{i,t} + \frac{IRD_{i,t} + IRD_{i,t+1}}{2} + \frac{RCD_{i,t} + RCD_{i,t+1}}{2}\right) \leq \overline{SOC_{i,t}}$~~ $SOC_{i,t} + \eta_i \left(RD_{i,t} + \frac{IRD_{i,t}}{2}\right.$ $, \forall i \in S_{LESR} \wedge t = 1,2, \dots, T$ • ASSOC constraints of LESR shall be consistent with Energy Storage Enhancements initiative, model attenuation and coverage factor to have SOC to support AS, IRU/IRD, and RCU/RCD provided by storage resource.	Core	RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted

DAME-BRQ-04332	**Include attenuation from capacity IR/RC awards in SOC envelop constraint in MPM, IFM, RUC**
	• Set hourly configurable parameters by BAA for attenuation factors for IR and RC capacity awards to storage resource in DAM
	  ○ System shall allow user to setup configurable parameters for attenuation factors for DAM and RTM, apply to all the storage resource SOC **envelop** constraints
	  ○ Attenuation factor shall be defined for Imbalance reserve and Reliability Reserve:
	  ▪ IRU
	  ▪ IRD
	  ▪ RCU
	  ▪ RCD
	  ○ Each Attenuation factor must be between 0 to 1,
	• The day-ahead market will generate an upper and lower bound, or envelope, for state of charge
	  ○ The envelope could constrain operation for storage resources
	  ○ The initial upper and lower bounds will be set to the initial day-ahead state of charge
	  ○ The initial multiplier attached to the imbalance reserves in the envelope equation will be 0.85
	$\forall i \in S_{LESR} \wedge t = 1,2,\ldots,T$
	RUC: $\left.\begin{array}{l} SOC_{i,t}^{(u)} = \left(\begin{array}{c} SOC_{i,t-1}^{(u)} - EN_{i,t}^{(+)} - \eta_i \, EN_{i,t}^{(-)} \\ -AIRU_t \frac{IRU_{i,t} + IRU_{i,t+1}}{2} - ARCU_t \frac{RCU_{i,t} + RCU_{i,t+1}}{2} \end{array} \right) \geq \underline{SOC}_{i,t} \\ SOC_{i,t}^{(d)} = \left(\begin{array}{c} SOC_{i,t-1}^{(d)} - EN_{i,t}^{(+)} - \eta_i \, EN_{i,t}^{(-)} + \\ \eta_i \, AIRD_t \frac{IRD_{i,t} + IRD_{i,t+1}}{2} + \eta_i \, ARCD_t \frac{RCD_{i,t} + RCD_{i,t+1}}{2} \end{array} \right) \leq \overline{SOC}_{i,t} \end{array}\right\},$ $\forall i \in S_{LESR} \wedge t = 1,2,\ldots,T$
	Where
	$IRU_{i,T+1} = IRD_{i,T+1} = RCU_{i,T+1} = RCD_{i,T+1} = 0$
		Core	DAM

~~DAME-BRQ-04334~~	~~**Add configurable parameters coverage factor for AS and IR capacity awards to storage resource opposite dispatch energy bids in IFM**~~	~~Core~~	~~IFM~~

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	~~• Set the Coverage Factor (CF) for each AS and IRU/IRD~~ ~~• The CF value 0 to 1, default for RegU and RegD 0.5~~ ~~**Notes**~~ ~~• Refer to DAME-BRQ-06075 for RTM.~~ ~~• This BRQ shall be consistent with Energy Storage Enhancements initiative.~~		
~~DAME-BRQ-04337~~	~~**Add configurable parameters coverage factor for AS and IR and RC capacity awards to storage resource opposite dispatch energy bids in RUC**~~ ~~• Set the Coverage Factor (CF) for each AS, IRU/IRD, and RCU/RCD~~ ~~• The CF value 0 to 1, default for RegU and RegD 0.5~~ ~~**Notes**~~ ~~• This BRQ shall be consistent with Energy Storage Enhancements initiative.~~	~~Core~~	~~RUC~~
DAME-BRQ-04350	**Calculate hourly locational marginal price (LMP) for energy in DAM include IRU/IRD deployment scenarios on congestion, for nodal and resource** Energy locational marginal price LMP for each hour in IFM: • Shadow price of PBC/ Loss Penalty Factor (LPF) of res/node (existing) • (minus) Marginal Congestion cost components (MCC) of base case using shift factor $SF_{i,m,t}$ • (minus) MCC components of **base case** with N-1 preventive transmission contingency using shift factor $SF^{(k)}_{i,m,t}$ • (minus) MCC components of **base case** with GCARM generation/ transmission contingency using adjusted shift factor $SF'^{(g)}_{i,m,t}$ • (minus) MCC components of deployment case of **IRU**, using DIRU* shift factor $SF^{(u)}_{i,m,t}$ • (minus) MCC components of **IRU** deployment case with N-1 preventive transmission contingency using DIRU* shift factor $SF^{(k,u)}_{i,m,t}$	Core	IFM, IFM-MPM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• (minus) MCC components of **IRU** deployment case with GCARM generation/ transmission contingency using DIRD*adjusted shift factor $SF'^{(g,d)}_{i,m,t}$ • (minus) MCC components of deployment case of **IRD**, using DIRD* shift factor $SF^{(d)}_{i,m,t}$ • (minus) MCC components of **IRD** deployment case with N-1 preventive transmission contingency using DIRD*shift factor $SF^{(k,d)}_{i,m,t}$ • (minus) MCC components of **IRD** deployment case with GCARM generation/ transmission contingency using DIRD*adjusted shift factor $SF'^{(g,d)}_{i,m,t}$ • The intertie congestion components shall be included in LMP for energy • Gas nomogram shadow prices shall be reflected in resource prices only, not the Pnode/APnode IRUMP. Note: MCC is the sum of all congestion costs, each calculated as product of shift factor and shadow price of the binding network constraint		
DAME-BRQ-04360	**Calculate hourly SP-Tie LMP for energy in DAM include IRU/IRD deployment scenarios on congestion as normal nodal LMP plus shadow price of ITC/ISL, for nodal and resource** • The SP nodal price of energy minus the shadow prices of all binding Intertie Scheduling Limits (ISLs) and Inter-Tie Constraints (ITCs) associated with that SP-Tie Location	Core	IFM, IFM-MPM
DAME-BRQ-04370	**Calculate hourly nodal IRU marginal price (IRUMP) in DAM for all nodal and resource** • Shadow price of IRU procurement constraint (no loss component) • (minus) MCC components of deployment case of **IRU**, using shift factor $SF_{i,m,t}$ • (minus) MCC components of **IRU** deployment case with N-1 preventive transmission contingency using shift factor $SF^{(k)}_{i,m,t}$ • (minus) MCC components of **IRU** deployment case with GCARM generation/ transmission contingency using adjusted shift factor $SF'^{(g)}_{i,m,t}$ • Gas nomogram shadow prices shall be reflected in resource prices only, not the Pnode/APnode IRUMP.	Core	IFM, IFM-MPM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Note • IRUMP/IRDMP will be calculated for all the pnodes and resources, similar as for Energy LMP.		
DAME-BRQ-04380	**Calculate hourly nodal IRD marginal price (IRDMP) in DAM for node and resource** • Shadow price of IRD procurement constraint (no loss component) • (plus) MCC components of deployment case of **IRD**, using shift factor $SF_{i,m,t}$ • (plus) MCC components of **IRD** deployment case with N-1 preventive transmission contingency using shift factor $SF^{(k)}_{i,m,t}$ • (plus) MCC components of **IRD** deployment case with GCARM generation/ transmission contingency using adjusted shift factor $SF'^{(g)}_{i,m,t}$ • The intertie congestion components shall be included in IRDMP	Core	IFM, IFM-MPM
DAME-BRQ-04390	**Calculate hourly SP-tie IRU marginal price (IRUMP) in DAM for nodal and resource** • SP nodal price of IRU • (minus) the shadow prices of all binding Intertie Scheduling Limits (ISLs) and Inter-Tie Constraints (ITCs) associated with that SP-Tie Location of IRU	Core	IFM, IFM-MPM
DAME-BRQ-04400	**Calculate hourly SP-tie IRD marginal price (IRDMP) in DAM for nodal and resource** • SP nodal price IRD • (plus) the shadow prices of all binding Intertie Scheduling Limits (ISLs) and Inter-Tie Constraints (ITCs) associated with that SP-Tie Location of IRD	Core	IFM, IFM-MPM
DAME-BRQ-04451	**Calculate weight of distribution of IRUR/IRDR in the BAA** **For each load/Solar/Wind (d/s/w) distribution** **Weight factors for IRU/IRD,** using (D/S/W) Distribution factor*(D/S/W) Allocation Factor	Core	IFM, IFM-MPM, RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	$\mathrm{w}_{i,t}^{u}(\mathrm{d}) = (LDF_{i,t} * IRUDF_{60}(d,s,w)$ $\mathrm{w}_{i,t}^{u}(\mathrm{s}) = (SDF_{i,t} * IRUSF_{60}(d,s,w)$ $\mathrm{w}_{i,t}^{u}(\mathrm{w}) = (WDF_{i,t} * IRUWF_{60}(d,s,w)$ $\mathrm{w}_{i,t}^{d}(\mathrm{d}) = (LDF_{i,t} * IRDDF_{60}(d,s,w)$ $\mathrm{w}_{i,t}^{d}(\mathrm{s}) = (SDF_{i,t} * IRDSF_{60}(d,s,w)$ $\mathrm{w}_{i,t}^{d}(\mathrm{w}) = (WDF_{i,t} * IRDWF_{60}(d,s,w)$		
DAME-BRQ-04452	**Calculate BAA Imbalance Upward/Downward deployment Shift Factors Imbalance demand reference point (Anode)** Calculate BAA market footprint aggregated Imbalance demand Shift Factor $SF_{m,t}^{(u)}$ /$SF_{m,t}^{(d)}$ for base case and $SF_{m,t}^{(k,u)}$ /$SF_{m,t}^{(k,d)}$ $SF_{m,t}^{(g,u)}$ /$SF_{m,t}^{(g,d)}$ for contingency case (that reference point of market footprint distributed load) as sum of product of nodal weight and nodal shift factor. Calculate adjusted shift factor $SF_{m,t}^{\prime(g,u)}$ /$SF_{m,t}^{\prime(g,d)}$ for GCARM with post contingency correction Note: Same Reference point is used to calculate SF for balance demand anode of each EDAM BAAs.	Core	IFM, IFM-MPM, RUC
DAME-BRQ-04453	**Include IRU/IRD awards, requirement and surplus contribution in transmission constraint** Include IRU/IRD awards, IRU/IRD Requirements (IRUR/IRDR) and IRU/IRD Surplus (IRUS/IRDS) contribution on transmission constraint $\widetilde{LFL}_{m,t} \le \tilde{F}_{m,t} + \sum_{i}\left(\Delta EN_{i,t} + DFIRU\ IRU_{i,t} + \Delta VS_{i,t} - \Delta VD_{i,t} - \Delta L_{i,t}\right) SF_{i,m,t} + DFIRU\ (IRUS_t - IRUR_t)\ SF_{m,t}^{(u)} \le \widetilde{UFL}_{m,t}$ $\widetilde{LFL}_{m,t} \le \tilde{F}_{m,t} + \sum_{i}\left(\Delta EN_{i,t} - DFIRD\ IRD_{i,t} + \Delta VS_{i,t} - \Delta VD_{i,t} - \Delta L_{i,t}\right) SF_{i,m,t} - DFIRD\ (IRDS_t - IRDR_t)\ SF_{m,t}^{(d)} \le \widetilde{UFL}_{m,t}$ $\forall m \wedge t = 1,2,\ldots,T$	Core	IFM, IFM-MPM, RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	$$\widetilde{LFL}^{(k)}_{m,t} \le \tilde{F}^{(k)}_{m,t} + \sum_i \left(\Delta EN_{i,t} + DFIRU\ IRU_{i,t} + \Delta VS_{i,t} - \Delta VD_{i,t} - \Delta L_{i,t}\right) SF^{(k)}_{i,m,t} + DFIRU\ (IRUS_t - IRUR_t)\ SF^{(k,u)}_{m,t} \le \widetilde{UFL}^{(k)}_{m,t}$$ $$\widetilde{LFL}^{(k)}_{m,t} \le \tilde{F}^{(k)}_{m,t} + \sum_i \left(\Delta EN_{i,t} - DFIRD\ IRD_{i,t} + \Delta VS_{i,t} - \Delta VD_{i,t} - \Delta L_{i,t}\right) SF^{(k)}_{i,m,t} - DFIRD\ (IRDS_t - IRDR_t)\ SF^{(k,d)}_{m,t} \le \widetilde{UFL}^{(k)}_{m,t}$$ $\forall k, m \wedge t = 1,2,\dots,T$ $$\widetilde{LFL}^{(g)}_{m,t} \le \tilde{F}^{(g)}_{m,t} + \sum_i \left(\Delta EN_{i,t} + DFIRU\ IRU_{i,t} + \Delta VS_{i,t} - \Delta VD_{i,t} - \Delta L_{i,t}\right) SF'^{(g)}_{i,m,t} + DFIRU\ (IRUS_t - IRUR_t)\ SF'^{(g,u)}_{i,m,t} \le \widetilde{UFL}^{(g)}_{m,t}$$ $$\widetilde{LFL}^{(g)}_{m,t} \le \tilde{F}^{(g)}_{m,t} + \sum_i \left(\Delta EN_{i,t} - DFIRD\ IRD_{i,t} + \Delta VS_{i,t} - \Delta VD_{i,t} - \Delta L_{i,t}\right) SF'^{(g)}_{i,m,t} - DFIRD\ (IRDS_t - IRDR_t)\ SF'^{(g,d)}_{i,m,t} \le \widetilde{UFL}^{(g)}_{m,t}$$ $\forall g, m \wedge t = 1,2,\dots,T$		
DAME-BRQ-04454	**Calculate hourly IRU/IRD Surplus variable and IRU/IRD marginal price of Surplus Apnode, price breakdown by BAA** • Access Associated Imbalance Demand Hub Apnode of each BAA from MF. • Access associated IR surplus zones of each BAA and their associated Apnodes from MF. • The hourly IRU/IRD surplus variable values are optimally calculated through IFM co-optimization Energy, AS and IRU/IRD with demand curve. • Calculate the BAA aggregated hourly IRU/IRD Marginal prices of IRU/IRD surplus as a IRU/IRD Locational Marginal Prices and the price components at location (Apnode) associated with the BAA Imbalance Demand Hub (same method as for DLAP) per PIME logic ○ The IRU/IRD surplus is defined on each Apnode associated with corresponding surplus zone and are aggregated on BAA level to be on the same Imbalance Demand Hub Apnode of each BAA (DAME-BRQ-01150) ○ The Shift factor of IRU/IRD APnode is defined in (DAME-BRQ-04452) ○ The IRUMP/IRDMP locational price is defined in DAME-BRQ-04370, DAME-BRQ-04380	Core	IFM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	○ Calculate the BAA aggregated hourly IRU/IRD price MCC components using the shift factor of Imbalance Demand anode of the BAA		

5.5 Business Process: Manage DAM – RUC

- MOO for RA in RUC, VER to the forecast
- Define notion REN=EN+RCU-RCD
- Build RUC-MPM, apply LMPM for RCU
- Apply mitigated RUC bids for 24 hours, un-mitigated bids for 48 hour RUC or 72 hour RUC
- Procure RCU/RCD through optimization
- Fixed EN, AS and IRU/IRD IFM awards
- Model MSG transition in RUC
- RUC-NA use REN as injection, no IRU/IRD deployment scenarios
- Calculate LMP for RCU/RCD

5.5.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-05000	**Consume RCU/RCD resource bids and MOO in RUC, insert ~~DAB~~/extend RCU bids for RA ~~capacity not bid in, insert DAB bid for non-~~VER ~~that does not bid in~~resources.** • Consume MF defined physical market resource eligibility for Reliability Capacity (RC): Separate flag for upper (RCU), down (RCD) • Consume MF defined Certified quantity (MW) for RCU and RCD • Consume MF defined BAA-Specific EDAM Participation Flag. • Accept resource RCU/RCD bids through SIBR. ~~SIBR will insert DAB bids up to UEL for RCU in RUC if RA resource not bid in for any RC product~~ • For non-VERs, if an RA resource did not bid in for RCU product, SIBR shall insert DAB bids up to the lower of energy bid range and RCU Certified Capacity. • For non-VERs, if an RA resource bid in for RCU product lower than the lower of energy bid range and RCU Certified Capacity, SIBR shall extend that bid up to that latter limit at the submitted RCU bid price. • **Note:** For VERs, refer to DAME-BRQ-04031. **Notes**	Core	SIBR (from MF)

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• RMR resources shall be treated as generating resources.		
DAME-BRQ-05001	**Keep IFM Energy, AS, IRU/IRD Fixed in RUC** Keep the resource day-ahead market IFM awards/self-schedules for energy (EN), Ancillary Services (AS), Imbalance Reserves (IRU, IRD) at fixed value in RUC.	Core	RUC
DAME-BRQ-05002	**Create Proxy RCU Bid for Exports with IFM LPT and/or Economic Energy Schedules with Not Enough RCU Clean Bid with No RCU Clean Bid or Not Enough RCU Clean Bid** • If exports cleared IFM with LPT and/or economic energy schedules and do not have RCU clean bids, in the RUC schedule run, System shall create proxy RCU bids for them that covers their cleared IFM energy schedules with a bid price higher than the RCU penalty prices while maintain the merit order of their highest energy bid price in the IFM (between DAB bid price and RUC PBC penalty in the scheduling run and at DAB bid price in the pricing run). The proxy RCU award due to proxy penalty bids will be fixed in pricing run. • If exports cleared IFM with LPT and/or economic energy schedules and have RCU clean bids that does not cover all energy bid range, (not *enough* RCU clean bids), in the RUC schedule run, System shall create proxy RCU bids for them (extending their RCU clean bids) to	Core	RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	cover their cleared IFM energy schedules with a bid price higher than the RCU penalty prices while maintain the merit order of their highest energy bid price in the IFM (between DAB bid price and RUC PBC penalty in the scheduling run and at DAB bid price in the pricing run). The proxy RCU award due to proxy penalty bids will be fixed in pricing run. • System shall create a resource-specific hourly flag to indicate the creation of such proxy bids and their proxy RCU awards if market awarded them. • The proxy RUC bids shall not apply to PT export, and wheeling export. • System shall exclude Proxy RCU bids from setting RCUMP. **Notes** • The Proxy Awards can co-exist for same resource and hour with RCU Awards. • This bid insertion is a mechanism to indicate the cleared IFM LPT and/or economic schedules for these exports are subject to Curtailment in RTM, if they are awarded RCU awards in RUC. • Since these exports have their created RCU bids at the penalty prices, they will only be awarded RCU awards if there is no available physical supply capacity in the RUC above energy schedules to meet both the demand forecast and the economic and LPT exports that cleared the IFM. • The SCs for these exports will be obligated to submit energy bids for the RCU capacity, similar to the MOO for RCU awards. • These created proxy RCU bids and proxy RCU awards will not be paid at the relevant marginal RCUMP in Settlements, while the clean RCU bids and RCU awards will be paid the relevant marginal RCUMP in Settlements. • Proxy RCU bids shall be excluded from final bid set. • In the scheduling run for RUC, the proxy RCU price will be indexed in the price range of $250~~-~~/MWh-$300/MWh based on the energy bid for the same resource capacity portion to maintain the same merit order when proxy RCU is awarded (DAECON first followed by DALPT). • In the pricing run for RUC, the proxy RCU awards will be fixed and the price discovery feature will be used to produce a $250/MWh price (excluding marginal losses and congestion). • Where $250/MWh is RCU Bid Price Cap.		

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-05005	~~**Ensure VER bid RUC capacity up to forecast , insert DAB bid for the capacity not bid in**~~ ~~• Extend VERs RCU bid RCU quantity up to their forecast~~ ~~• Insert DAB RCU bid for VER up to the forecast if eligible VER not bid in RCU~~ **Adjust VER RCU/RCD Bid Down If Forecast Output Less than Bid MW Value** ~~•~~ Adjust the clean RCU/RCD VER bid down as necessary if the forecast output is less than the max MW value of the bid.~~-~~	Core	~~SIBR~~ RUC
DAME-BRQ-05010	**Define the notion of Reliability Energy REN** In the RUC, • Set the notion of REN as resource reliability energy schedules that RCU/RCD awards are related to the day-ahead energy schedules fixed EN $REN_{i,t} \equiv EN_{i,t} + RCU_{i,t} - RCD_{i,t}$ **Note** • REN is another alternative terminology of RUC Schedule.	Information-Only	RUC
DAME-BRQ-05020	**Build RUC-MPM pass, perform market power mitigation for RCU** • Build Activation switch for turn on/off of RUC-MPM • If RUC-MPM is off, skip RUC-MPM pass **Note:** **With RUC-MPM is on:** • Add market power mitigation pass in RUC (DAME-BRQ-05021, DAME-BRQ-05025) • Run RUC optimization with SIBR submitted bids in RUC-MPM path.	Core	RUC -MPM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-05021	**Build RUC- DCPA,** Use same process as IFM MPM for energy, except use REN in place of energy EN, in the counter-flow calculation to identify the non-competitive binding constraints use $$REN_{i,t} \equiv EN_{i,t} + RCU_{i,t} - RCD_{i,t}$$ **Notes** • REN is another alternative terminology of RUC Schedule.	Core	RUC -MPM
DAME-BRQ-05025	**Build RUC- LMPM**: • The shadow price of REN PBC of each BAA is used in price formation/decomposition in LMP for RCU. • Calculate competitive LMP for RCU that excludes non-competitive path congestion prices, in the same manner as IFM-MPM for energy (no change to reference point for calculate LMP) • Mitigation: If the non-competitive constraint congestion component of a RCU supply bid is greater than Mitigation Threshold Price (default value 0.02), the resource RCU bid will be mitigated to greater of (RCU competitive LMP and RCU DAB) if it is lower than the unmitigated bid. • RCD bids shall not be mitigated. • RCU Bids submitted on behalf of imports from outside the EDAM Area shall not be mitigated. **Notes** • REN is another alternative terminology of RUC Schedule.	Core	RUC-MPM
DAME-BRQ-05030	**Apply mitigated RCU bids for trading day hours only** • Use mitigated bids for RCU in RUC optimization for Trading day hours (24 hours) • Use un-mitigated bids for other hours in RUC (RUC 48 hours run or RUC 72 hours run).	Core	RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-05050	**Procure RCU/RCD through optimization in RUC** **Objective function:** • Include resource RCU and RCD bid cost in OBJ function of RUC, and corresponding start-up cost and minimum load cost. • No de-commitment: Resources that are committed in IFM are modeled as must run in RUC, kept online, no de-commitment. The resource dispatch level in RUC is determined by REN optimization. • RCU and RCD are zero when the resource is offline, except for RCU that can be provided by offline resources that can start within 60min (SUT ≤ 60min), which the optimization will determine the resource commitment based on the min load cost, start-up cost and energy bid. • For the MSG committed in IFM, model MSG transition cost • RUC shall not issue infeasible MSG transition due to RC Awards from an IFM MSG configuration. • System Resources (SRs) and Non-Generator Resources (NGRs) have no discontinuities or inter-temporal constraints and are always modeled as online. **Notes** • Refer to ***Error! Reference source not found.*** in ***Error! Reference source not found.*** • Fixed IFM schedules for EN, AS, IRU/IRD are not be optimized in RUC. • REN is another alternative terminology of RUC Schedule. • RC Awards can be either RCU or RCD but not both for a given resource and hour. • For a trading hour: ○ If CAISO forecast of BAA Demand **>** IFM Cleared Physical Supply, then RCU Target = Mismatch quantity and RCD Target = 0. ○ Else If CAISO forecast of BAA Demand **<** IFM Cleared Physical Supply, then RCU Target = 0 and RCD Target = Mismatch quantity. ○ Else If CAISO forecast of BAA Demand = IFM Cleared Physical Supply, then RCU Target = 0 and RCD Target = 0.	Core	RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-05060	**Allow MSG transition in RUC** • Keep online for the MSG is committed in IFM • Allow all feasible transitions modeled. The resource dispatch level and stage are determined by REN, can be at different stage, different MW from IFM • RUC shall not issue infeasible MSG transition due to RC Awards from an IFM MSG configuration. **Note:** MSG may be transitioned to a lower configuration but not shut down in RUC. Lower configuration MLC shall be set to 0 for both CISO and EDAM BAAs in the objective function. The compromise with Ops was that RUC will not shut down any resource, including MSG, if scheduled by IFM. Regular resources can be assigned RCD down to Pmin, and MSGs down to the Pmin of lowest configuration. The rationale is that the operator may still ED a resource up if it is online, but not if it is shut down. In any case, the IFM schedule is the DA schedule (and that is why RUC does not shut down); The difference between the RUC schedule and the IFM schedule is RCU or RCD. **Note** • REN is another alternative terminology of RUC Schedule.	Core	RUC
DAME-BRQ-05070	**Procurement REN balance constraints in RUC** • Reliability energy (REN) Power Balance Constraint (PBC) is **for t**he REN to balance the demand forecast (D) include losses. $\sum_i REN_{i,t} = D_t,$ $t = 1,2,\dots,T.$ • Ancillary Service awards are fixed in RUC at IFM solution • IRU/IRD awards are fixed in RUC at IFM solution **Note** • REN is another alternative terminology of RUC Schedule.	Core	RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-05080	**RCU/RCD Capacity upper/lower bound constraints in RUC** • The RCU/RCD upper/lower bound constraints by certified the RCU/RCD capacities • An energy bid is required for reliability energy schedules and RCU/RCD awards	Core	RUC
DAME-BRQ-05090	**Resource Capacity constraint for RCU/RCD in RUC** • For online physical resource, the REN is limited by capacity between the physical resource UCL minus upward AS and IRU awards, and LCL plus the downward AS and IRD • ~~The~~For online physical resource, the REN is limited by economic limit between the adjusted LEL + IRD and adjusted UEL-IRU • For offline physical resource the upward capacity awards NR + IRU +RCU is limited by capacity UCL, RCU+IRU is limited by economic limit adjusted UEL For VER, • the capacity and economic limit are limited by the VER forecast **Notes** • Adjusted LEL = max(LCL, LEL) ensure the resource must bid IFM • Adjusted UEL=min(UCL,UEL) • REN is another alternative terminology of RUC Schedule.	Core	RUC
DAME-BRQ-05100	**Ramp capability constraints for REN in RUC** • Include REN, AS and IRU/IRD in resource ramp capability constraint • The ramp capability constraint for offline start up at beginning of the hour to support REN and upward AS, IRU • The ramp capability constraint for the resource shut down at the end of hour to support REN, IRD and downward AS • Use same granularity adjustment factors as in IFM **Note** • REN is another alternative terminology of RUC Schedule.	Core	RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-05110	**RUC-NA use REN as injection, no IRU/IRD deployment scenarios:** • Use REN as nodal injection in RUC-NA. • Not include IRU/IRD deployment scenarios in RUC-NA power flow. • The demand forecast is distributed to the load nodes using LDF **Notes** • Treat IRU/IRD the similar manner as AS. Not include in power flow and transmission constraints, but include in the resource capacity constraint. • REN is another alternative terminology of RUC Schedule.	Core	RUC
DAME-BRQ-05120	**Network constraints in RUC using same network topology and transmission limits as IFM** • Enforce critical transmission constraints from NA power flow by REN injection for ○ base case, using same topology in IFM base case (shift factor set $SF_{i,m,t}$) ○ base case with contingencies of N-1 transmission using same topology in IFM base case with contingencies (shift factor set $SF_{i,m,t}^{(k)}$) ○ base case with contingencies of GCARM generation/transmission using same topology in IFM base case with contingencies of GCARM (shift factor set $SF_{i,m,t}^{(g)}$) • Use the same transmission limits as used in IFM **Notes** • The shift factors in the RUC base case are the same as the ones in the IFM base case because the transmission network is the same; however, the set of critical constraints is different in general. • REN is another alternative terminology of RUC Schedule.	Core	RUC
DAME-BRQ-05130	**Scheduling Limit constraints in RUC** • Include RCU from import resources and RCD from export resources in ITC/ISL upper limit (import) constraints for energy plus upward AS ~~plus~~and IRU/IRD	Core	RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• Include RCU from import resources and RCD from export resources in ITC/ISL upper limit constraints for upward AS and IRU/IRD without energy • Include ~~RCD~~RCU from export resources and RCD from import resources in ITC/ISL lower limit (export) constraints for energy plus downward AS plus IRD/IRU • Include ~~RCD~~RCU from export resources and RCD from import resources in ITC/ISL lower limit constraints for downward AS and IRD/IRU without energy **Note~~:~~** • The ITC/ISL constraints allow netting of import and export energy schedules, but they prevent netting among energy schedules and ancillary services or RCU/RCD/IRU/IRD awards.		
DAME-BRQ-05140	**Energy limit, Gas-burn, pump and other constraints in RUC** • *Gas-Burn Nomogram*: Add RCU/RCD, in addition to En+IRU, in the Gas-Burn nomograms • *Daily Energy limit:* include En, RCU and IRU in the Daily Energy limit constraint • Pump-storage Hydro (PSH): En+ IRU+RCU, in the PSH upper limit constraint; En-IRD-RCD, in the PSH lower limit constraint;	Core	RUC
DAME-BRQ-05144	**Model State of Charge (SOC) constraints envelop and limits of LESR:** Use RCU/RCD for energy charge/discharge SOC balance constraint, SOC limit constraint, attenuation factors and coverage factor apply to the AS and IR capacity awards (same as DAME-BRQ-04331, DAME-BRQ-04332~~, DAME-BRQ-04334~~) Envelop constraint include RCU/RCD • $SOC_{i,t}^{(u)} = SOC_{i,t-1}^{(u)} - EN_{i,t}^{(+)} - \eta_i\, EN_{i,t}^{(-)} + \eta_i\, AIRD_t\, IRD_{i,t} + \eta_i\, ARCD_t\, RCD_{i,t} \le \overline{SOC}_{i,t}$ $SOC_{i,t}^{(l)} = SOC_{i,t-1}^{(l)} - EN_{i,t}^{(+)} - \eta_i\, EN_{i,t}^{(-)} - AIRU_t\, IRU_{i,t} - ARCU_t\, RCU_{i,t} \ge \underline{SOC}_{i,t}$ SOC limit include RCU/RCD: $$SOC_{i,t} - RU_{i,t} - SR_{i,t} - NR_{i,t} - IRU_{i,t} - RCU_{i,t} \ge \underline{SOC}_{i,t}$$ $$SOC_{i,t} + \eta_i \left(RD_{i,t} + IRD_{i,t} + RCD_{i,t}\right) \le \overline{SOC}_{i,t}$$	Core	RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-05160	**Calculate hourly nodal RCU marginal price (RCUMP) and price breakdowns and sub-components of marginal congestion prices in RUC for nodal and resource** • Shadow price of REN balance constraint / Loss Penalty Factor (LPF) of res/node • (minus) MCC components of **REN**, using shift factor $SF_{i,m,t}$ • (minus) MCC components of **REN** with N-1 preventive transmission contingency using shift factor $SF_{i,m,t}^{(k)}$ • (minus) MCC components of **REN** with GCARM generation/ transmission contingency using adjusted shift factor $SF'^{(g)}_{i,m,t}$ **Notes** • For RCUMP and RCDMP, the sign is opposite for each component of price formation, represent the RCU RCD opposite direction impact on price. • Loss factor in area control feature need apply • REN is another alternative terminology of RUC Schedule.	Core	RUC
DAME-BRQ-05170	**Calculate hourly nodal RCD marginal price (RCDMP) and breakdowns and sub- components of marginal congestion prices in RUC for node and resource ~~for nodal and resource~~** • (minus)Shadow price of REN balance constraint / Loss Penalty Factor (LPF) of res/node • (plus) MCC components of **REN**, using shift factor $SF_{i,m,t}$ • (plus) MCC components of **REN** with N-1 preventive transmission contingency using shift factor $SF_{i,m,t}^{(k)}$ • (plus) MCC components of **REN** with GCARM generation/ transmission contingency using adjusted shift factor $SF'^{(g)}_{i,m,t}$ **Notes** • REN is another alternative terminology of RUC Schedule.	Core	RUC
DAME-BRQ-05180	**Calculate hourly SP-tie RCU marginal price (RCUMP) in DAM for nodal and resource**	Core	RUC

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• SP nodal price of RCU • (minus) the shadow prices of all binding Intertie Scheduling Limits (ISLs) and Inter-Tie Constraints (ITCs) associated with that SP-Tie Location of RCU		
DAME-BRQ-05182	**Calculate hourly SP-tie RCD marginal price (RCDMP) in DAM for nodal and resource** • SP nodal price RCD • (plus) the shadow prices of all binding Intertie Scheduling Limits (ISLs) and Inter-Tie Constraints (ITCs) associated with that SP-Tie Location of RCD	Core	RUC

5.6 Business Process: Manage RTM

- MOO for Resource have DAM IRU/IRD, RCU/RCD awards
- MOO for RA resource that no DAM EN/AS/IR/RC awards
- Use IFM schedule for MSG reference stage to calculate min load
- Set UEL to 0 if IRU and/or RCU eTagging Validation Fails for System Resources
- Identify the critical constraints for FRU/FRD deployment scenarios
- Add configurable parameters coverage factor for AS and FRP capacity awards to storage resource opposite dispatch energy bids in RTM

5.6.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-06010	**Enforce must offer obligation in RTM for the resources with IRU/IRD, RCU/RCD DAM awards:** • Resources that are awarded reliability capacity (RCU/RCD), or imbalance reserve awards (IRU/IRD) in the day-ahead market will have real-time market bidding obligations. • Resources must bid economically energy bid the full range of their reliability capacity and imbalance reserve awards in the real-time market. • Real-time must offer obligations apply in the hours that a resource has a reliability capacity or imbalance reserve award. • The resources that do not submit the bids will have economic energy bids inserted for them at their Default Energy Bid (DEB) for the full range of RC and IR awards. • Resources receiving a RCU Award for which their SC has submitted a DA Energy Bid to export outside the EDAM Area must provide a decremental RT Energy Bid to dispatch down the export schedule in the FMM if needed.	Core	SIBR *For RTM*
DAME-BRQ-06020	**Maintain the CAISO BAA resource adequacy real-time must-offer obligation** System shall maintain the CAISO BAA RA RT MOO.	Core	SIBR *For RTM*
DAME-BRQ-06060	**Use IFM schedule for MSG reference stage to calculate MLC**	Core	RTM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	In RTM, use IFM schedule as MSG reference stage to calculate MLC. **Note:** The difference between the RUC schedule and the IFM schedule is RCU or RCD, RUC stage will not be used as reference stage for MSG.		
~~DAME-BRQ-06065~~	~~**Set UEL to 0 if IRU and/or RCU eTagging Validation Fails for System Resources**~~ ~~By T-40', if System Resource receiving IRU Award and/or RCU Award did not submit e-Tag that passes CAISO validation with the quantity (or sum of quantities) of the transmission profile no less than DAES + IRU Award + RCU Award, System shall make of the untagged portion of IRU Award and/or RCU Award unavailable, by setting its UEL to zero.~~	~~Core~~	~~RTM~~
DAME-BRQ-06070	**Identify the critical constraints for FRU/FRD deployment scenarios** Determine the critical set in the deployment scenarios superimposing the linear FR flows from UC **Note** • Refer to DAME-BRQ-04232 for DAM.	Core	RTM
~~DAME-BRQ-06075~~	~~**Add configurable parameters coverage factor for AS and FRP capacity awards to storage resource opposite dispatch energy bids in RTM**~~ ~~• Set the Coverage Factor (CF) for each AS and FRU/FRD~~ ~~• The CF value 0 to 1, default for RegU and RegD 0.5~~ ~~**Note**~~ ~~• Refer to DAME-BRQ-04334 for IFM.~~ ~~• This BRQ shall be consistent with Energy Storage Enhancements initiative.~~	~~Core~~	~~RTM~~

5.7 Business Process: Manage Market Quality System

- Calculate 15-min IRU/IRD and RCU/RCD Overlapping RA Capacity
- Calculate 15-min IRU/IRD LOC for Overlapping RA Capacity
- Calculate DA/Base Schedule Forecasted Movement Data
- Resource IRU/IRD Award 5-min Ramp Capable Portion Calculation
- FMM Ex-Post Capacity Calculation
- FMM Ex-Post IR/RC Capacity Allocations
- Update Commitment Cost Determination Logic to Account for RC
- Use IFM MSG Configuration as Reference for RT MLC Calculations
- Account for IRU/IRD in CRR1B Logic

5.7.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-07265	**Calculate 15-min IRU/IRD and RCU/RCD Overlapping RA Capacity** On daily basis, and after all RTM markets run for a trade day, and after everytime corrections occurred on any of the data used in the calculations, System shall have the capability to calculate 15-min resource-specific IRU/IRD and RCU/RCD Overlapping RA Capacity, as sliced by final DA energy bid segments and as total, using latest available data for RA-resources only: • 15-min IRU/IRD and RCU/RCD Overlapping RA Capacity are calculated as the overlapped capacity between RA Capacity and corresponding IRU/IRD and RCU/RCD awards, as sliced by final DA energy bid segments and as a total, accounting for any Pmax derates and/or Pmin re-rates that occur in FMM, where ○ RA Capacity is the most restrictive between monthly RA showing and Daily RA Capacity. ○ Monthly RA showing is fetched from the monthly showing plan and does not account for the RA substitution. ○ Daily RA capacity accounts for RA resources substitution and accounts for both Generic RA capacity and Flex RA Capacity.	Core	• Internal ISO System

	Notes • No substitutions will be accounted for in the monthly RA showing and mapping data. • Substitution will be included in the daily RA capacity and identification data.		
DAME-BRQ-07270	**Calculate 15-min IRU/IRD LOC for Overlapping RA Capacity** On daily basis, and after all RTM markets run for a trade day, and after everytime corrections occurred on any of the data used in LOC calculations, System shall have the capability to calculate 15-min resource-specific IRU/IRD Lost Opportunity Cost (LOC) for each IRU/IRD Overlapping RA Capacity, sliced by final DA energy bid segments, using latest available data for RA-resources only, include internal RA resources and intertie RA resources: • 15-min IRU/IRD LOC is calculated as difference between DA Energy LMP and final DA energy bid for the amount of 15-min resource IRU/IRD Overlapping RA capacity, and converted into 15-min granularity, where: • Mathematically: ○ 15-min IRx LOC = (¼) * Sum over all corresponding DA energy bid segment i of (15-min resource IRx Overlapping RA Capacity, sliced by final DA energy bid segment i) * (hourly DA Energy LMP – hourly DA Final Energy Bid Price for bid segment i) ○ Where, x is { U , D} **Notes** • No substitutions will be accounted for in the monthly RA showing and mapping data. • Substitution will be included in the daily RA capacity and identification data.	Core	• Internal ISO System
DAME-BRQ-07320	**Calculate DA/Base Schedule Forecasted Movement Data** Using similar calculation calendar as FMM and RTD Forecasted Movement, and for every trade hour (h) of each trade day, System shall calculate resource-specific hourly DA/Base Schedule Forecasted Movement as: • For CAISO and EDAM BAA resources (including virtual supply and demand resources): ○ DA Schedule Forecasted Movement (h) = $DAES_{DAM,h} - DAES_{DAM,h-1}$ • For WEIM-only BAA-only (non-EDAM) resources: ○ Base Schedule Forecasted Movement (h) = $BS_h - BS_{h-1}$	Core	• Internal ISO System

	Notes • For Virtual Awards, the Forecasted Movement is the algebraic difference of the Virtual Award between consecutive hours. • For the calculation of the DA/Base Schedule Forecasted Movement for first hour of the day, results from the previous day last hour will be used. • Movement shall be calculated for all hours when there is a non-zero DAES/Base Schedule for at least one hour in the day, or there is a non-zero DAES/Base Schedule in the last hour of the previous day. • This FM calculation shall run in the same run as existing FMM/RTD Forecasted Movement calculation run.		
DAME-BRQ-07600	**Resource IRU/IRD Award 5-min Ramp Capable Portion Calculation** System shall automatically calculate IRU/IRD award 5-min ramp capable portion ($IRU5_{DAM}$, $IRD5_{DAM}$) on resource-specific hourly basis as follows: • Determine DAM upward and downward ramp rate segments (RRU_{DAM} and RRD_{DAM} in MW/min, respectively) that corresponds to $DAES_{DAM}$. • $IRU5_{DAM} = min\ (IRU_{DAM}, [RRU_{DAM} * 5'])$ • $IRD5_{DAM} = min\ (IRD_{DAM}, [RRD_{DAM} * 5'])$	Core	• Internal ISO System
DAME-BRQ-07610	**FMM Ex-Post Capacity Calculation** System shall automatically calculate FMM Ex-Post Capacities ($MinExCap_{FMM}$, $MaxExCap_{FMM}$) on resource-specific 15-minute basis by utilizing FMM bid data and data that are available in FMM run, and using similar formulation as the ones used for the calculation of RTD Ex-Post Capacities ($MinExCap$, $MaxExCap$).	Core	• Internal ISO System
DAME-BRQ-07615	**FMM Ex-Post IR/RC Capacity Allocations** System shall automatically calculate FMM Ex-Post IRU/IRD and RCU/RCD capacity allocations on resource-specific 15-minute basis: $IRUC_{FMM}$ Imbalance Reserve Up allocated capacity range (FMM). $IRDC_{FMM}$ Imbalance Reserve Down allocated capacity range (FMM). $RCUC_{FMM}$ Reliability Capacity Up allocated capacity range (FMM). $RCDC_{FMM}$ Reliability Capacity Down allocated capacity range (FMM).	Core	• Internal ISO System

DAME-BRQ-07620	**Update Commitment Cost Determination Logic to Account for RC** • System shall be updated to use RCU Awards instead of RUC Awards in commitment cost determination logic, starting from Go-Live date going forward. • System shall account for RCD Awards in commitment cost determination logic, as applicable to commitment to downward MSG commitments in RUC due to RCD Awards.	Core	• Internal ISO System
DAME-BRQ-07630	**Use IFM MSG Configuration as Reference for RT MLC Calculations** System shall use IFM MSG configuration as reference for RT MLC calculations.	Core	• Internal ISO System
DAME-BRQ-07860	**Account for IRU/IRD in CRR1B Logic** System shall update CRR1B logic to account for IRU/IRD, by utilizing Shift Factors for IRU/IRD, IRU/IRD Deployment Factor (DIRU/DIRD), and IRU/IRD Resource Awards, for all upward/downward deployment scenarios, as follows: • Calculate Hourly IRU/IRD flow by constraint and constraint case, considering IRU/IRD deployment factors. • Update calculations of hourly Constraint Flow Difference (Market flow vs CRR flow) to account for IRU/IRD. • Update calculations of hourly portion of CRR-settled flow by constraint and constraint case. • Calculations shall include IRU/IRD deployment scenarios constraints, IRUR/IRDR and IRUS/IRDS and their Associated Imbalance Demand Hub/IR Surplus Zone Apnode for each BAA.	Core	• Internal ISO System
DAME-BRQ-07875	**Include Virtual Bids impact on IRU/IRD deployment scenario binding constraints in CRR clawback for ISO BAA** For the day-ahead constraint-entity-specific CRR revenues for ISO BAA: • Consume IFM binding constraint information by deployment scenarios • Calculate the impact from all virtual bids and implicit virtuals at CAISO BA ties for the flow impact on each constraint in CAISO, include IRU/IRD deployment constraint ○ Shift factors to be used for deployment scenarios are the same as the shift factors for the base scenarios for the same constraint • Expand the comparison of the magnitude of the flow impact between IFM and FMM CRR congestion impacted the constraint to cover deployment scenarios	Core	• Internal ISO System

	○ Base/IRU/IRD deployment scenarios in IFM shall be compared with base scenario in FMM for the same constraint • If the difference is more than the 10% flow impact threshold, clawback the corresponding CRR revenue • Expand reporting the CRR payment adjustment by deployment scenarios. • Note: moved from EDAM-BRQ-06012		

5.8 Business Process: Manage Market Billing and Settlements

- IFM IR & RUC RC Payments
- IFM IR & RUC Cost Allocation
- IR DA & RC RT BCR Settlements
- Inclusion of IR & RC in GMC Settlements
- IRU/IRD & RCU/RCD Unavailability No-Pay Charges
- IR and RC Unavailability No-Pay Charges Priority
- Do not assess RAAIM to IR and RC awards for generic and Flex RA
- IR – FRP RTM Ramp Deviation Settlements
- FMM Forecasted Movement Deviation Settlements
- Accounting for Virtuals in Allocation of Residual Forecasted Movement Settlements
- Settlements of Overlapping RA Capacity for True-Up Settlements Mechanism
- Apply CRR 1B Methodology for CAISO BAA
- Calculate BAA IRU/IRD and Energy Congestion Revenues
- Distribute BAA IRU/IRD Congestion Revenues for CAISO and EDAM BAAs
- Apply HASP Reversal to CAISO BAA IFM Intertie Schedule

5.8.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-09140	**IFM IR & RUC RC Payments** System shall be updated for the following: • All eligible resources (including MSS resources) that have been awarded hourly IFM IRU/IRD shall be paid hourly IFM IRUMP/IRDMP prices, respectively. • All eligible resources (including CAISO RA resources and MSS resources) that have been awarded hourly RUC RCU (but excluding resources with proxy RCU awards) shall be paid hourly RUC RCUMP prices, respectively. • All eligible resources (including CAISO RA resources and MSS resources) that have been awarded hourly RUC RCD shall be paid hourly RUC RCDMP prices, respectively **Notes**	Core	• Settlements

<table>
<tr><th>ID#</th><th>Business Feature</th><th>Requirement Type</th><th>Potential Application(s) Impacted</th></tr>
<tr><td></td><td>• This shall apply to MSS resources that have been awarded IR, regardless of the MSS operator's selection of Net or Gross settlement.</td><td></td><td></td></tr>
<tr><td>DAME-BRQ-09160</td><td>IFM IR Cost Allocation
• System shall be updated to allocate IFM IRx costs in two Tiers, where x = U, D.
• Tier-1 IRx Cost Allocation, for each individual component, and on hourly basis:
○ Tier-1 IFM IRx Allocation Cost = Tier-1 IRx Allocation Quantity * Tier-1 IRx BAA Allocation Price.
○ Tier-1 IRx Allocation Quantity shall be calculated as follows:

<table>
<tr><th>Component Type</th><th>Tier-1 IRU Allocation Quantity</th><th>Tier-1 IRD Allocation Quantity</th></tr>
<tr><td>Generation
(including ESR)</td><td>$\max(0, [DAES_{DAM} - MaxExCap_{FMM}])$
as affected by de-rates and reduction in VER forecast between DAM and RTM (if applicable))</td><td>$\max(0, [MaxExCap_{FMM} - DAES_{DAM}])$
as affected by rerates or self-schedules (if applicable))</td></tr>
<tr><td>Import</td><td>$\max(0, [DAES_{DAM} - MaxExCap_{FMM}])$
as affected by e-Tag transmission profile)</td><td>max(0, $[SS_{FMM} - DAES_{DAM}]$)</td></tr>
<tr><td>Load</td><td>ABS (Negative UIE)</td><td>Positive UIE</td></tr>
<tr><td>Export</td><td>max(0, $[SS_{FMM} - DAES_{DAM}]$)</td><td>max(0, $[DAES_{DAM}$– eTag transmission profile])</td></tr>
<tr><td>MSS
(on Load Following)</td><td>MSS operator's net portfolio uninstructed deviations.</td><td>MSS operator's net portfolio uninstructed deviations.</td></tr>
</table>
</td><td>Core</td><td>• Settlements</td></tr>
</table>

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted

MSS (NOT on Load Following, regardless of their Net versus Gross selection)	Same as non-MSS resources	Same as non-MSS resources

- For each BAA, and on hourly basis, Tier-1 IRx BAA Allocation Price shall be calculated as follows:
  - Min (IRx BAA Average Price~~-~~, IRx BAA Derived Price)
  - where
    - IRx BAA Average Price = IRx BAA ~~Requirement Price / Sum~~Allocation Cost / (IRxR minus sum of IRxS over all surplus zones within the BAA minus sum of IRx ~~Award across BAA.~~No Pay Quantity over all resources within the BAA)
    - ~~Where IRx BAA Requirement Price = IRxMP price at the Apnode associated with BAA IR Requirement/Surplus~~
    - IRx BAA Derived Price = IRx ~~Requirement~~BAA Allocation Cost ~~across BAA~~ / Sum of Tier-1 IRx Allocation Quantity across BAA.
    - Where **IRx** ~~Requirement~~**BAA Allocation Cost** ~~across BAA = IRx~~= Max {0, [IRx BAA Requirement Cost + IRx BAA Surplus Adjustment]} + IRx BAA No Pay Revenue
    - IRx BAA Requirement ~~* IRx BAA~~ Cost = IRxR * IRxRMP
    - IRx BAA Surplus Adjustment = sum of (IRxS * IRxSMP) over all IR Surplus zones in BAA

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• IRx BAA No Pay Revenue = -1 * Sum over all resources within a BAA of (IRx No Pay Charge) • IRxRMP = IRX BAA Requirement Price = IRxMP Associated Imbalance Demand Hub Apnode of the BAA • IRxSMP = IRX Surplus Marginal Price = IRxMP at Associated Apnode of the IR Surplus Zone • **Tier-2** IRx Cost Allocation, for each BAA, and on hourly basis: ○ System shall calculate Tier-2 IRx BAA Allocation Cost as the remainder (left over) of unallocated IRx costs from Tier-1, as follows: ▪ Tier-2 IRx BAA Allocation Cost = ~~max (0 , [~~IRx ~~Requirement~~ BAA Allocation Cost ~~across BAA~~ – Sum of Tier-1 IRx Cost Allocation across BAA~~])~~ ○ System shall allocate Tier-2 IRx 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 IRx 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 IRx Tier-1 and IRx Tier-2 cost allocations based on the MSS operator's net portfolio uninstructed deviations. ▪ **Note:** 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.		

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	○ Otherwise, for both IRx Tier-1 and IRx 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 IRx Tier-1 and IRx Tier-2 cost allocations. **Notes** • This cost allocation does not apply to EIM BAAs. • Tier-1 IRx Cost Allocation to Generation and Import/Export component types applies to all generation resources, regardless whether they are awarded IRx 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 IRx cost allocations. • For each BAA, if the IRx obligation is higher than the IRx awards, all of the IRx cost will be allocated to IRx Tier-1, otherwise, IRx cost will be split between Tier-1 and Tier-2.		
DAME-BRQ-09180	**RUC RC Cost Allocation** • System shall be updated to allocate RUC RCx costs in two Tiers, where x = U, D. • **Tier-1** RCx Cost Allocation, for each individual component, and on hourly basis: ○ Tier-1 RUC RCx Allocation Cost = Tier-1 RCx Allocation Quantity * Tier-1 RCx BAA Allocation Price. ○ Tier-1 RCx Allocation Quantity shall be calculated as follows:	Core	• Settlements

Component Type	Tier-1 RCU Allocation Quantity	Tier-1 RCD Allocation Quantity

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted

Virtual Bids	max (0 , SC Net Virtual Supply Awards). Applies only if the BAA has total net virtual supply.	max (0 , SC Net Virtual Demand Awards). Applies only if the BAA has total net virtual demand.
Load	ABS (Net Negative Metered Demand) i.e. Under-Scheduled Load See note below about Net Negative Metered Demand exclusions.	Net Positive Metered Demand i.e. Over-Scheduled Load See note below about Net Positive Metered Demand exclusions.

- For each BAA, Tier-1 RCx BAA Allocation Price shall be calculated as follows:
  - Min (RCx BAA Average Price , RCx BAA Derived Price)
  - where
    - RCx BAA Average Price = ~~Sum of~~ RCx ~~Payments across~~ BAA Allocation Cost / Sum of (RCx Awards ~~across~~minus RCx No Pay Quantity) over all resources within the BAA.
    - RCx BAA Derived Price = ~~Sum of~~ RCx ~~Payments across~~ BAA Allocation Cost / Sum of Tier-1 RCx Allocation Quantity across BAA.
    - Where **RCx BAA Allocation Cost** = Sum of (RCx Payments minus RCx No Pay Charge) over all resources within the BAA

- **Tier-2** RCx Cost Allocation, for each BAA, and on hourly basis:
  - System shall calculate Tier-2 RCx BAA Allocation Cost as the remainder (left over) of unallocated RCx costs from Tier-1, as follows:

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	▪ Tier-2 RCx BAA Allocation Cost = ~~max (0 , [Sum of~~ RCx ~~Payments across~~ BAA Allocation Cost – Sum of Tier-1 RCx Cost Allocation across BAA~~])~~ ○ System shall allocate Tier-2 RCx BAA Allocation Cost proportional to Metered Demand within each BAA. ○ If a BAA is Gen-only (does not have metered demand), Tier-2 RCx 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 NOT get RCx Tier-1 nor RCx Tier-2 cost allocations. ▪ **Note:** Because an MSS Operator that has elected to Load Follow is required to provide sufficient resources in DAM to follow its Load within the MSS Deviation Band, the MSS Bubble which has elected to Load Follow shall not receive a RCU/RCD allocation. ○ Otherwise, for both RCx Tier-1 and RCx 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 RCx Tier-1 and RCx 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 RCx Tier-1 and RCx Tier-2 cost allocations. **Notes** • This cost allocation does not apply to EIM BAAs. • For Tier-1 RCU (RCD, respectively) cost allocations to Load component type, the net negative (positive) metered demand will exclude net negative (positive) demand associated with balanced ETC/TOR rights, negative (positive) deviation for Participating Load (PL) resulting from a market dispatch.		

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• For each BAA, If the RCx obligation is higher than the RCx awards, all of the RCx cost will be allocated to RCx Tier-1, otherwise, RCx cost will be split between Tier-1 and Tier-2, where x = U, D.		
DAME-BRQ-09200	**IR DA BCR Settlements** System shall be updated for the following: • Revenue and bid costs for IRU/IRD awards (after netting No-Pay) shall be included in the calculation of DA BCR. • Mathematically, for each resource, for each hour: ○ IR Revenues = ([IFM IRU Awards – IRU No-Pay Quantity] * IFM IRUMP) + ([IFM IRD Awards – IRD No-Pay Quantity] * IFM IRDMP) ○ IR Bid Costs = ([IFM IRU Awards – IRU No-Pay Quantity] * IFM IRU Bid Price) + ([IFM IRD Awards – IRD No-Pay Quantity] * IFM IRD Bid Price) **Notes** • Resources committed in IFM, including resources that are scheduled for IRU/IRD, shall be eligible to get DA BCR. • Accounting Commitment Costs in DA BCR will remain intact as existing.	Core	• Settlements
DAME-BRQ-09220	**RC RT BCR Settlements** System shall be updated for the following: • Revenue and bid costs for RCU awards (but excluding resources with proxy RCU awards) (after netting No-Pay and RCU/RCD Overlapping RA Capacity, regardless of their LSE-RA Resource Pair True-Up Flags) shall be included in the calculation of RT BCR. • Revenue and bid costs for RCD awards (after netting No-Pay) shall be included in the calculation of RT BCR. • Mathematically, for each resource, for each hour: ○ RC Revenues = {Max (0, [RUC RCU Awards – Hourly RCU Overlapping RA Capacity Quantity – RCU No-Pay Quantity]) * RUC RCUMP} + {Max (0, [RUC RCD Awards – Hourly RCD Overlapping RA Capacity Quantity – RCD No-Pay Quantity]) * RUC RCDMP} ○ RC Bid Costs = {Max (0, [RUC RCU Awards – Hourly RCU Overlapping RA Capacity Quantity – RCU No-Pay Quantity]) * RUC RCU Bid Price} +	Core	• Settlements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	{Max (0, [RUC RCD Awards – Hourly RCD Overlapping RA Capacity Quantity – RCD No-Pay Quantity]) * RUC RCD Bid Price} • RUC BCR costs shall be allocated, in alignment with RCU cost allocation, to net virtual supply and under scheduled load. **Notes** • Resources committed in RUC, including resources that are scheduled for RCU/RCD, shall be eligible to get RT BCR. • A resource can be awarded either RCU or RCD awards, but not both, for the same hour. • Accounting Commitment Costs in RT BCR will remain intact as existing.		
DAME-BRQ-09240	**Inclusion of IR & RC in GMC Settlements** System shall be updated for the following: • GMC Bid Transaction Fee shall be applied for IRU/IRD and RCU/RCD bid segments. • GMC Market Services Charge shall be applied for IRU/IRD and RCU/RCD awards (but excluding proxy RCU awards). **Notes** • Eligible resources will include these GMC costs in their IR and RC bids. • Final RCU bids will not contain any proxy RCU bids. • Coordination/synchronization may be needed with GMC initiative.	Core	• Settlements
DAME-BRQ-09260	**IRU/IRD Unavailability No-Pay Charges** System shall be updated for the following: • Resources with an FMM Ex-post capacity range that does not support ($DAES_{DAM} + [IRU_{DAM} - IRU5_{DAM}]$) will be charged the resource-specific IRU No-Pay Penalty Price of Max (FMM FRUMP, IRUMP) for the undelivered MW quantity after accounting for DA Spinning Reserve award, and DA Non-Spinning Reserve award, in that respective order. • Resources with an FMM Ex-post capacity range that does not support ($DAES_{DAM} - [IRD_{DAM} - IRD5_{DAM}]$) will be charged the resource-specific IRD No-Pay Penalty Price of Max (FMM FRDMP, IRDMP) for the undelivered MW quantity.	Core	• Settlements
DAME-BRQ-09280	**RCU/RCD Unavailability No-Pay Charges** System shall be updated for the following:	Core	• Settlements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• Resources with an FMM Ex-post capacity range that does not support ($DAES_{DAM} + RCU_{DAM}$) (but excluding proxy RCU awards) will be charged the 5-minute resource-specific RCUMP for the undelivered MW quantity after accounting for DA Spinning Reserve award, DA Non-Spinning Reserve award, and IRU award, in that respective order. Exception is for VERs, where RCU No-Pay Penalty Price shall be the RCUMP. • Resources with an FMM Ex-post capacity range that does not support ($DAES_{DAM} - RCD_{DAM}$) will be charged the 5-minute resource-specific RCDMP for the undelivered MW quantity after accounting for IRD award.		
DAME-BRQ-09300	**IR and RC Unavailability No-Pay Charges Priority** System shall be updated for the following: • Resources that have been awarded both a RC and IR and are not available, or only bid a portion of their combined award, shall have the unavailability charge applied first to RC and then to IR.	Core	• Settlements
DAME-BRQ-09310	**Do not Assess RAAIM to IR and RC Awards for Generic and Flex RA** System shall continue to assess RAAIM penalty for Energy and AS bids. **Notes** • CAISO's availability assessment shall not consider local and system (generic) nor Flex RA resource's compliance with any IR and RC bidding obligations it holds. • **Implementation** • There will not be impact to exiting RAAIM functionality.	Existing	• Settlements
DAME-BRQ-09320	**IR – FRP RTM Ramp Deviation Settlements** System shall be updated for the following: • Resources that have been awarded both IRU (IRD) in IFM and FRU (FRD) in FMM shall be charged (paid) for the deviation between the FMM FRU (FRD) award and the 5-min ramp capable portion of the IRU (IRD) award [$IRU5_{DAM}$ ($IRD5_{DAM}$) from MQS] at the FMM FRUMP (FRDMP), respectively. **Notes** • Deviation settlements between FMM FRU (FRD) and RTD FRU (FRD), respectively, is existing functionality.	Core	• Settlements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-09340	**FMM Forecasted Movement Deviation Settlements** System shall be updated for the following: • For CAISO and EDAM BAAs, resources (including virtual supply and demand resources) that have upward (downward) deviation in Forecasted Movement in FMM relative to DAM is paid (charged) net difference between FMM FRUMP and FMM FRDMP, respectively. • For WEIM-only BAAs, resources that have upward (downward) deviation in Forecasted Movement in FMM relative to Base Schedule Forecasted Movement is paid (charged) net difference between FMM FRUMP and FMM FRDMP, respectively. **Notes** • DA/Base Schedule Forecasted Movement is not settled. It is used to determine the deviation settlement of FMM Forecasted Movement Deviation only. DA/Base Schedule Forecasted Movement settlement is embedded in Day Ahead Energy settlement already or in the bi-lateral market settlement. • Forecasted Movement Deviation settlements between FMM and RTD is existing functionality. • If the 5-minute ramp capability that is awarded in IFM (as either energy movement or an IR award) is available and awarded in FMM (as either forecasted movement or a FRP award), there should be No net deviation settlement in FMM. • If the 5-minute ramp capability that is awarded in FMM is available and awarded in RTD (as either forecasted movement or a FRP award), there should be No net deviation settlement in RTD. • If the 5-minute ramp capability of a resource is awarded between forecasted movement and uncertainty awards the same across markets, from IFM to FMM to RTD, there are no net payments or charges due to deviations in RTM. • The only exceptions are when a resource reaches their Pmin or Pmax at a different time than in the preceding market, there is a ramp rate de-rate, or the resource's ramp capability is not fully used.	Core	• Settlements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-09350	**Accounting for Virtuals in Allocation of Residual Forecasted Movement Settlements** System shall be updated for the following for each 5-min interval: • For BAAs (CAISO BAA, EDAM BAAs and WEIM-only BAAs), the summation of FMM resource-specific FM and FMM virtual FM and RTD resource-specific FM shall be allocated to Meter Demand of the BAA or Passed Group as determined by WEIM RSE flexible ramp assessment. **Notes** • Allocation methodology is existing but adding virtual award FM costs/revenues.	Core	• Settlements
DAME-BRQ-09380	**Settlements of Overlapping RA Capacity for LSE-RA Resource True-Up Settlements Mechanism** If an RA resource is mapped to one or more LSEs that have their LSE-RA Resource Pair True-Up Flag set to Opt-In for a trading day, • System shall calculate the Settlements Amount for that RA Resource and each hour as: ○ Hourly IRx Overlapping RA Capacity Quantity ▪ Sum over all 15-min within the hour (15-min IRx Overlapping RA Capacity / 4) ○ Hourly IRx LOC for Overlapping RA Capacity ▪ Sum over all 15-min within the hour (15-min IRx LOC for Overlapping RA Capacity) ○ Hourly IRx Overlapping RA Capacity Amount ▪ (Hourly IRx Overlapping RA Capacity Quantity * Hourly IRxMP) – Hourly IRx LOC for Overlapping RA Capacity ○ Hourly RCx Overlapping RA Capacity Quantity ▪ Sum over all 15-min within the hour (15-min RCx Overlapping RA Capacity / 4) ○ Hourly RCx Overlapping RA Capacity Amount ▪ Hourly RCx Overlapping RA Capacity * Hourly RCxMP ○ Where x = {U, D} • System shall allocate the hourly IRx and RCx Overlapping RA Capacity Amount for that RA resource to the LSEs associated with it pro-rata to their monthly ~~RA showing~~Generic and Flex (across all	Core	• Settlements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	categories) RA Showings for LSEs that have Opted-In LSE-RA Resource Pair True-Up Flag, resulting in: ○ Hourly IRx Overlapping RA Capacity LSE Amount ○ Hourly RCx Overlapping RA Capacity LSE Amount • SCs of LSEs that have their LSE-RA Resource Pair True-Up Flag opted-in shall be paid Hourly IRx Overlapping RA Capacity LSE Amount and RCx Overlapping RA Capacity LSE Amount for all RA resources that are associated with them. • SCs of resources shall be charged the Hourly IRx Overlapping RA Capacity LSE Amount and RCx Overlapping RA Capacity LSE Amount for all LSEs that are associated with it.		
DAME-BRQ-09520	**Apply CRR 1B Methodology for CAISO BAA** For CAISO BAA: System shall apply CRR 1B methodology per existing Tariff	Core	• Settlements
~~DAME-BRQ-09530~~	~~**Calculate BAA IRU/IRD Allocation Cost**~~ ~~For CAISO and EDAM BAAs:~~ ~~• System shall calculate BAA IRU/IRD Allocation Cost as the product of (IRU/IRD Requirement netted against Sum of IRU/IRD Surplus) and IRUMP/IRDMP.~~ ~~• Mathematically, for each BAA, for each hour:~~ ~~○ IRx Allocation Cost = Max {0, [IRx Requirement – Sum (IRx Surplus)]} * IRxMP~~ ~~○ Where x = {U, D}~~	~~Core~~	~~• Settlements~~
~~DAME-BRQ-09535~~	~~**BAA IRU/IRD Allocation Cost Allocation**~~ ~~For CAISO and EDAM BAAs:~~ ~~• System shall allocate the BAA IRU/IRD Allocation Cost via the two-tier allocation methodology as described in DAME-BRQ-09160.~~ ~~• Mathematically, for each BAA, for each hour:~~ ~~○ Max {0, [IRx Requirement – Sum (IRx Surplus)]} * (IRxMP at associated Apnode) only is allocated to two-tier allocation methodology.~~ ~~○ Where x = {U, D}~~ ~~**Notes**~~ ~~• This represents the collection of demand Imbalance Reserve settlements.~~	~~Core~~	~~• Settlements~~
DAME-BRQ-09540	**Calculate BAA IRU/IRD Congestion Revenue** For CAISO and EDAM BAAs:	Core	• Settlements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• System shall calculate BAA IRU/IRD Congestion Revenue as the sum over all resources within that BAA of the product of (IRU/IRD Awards and the sub-components of marginal congestion prices of IRUMP/IRDMP [by BAA]) netted against the BAA-level (product of ~~BAA-level (~~IRUR/IRDR ~~minus Sum of IRUS/IRDS)~~ and the sub-components of marginal congestion prices of ~~IRUMP/IRDMP~~IRURMP/IRDRMP (for corresponding BAA) at the associated Imbalance Demand Hub Apnode minus product of Sum of IRUS/IRDS over the IR surplus zones within the BAA and the sub-components of marginal congestion prices of IRUSMP/IRDSMP of the associated IR surplus zone Apnode, respectively. • Mathematically, for each BAA, for each hour: ○ IRx Congestion Revenue = ~~{~~Sum ~~-~~over all resources for that BAA (IRx Award * IRxMP MCC by BAA) – Max {0, [IRx BAA Requirement ~~– Sum (~~Congestion Amount – IRx Surplus Congestion Amount] ○ Where~~)}} * (IRxMP~~ ▪ IRx BAA Requirement Congestion Amount = IRxR * IRxRMP MCC by BAA ~~at~~ ▪ IRx Surplus Congestion Amount = Sum over all IR Surplus Zones within the ~~associated Imbalance Demand Hub Apnode~~BAA (IRxS * IRxSMP MCC by BAA) ▪ Where x = {U, D} **Notes** • Based upon payload failures and fill logic, any IRx imbalance will be settled through neutrality charge code (rounding).		
DAME-BRQ-09560	**Calculate BAA Energy Congestion Revenues** For CAISO and EDAM BAAs: • System shall calculate BAA Energy congestion revenues as product of DA Energy Awards and congestion sub-components MCC of Energy LMP (for corresponding BAA).	**Existing System Functionality**	• Settlements
DAME-BRQ-09580	**Distribute BAA IRU/IRD Congestion Revenues for CAISO BAA** For CAISO BAA: • System shall distribute the BAA IRU/IRD congestion revenues net of BAA Energy congestion revenues through the existing CRR Balancing Account.	Core	• Settlements
DAME-BRQ-09600	**Distribute BAA IRU/IRD Congestion Revenues for EDAM BAAs** For EDAM BAA: • System shall return the BAA IRU/IRD congestion revenues, along with BAA Energy congestion revenues, to EDAM BAAs through BAA Congestion Offset Account, for distribution to its participants according to their OATT processes.	Core	• Settlements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Notes • Congestion contributions to transmission constraints in an EDAM BAA from resources in other EDAM BAAs contribute to the congestion offset of the EDAM BAA where the congestion occurs.		
DAME-BRQ-09610	**Apply HASP Reversal to CAISO BAA IFM Intertie Schedule** For CAISO BAA: • For intertie schedules that are awarded energy and/or RCU/RCD schedules in DAM and subsequently have incremental/decremental FMM schedule change in the RTM and did not submit energy profile tag prior to HASP, System shall apply revised Settlements HASP reversal rule on them by using IFM Energy plus RCU Award minus RCD Award instead of the current logic of using the minimum of IFM Energy Award and RUC Energy Schedule.	Core	• Settlements

5.9 Business Process: Manage Market Reporting

OASIS

- Publish IR/RC Bid-Related Data
- Publish IFM IR and RUC RC Nodal Prices
- Publish IFM IR and RUC Binding Constraints Shadow Prices
- Publish IFM IR and RUC RC Nomogram/Branch and Interties Shadow Prices
- Publish IFM IR and RUC RC MPM Intertie Constraint Competitive Path
- Publish IFM IR and RUC RC MPM Nomogram/Branch Competitive Path
- Publish IFM IR and RUC RC Aggregate Awards
- Publish IRU/IRD Requirements (IRUR/IRDR), IRU/IRD Surplus (IRUS/IRDS) and their Associated Imbalance Demand Hub/IR surplus zones Apnode for each BAA
- Publish IRU/IRD Requirement Thresholds
- Publish IRU/IRD Requirements Input Polynomials
- Publish IRU/IRD Requirements Uncertainty Histograms
- Publish IRU/IRD Forecasts
- Publish IRU/IRD Demand Curves
- ~~Publish IFM Forecast Movement~~
- Publish Payment and No-Payments of IR/RC-Charge Code Settlements Amounts Data

CMRI

- Publish IR and RC DAB Curves
- Publish IFM IRU and RUC RCU Mitigated Bids
- Publish IFM IR and RUC RC Resource Awards
- Publish IFM IR and RUC RC Resource Prices
- Publish IFM IR and RUC RC LSE Resource Awards
- Publish 15-min IRU/IRD LOC for Overlapping RA Capacity
- Publish resource-specific DA/Base Schedule Forecasted Movement Data
- Publish nodal, by SC DA Schedule Virtual Forecasted Movement Data

MPP

- Publish Shift Factors Data for IR Deployment Scenarios from IFM

5.9.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-10140	**Publish IR/RC Bid-Related Data** Upon data receipt, System shall report the following IR/RC bid-related data (original and corrected): • Resource-Specific Hourly Data o IRU/IRD Clean Bids o RCU/RCD Clean Bids	Core	• OASIS
DAME-BRQ-10160	**Publish IFM IR and RUC RC Nodal Prices** Upon data receipt, System shall report the following IFM IR and RUC RC market results data (original and corrected): • Nodal Hourly Data o IFM IRUMP/IRDMP Nodal Prices and their price breakdown, but shall not include the sub-components of their marginal congestion prices, including prices for Imbalance Demand Hub Apnodes as well as Apnodes associated with IR surplus zones. o RUC RCUMP/RCDMP Nodal Prices (single total prices [no price breakdown])	Core	• OASIS
DAME-BRQ-10160A	**Publish IFM IR and RUC RC Scheduling Point/Tie Combination Nodal Prices** Upon data receipt, System shall report the following IFM IR and RUC RC market results data (original and corrected) for Scheduling Points/Tie Combinations: • Nodal Hourly Data o IFM IRUMP/IRDMP Nodal Prices and their price breakdown, but shall not include the sub-components of their marginal congestion prices, including prices for Imbalance Demand Hub Apnodes as well as Apnodes associated with IR surplus zones. o RUC RCUMP/RCDMP Nodal Prices (single total prices [no price breakdown])	Core	• OASIS

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-~~10160~~10160B	**Publish IFM-MPM IR and RUC-MPM RC Nodal Prices** Upon data receipt, System shall report the following IFM-MPM IR and RUC-MPM RC market results data (original and corrected): • Nodal Hourly Data ○ ~~IFM &~~ IFM-MPM IRUMP/IRDMP Nodal Prices and their price breakdown, but shall not include the sub-components of their marginal congestion prices, including prices for Imbalance Demand Hub Apnodes as well as Apnodes associated with IR surplus zones. ○ ~~RUC &~~ RUC-MPM RCUMP/RCDMP Nodal Prices (single total prices [no price breakdown])	Core	• OASIS
DAME-BRQ-10180	**Publish IFM IR Binding Constraints Results** Upon data receipt, System shall report the following IFM IR market results data (original and corrected): • BAA Group Hourly Data ○ Binding IFM IRU/IRD Capacity. ○ Binding IFM IRU/IRD Shadow Prices	Core	• OASIS
DAME-BRQ-~~10180~~10180A	**Publish IFM IR Binding Constraints Shadow Prices** Upon data receipt, System shall report the following IFM IR market results data (original and corrected): • Network Constraints Hourly Data ○ Binding Constraint due to IFM IRU/IRD. ○ IFM IRU/IRD Constraint Shadow Prices	Core	• OASIS
DAME-BRQ-10180B	**Publish IFM IR Binding Scheduling Constraints Shadow Prices** Upon data receipt, System shall report the following IFM IR market results data (original and corrected): • Scheduling Constraints Hourly Data ○ Binding Constraint due to IFM IRU/IRD. ○ IFM IRU/IRD Constraint Shadow Prices	Core	• OASIS

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-10200	**Publish IFM IR and RUC RC Nomogram/Branch Shadow Prices** Upon data receipt, System shall report the following IFM IR and RUC RC market results data (original and corrected): • Network Constraints Hourly Data o IFM IRU/IRD Nomogram/Branch Shadow Prices o RUC RCU/RCD Nomogram/Branch Shadow Prices	Core	• OASIS
DAME-BRQ-10200A	**Publish IFM IR and RUC RC Interties Shadow Prices** Upon data receipt, System shall report the following IFM IR and RUC RC market results data (original and corrected): • Network Constraints Hourly Data o IFM IRU/IRD Intertie Shadow Prices o RUC RCU/RCD Intertie Shadow Prices	Core	• OASIS
DAME-BRQ-~~10200~~10200B	**Publish IFM-MPM IR and RUC-MPM RC Nomogram/Branch ~~and Interties~~ Shadow Prices** Upon data receipt, System shall report the following IFM-MPM IR and RUC-MPM RC market results data (original and corrected): • Network Constraints Hourly Data o ~~IFM &~~ IFM-MPM IRU/IRD Nomogram/Branch Shadow Prices o ~~RUC &~~ RUC-MPM RCU/RCD Nomogram/Branch Shadow Prices o ~~IFM & IFM-MPM IRU/IRD Intertie Shadow Prices~~ o ~~RUC & RUC-MPM RCU/RCD Intertie Shadow Prices~~	Core	• OASIS
DAME-BRQ-10200C	**Publish IFM-MPM IR and RUC-MPM RC Interties Shadow Prices** Upon data receipt, System shall report the following IFM-MPM IR and RUC-MPM RC market results data (original and corrected): • Network Constraints Hourly Data o IFM-MPM IRU/IRD Intertie Shadow Prices	Core	• OASIS

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	○ RUC-MPM RCU/RCD Intertie Shadow Prices		
DAME-BRQ-10220	**Publish IFM-MPM IR and RUC-MPM RC MPM Nomogram/Branch Competitive Path** Upon data receipt, System shall report the following IFM-MPM IR and RUC-MPM RC market results data (original and corrected): • Competitive Path Hourly Data ○ MPM Nomogram/Branch Competitive Path	Core	• OASIS
DAME-BRQ-~~10220~~10220A	**Publish IFM-MPM IR and RUC-MPM RC MPM ~~Nomogram/Branch &~~ Intertie Constraint Competitive Path** Upon data receipt, System shall report the following IFM-MPM IR and RUC-MPM RC market results data (original and corrected): • ~~Intertie Constraint~~ Competitive Path Hourly Data ~~○ MPM Nomogram/Branch Competitive Path~~ ○ MPM Intertie Constraint Competitive Path	Core	• OASIS
DAME-BRQ-10240	**Publish IFM IR and RUC RC Aggregate Awards** Upon data receipt, System shall report the following IFM IR and RUC RC market results data (original and corrected): • BAA Hourly Data ○ IFM IRU/IRD Awards ○ RUC RCU/RCD Awards (including proxy RCU awards)	Core	• OASIS
DAME-BRQ-10260	**Publish IRU/IRD Requirements ~~& Surplus~~** Upon data receipt, System shall report the following data for next Trade Days (binding: D+1 as well as advisory: D+2 and D+3) (original and corrected data): • BAA Hourly Data ○ IRU/IRD Requirements (IRUR/IRDR) ○ IRU/IRD Surplus (IRUS/IRDS) ○ Associated Imbalance Demand Hub Apnode **Notes**	Core	• OASIS

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• The published IRUR/IRDR are the ones that are adjusted to account for diversity benefit. • D+2 advisory data will be published at different time by 6 pm everyday. • D+3 advisory data will be published at different time by 6+ pm everyday.		
DAME-BRQ-~~1028~~10260A	**Publish IRU/IRD ~~Requirement Thresholds~~Surplus** Upon data receipt, System shall report the following data for next Trade Days (binding: D+1 as well as advisory: D+2 and D+3) (original and corrected data ~~only, no data corrections~~): • ~~BAA~~IR Surplus Zone Hourly Data (within each BAA) ○ IRU/IRD Surplus (IRUS/IRDS) ○ Associated IR Surplus Zone Apnode **Notes** • ~~Requirement Thresholds~~D+2 advisory data will be published at different time by 6 pm everyday. • D+3 advisory data will be published at different time by 6+ pm everyday.	Core	• OASIS
DAME-BRQ-~~1030~~10280	**Publish IRU/IRD ~~Requirements Input Polynomials~~Requirement Thresholds** Upon data receipt, System shall report the following data for next Trade ~~Days~~Day (D+1 ~~as well as D+2~~) (original data only, no data corrections): • BAA Hourly Data ○ IRU/IRD ~~Requirements Input Polynomials~~Requirement Thresholds	Core	• OASIS
DAME-BRQ-~~1032~~10300	**Publish IRU/IRD Requirements ~~Uncertainty Histograms~~Input Polynomials** Upon data receipt, System shall report the following data for next Trade ~~Days~~Day (D+1 ~~as well as D+2~~) (original data only, no data corrections): • BAA Hourly Data ○ IRU/IRD Requirements ~~Uncertainty Histograms~~Input Polynomials	Core	• OASIS

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-~~1034~~10320	**Publish IRU/IRD ~~Forecasts~~Requirements Uncertainty Histograms** Upon data receipt, System shall report the following data for next Trade ~~Days~~Day (D+1~~ as well as D+2~~) (original data only, no data corrections): • BAA Hourly Data ○ IRU/IRD ~~Forecasts~~Requirements Uncertainty Histograms	Core	• OASIS
DAME-BRQ-~~1036~~10340	**Publish IRU/IRD Input Data for Demand ~~Curves~~, Wind, Solar Forecasts** Upon data receipt, System shall report the following data for next Trade ~~Days~~Das (D+1~~ as well as D+2~~) (original data only, no data corrections): • BAA Hourly Data ○ IRU/IRD ~~Demand Curves~~Forecasts	Core	• OASIS
DAME-BRQ-~~1038~~10360	**Publish ~~IFM Forecast Movement~~IRU/IRD Demand Curves** Upon data receipt, System shall report the following data for next Trade Day (D+1) (original ~~and corrected~~ data only, no data corrections): • BAA Hourly Data~~, split by (Registered Generator, Load, and Intertie)~~ ○ ~~IFM Forecast Movement~~IRU/IRD Demand Curves	Core	• OASIS

DAME-BRQ-10400	**Publish Payment and No-Payments of IR/RC-Charge Code Settlements Amounts Data**
	Upon data receipt, System shall report the following payment and no-payments of IR/RC charge code Settlements amounts (original and corrected):
	• Resource-Specific Monthly Data and Zonal-Specific Daily Data
	  ○ CC-6800 – DA RUC Availability Settlement
	  ▪ (or tentative replacement: CC-6xxxx – DA RUC Reliability Capacity Up Settlement)
	  ○ CC-06824 – No Pay Residual Unit Commitment (RUC) Settlement
	  ▪ (or tentative replacement: CC-6xxxx – No Pay Residual Unit Commitment (RUC) Reliability Capacity Up Settlement)
	  ○ CC-6xxx (tentative) – No Pay Residual Unit Commitment (RUC) Reliability Capacity Down Settlement
	  ○ CC-6xxx (tentative) – DA Imbalance Reserve Up Settlement)
		Core	• OASIS

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	○ CC-6xxx (tentative) – No Pay DA Imbalance Reserve Up Settlement ○ CC-6xxx (tentative) – DA Imbalance Reserve Down Settlement) ○ CC-6xxx (tentative) – No Pay DA Imbalance Reserve Down Settlement		
DAME-BRQ-10680	**Publish IR and RC DAB Curves** Upon data receipt, System shall report the following data: • Resource-specific Daily ○ DAB Curves (MW , Bid Price) ○ Market Product Type: ▪ IRU ▪ IRD ▪ RCU ▪ RCD	Core	• CMRI
DAME-BRQ-10700	**Publish IFM-MPM IRU and RUC RCU-MPM Mitigated Bids** Upon data receipt, System shall report the following IFM IR and RUC RC market results data (original and corrected): • Resource-Specific Hourly Data ○ IRU Mitigated Bids ○ RCU Mitigated Bids	Core	• CMRI
DAME-BRQ-10720	**Publish IFM IR and RUC RC Resource Awards** Upon data receipt, System shall report the following IFM IR and RUC RC market results data (original and corrected): • Resource-Specific Hourly Data ○ IFM IRU/IRD Resource Awards (Market and Cleared) ○ RUC RCU/RCD Resource Awards (Market, Proxy and Cleared) ○ Retire RUC Awards as it is replaced with RCU Awards. **Notes** • The Proxy RCU Awards can co-exist for same resource and hour with RCU Awards.	Core	• CMRI

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• Award MW: Represents market award MW corresponding to the submitted bid (after mitigation, if any) for a specific market product (IRU, IRD, RCU, or RCD). • Proxy RCU MW: Represents the proxy RCU Award MW corresponding to the inserted/extends proxy bid. • Cleared MW: Represents the total cleared capacity MW (Award MW + Proxy MW [if applicable]) for a specific market product (IRU, IRD, RCU, or RCD). • Proxy MW should be zero for non-export resources. • Proxy MW should be zero for IRU, IRD and RCD market products. • No self-schedule MW is applicable to IRU/IRD or RCU/RCD market products.		
DAME-BRQ-10730	**Publish REN** System shall continue to publish REN. **Notes** • The following existing CMRI reports will be used without any modifications. o Reliability Coordination ▪ Forecasted Generation	Existing	• CMRI
DAME-BRQ-10740	**Publish IFM IR and RUC RC Resource Prices** Upon data receipt, System shall report the following IFM IR and RUC RC market results data (original and corrected): • Resource-Specific Hourly Data o IFM IRUMP/IRDMP Resource Prices and their price breakdown, but shall not include the sub-components of their marginal congestion prices (by BAA). o RUC RCUMP/RCDMP Resource Prices (single total prices [no price breakdown])	Core	• CMRI
DAME-BRQ-10780	**Publish 15-min IRU/IRD LOC and IRU/IRD & RCU/RCD Overlapping RA Capacity**	Core	• CMRI

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Upon data receipt, System shall report the following data (original and corrected) and shall be accessed by each resource's SC and by each resource's associated LSE: • RA-Resource-Specific 15-min ○ IRU/IRD LOC for Overlapping RA Capacity ○ IRU/IRD Overlapping RA Capacity ○ RCU/RCD Overlapping RA Capacity		
DAME-BRQ-10800	**Publish DA/Base Schedule Forecasted Movement Data** Upon data receipt, System shall report the following data (original and corrected) and shall be accessed by each resource's SC: • Resource-Specific Hourly ○ DA Schedule Forecasted Movement (for CAISO and EDAM BAAs) ○ Base Schedule Forecasted Movement (for WEIM BAAs)	Core	• CMRI
DAME-BRQ-10810	**Publish DA Schedule Virtual Forecasted Movement Data** Upon data receipt, System shall report the following data (original and corrected) and shall be accessed by each node's SC: • Nodal, by SC, Hourly ○ DA Schedule Virtual Forecasted Movement (for CAISO and EDAM BAAs)	Core	• CMRI
DAME-BRQ-10880	**Publish Shift Factors for IRU/IRD Deployment Scenarios** Upon data receipt, System shall report the following IFM market results data: • Shift Factor Hourly Data ○ Shift Factor for IRU/IRD deployment scenarios (including Imbalance demand Anode)	Core	• MPP

5.10 Business Process: Manage FERC Reporting

- Publish Market Data FERC
- Publish Settlements Data FERC

5.10.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted

DAME-BRQ-11420	**Publish Market Data to FERC**
	System shall have the capability to automatically publish the following data to FERC:
	• System Parameters Daily Data
	  ○ IRU/IRD Deployment Factor (DIRU/DIRD)
	• Resource-Specific Data
	  ○ IR Eligibility Flag
	  ○ RC Eligibility Flag
	• RA-Resource-Specific Monthly Data
	  ○ Mapping between RA Resources and LSEs
	  ○ RA Resources RA ~~Shown~~Showing Capacity ~~for each mapped LSE~~
	  ○ RA Resources Generic RA Showing Capacity for each mapped LSE
	  ○ RA Resources Flex RA Showing Capacity (for all categories) for each mapped LSE
	  ○ LSE-Resource Pair True-Up Flag (Opt- In/Out)
	• RA-Resource-Specific Daily Data
	  ○ RA Resources Identification
	  ○ RA Resources Generic RA Capacity
	  ○ RA Resources Flex RA Capacity
	• Resource-Specific Daily Data
	  ○ DAB Curves (Capacity MW , Bid Price) for:
	  ▪ IRU
	  ▪ IRD
	  ▪ RCU
	  ▪ RCD
	• Resource-Specific Hourly Data
		Core	• Internal ISO System

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	○ IRU/IRD and RCU/RCD Clean Bids ○ IRU/IRD and RCU/RCD Final Bids (including mitigation flags) ○ IRU/IRD and RCU/RCD Resource Awards ○ Retire RUC Awards (from go-live) as it is replaced with RCU Awards. ○ Proxy RCU MW ○ IRUMP/IRDMP Resource Prices and their price breakdown, but excluding sub-components of marginal congestion prices (by BAA). ○ RCUMP/RCDMP Resource Prices and their price breakdown, but excluding sub-components of marginal congestion prices (by BAA). ○ DA Schedule Forecasted Movement (for CAISO and EDAM BAAs) ○ Base Schedule Forecasted Movement (for EIM BAAs) • RA-Resource-Specific 15-min ○ IRU/IRD LOC for Overlapping RA Capacity ○ IRU/IRD Overlapping RA Capacity ○ RCU/RCD Overlapping RA Capacity • Nodal Hourly Data ○ IRUMP/IRDMP Nodal Prices and their price breakdown, including sub-components of marginal congestion prices (by BAA), including prices for Imbalance Demand Hub Apnodes as well as Apnodes associated with IR surplus zones. ○ RCUMP/RCDMP Nodal Prices and their price breakdown, including sub-components of marginal congestion prices (by BAA). • Nodal, by SC, Hourly Data ○ DA Schedule Virtual Forecasted Movement (for CAISO and EDAM BAAs)		

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted

	• Network Constraints Hourly Data
	  ○ Binding Constraint due to IRU/IRD and RUC.
	  ○ IRU/IRD and RUC Constraint Shadow Prices
	• Network Constraints Daily Data
	  ○ Deployment Scenario Deliverability Constraints Activation Flag for IRU/IRD Awards (separate activation flags for IRU and IRD)
	  ~~○ Deployment Scenario Deliverability Inclusion Constraints Flag due RCU/RCD Awards (separate activation flags for RCU and RCD)~~
	• BAA Hourly Data [for next Trading Days (D+1 as well as D+2 and D+3)]
	  ○ IRU/IRD Requirements (IRUR/IRDR) (adjusted for diversity benefit)
	  ○ IRU/IRD Surplus (IRUS/IRDS)
	  ○ Associated Imbalance Demand Hub Apnode
	• BAA Hourly Data [for next Trading Day (D+1)]
	  ○ IRU/IRD Requirement Thresholds
	  ○ IRU/IRD Requirements Input Polynomials
	  ○ IRU/IRD Requirements Uncertainty Histograms
	  ○ IRU/IRD Forecasts
	  ○ IRU/IRD Demand Curves
	• ~~BAA~~IR Surplus Zone Hourly Data~~, by Resource Category (within each BAA)~~
	  ~~○ DA Schedule Forecasted Movement (for CAISO and EDAM BAAs)~~
	  ~~○ Base Schedule Forecasted Movement (for WEIM BAAs)~~
	  ○ IRU/IRD Surplus (IRUS/IRDS)
	  ○ Associated IR Surplus Zone Apnode
	
	Notes		

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	• The Proxy RCU Awards can co-exist for same resource and hour with RCU Awards.		

DAME-BRQ-11440	**Publish Settlements Data to FERC**
	System shall have the capability to automatically publish the following data to FERC:
	• IRU/IRD and RCU/RCD Settlements Charge Codes
	  ○ Payments
	  ○ No-Pay Charges
	  ○ Cost Allocations
	  ○ BCR
	  ○ GMC
	  ○ IR – FRP Ramp Deviation
		Core	• Internal ISO System

5.11 Business Process: Manage Resource Adequacy Requirements (CIRA)

- Define LSE-RA Resource True-Up Flag
- Consume LSE-Resource Pair True-Up Flag from LSE' SCs
- Consume LSE-Resource Pair True-Up Flag from Resource's SC
- Set and Display Effective LSE-Resource Pair True-Up Flag
- LSE-Resource Pair True-Up Flag Election Change Rules
- Set LSE-RA Resource Pair True-Up Flag
- Broadcast LSE-RA Resource Pair True-Up Flag
- Broadcast Monthly RA Resources Identification and Mappings
- Broadcast Daily RA Resources Identification and Mappings

5.11.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted

DAME-BRQ-13005	**Define LSE-Resource Pair True-Up Flag**
	• System shall define the following LSE-resource pair specific fields:
	  ○ LSE-Resource Pair True-Up Flag
	• Supported possible values are:
	  ○ Opt-In
	  ○ Opt-Out
	• Default values for first implementation shall be set to:
	  ○ Opt-Out
	• The same resource may be part of multiple LSE SCs.
	• The same LSE SC may be paired with multiple resources.
	Notes
	• This flag is used for LSE-RA Resource True-Up settlements to compensate LSEs for IRU/IRD and RCU/RCD awards that overlap with RA capacity with IRU/IRD awards for transitional three years period starting from Tariff activation date.
		Core	• CIRA

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
DAME-BRQ-13010	**Consume LSE-Resource Pair True-Up Flag from LSE' SCs** At any time, System shall automatically consume the following LSE-resource pair specific fields from LSE' SCs: • LSE-Resource Pair True-Up Flag (Submitted by LSE's SC)	Core	• CIRA
DAME-BRQ-13012	**Consume LSE-Resource Pair True-Up Flag from Resource's SC** At any time, System shall consume the following LSE resource pairs specific fields from resource's SC: • LSE-Resource Pair True-Up Flag (Submitted by resource's SC)	Core	• CIRA
DAME-BRQ-13013	**Set and Display Effective LSE-Resource Pair True-Up Flag** Upon receipt of any data change, • If the LSE-Resource Pair True-Up Flag submitted by resource's SC matches the corresponding flag submitted by LSE's SC, System shall use the matched flag; otherwise, the effective flag shall be set to Opt-Out for that LSE-Resource pair. • System shall display the Effective LSE-Resource Pair True-Up Flag to both resource's SC and LSE's SC.	Core	• CIRA
DAME-BRQ-13015	**LSE-Resource Pair True-Up Flag Election Change Rules** • If an LSE's SC and resource's SC mutually change their Opt-in/Opt-out election for LSE-resource pair within 60-days of Tariff activation date, System shall apply that election retroactively starting from the Tariff activation date. • If an LSE's SC and resource's SC mutually change their Opt-in/Opt-out election for LSE-resource pair more than 60-days of Tariff activation date, System shall apply that election starting with the first Trading Day of the month after the month in which they completed the election process. • Display this flag to LSE's and resource's SC. • After 3-years from Tariff activation date, System shall set this flag to always Opt-Out for all LSE-RA resource pairs.	Core	• CIRA

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Note • For this project, Tariff activation date is same as Go-Live date.		
DAME-BRQ-13017	**Set LSE-RA Resource Pair True-Up Flag** For all RA resources-LSE pairs, System shall have the capability to automatically perform the following: • If LSE-Resource Pair True-Up Flag exists (not NULL), set LSE-RA Resource Pair True-Up Flag to be equal to LSE-Resource Pair True-Up Flag. • Otherwise (LSE-Resource Pair True-Up Flag does not exist (NULL), set LSE-RA Resource Pair True-Up Flag to Opt-Out.	Core	• CIRA

5.12 Business Process: <Market/Business Simulation>

This section shall provide a basis for the development of the Market/Business Simulation Scenarios. These requirements will provide guidance on the market participant impacts, inputs into the Scenarios, endpoints to the Scenarios and reasons for potential Scenarios. The guidance on market participant impacts shall be gathered from the requirements that impact rules, interfaces, applications/reports, new system processes, new/modified data models, and new user roles. The source and sink systems shall be determined through the development of the system context diagram and the web service requirements. The *Reason for the Potential Scenario* column will be to offer guidance regarding what potential scenarios, and their context, may be needed for this project. This section applies to all policy development projects, market enhancements, technology enhancements, operation enhancements, Western Energy Imbalance Market (WEIM) implementations, and Reliability Coordination (RC) service implementations.

In the Reason for Potential Scenario column, select one or more of the following reasons:

1. **Rule Impacts**: Generalized changes in market rules, bidding rules, settlements rules, market design changes, or other business rules.
2. **Interface changes**: Changes that impact templates (e.g., the Resource Adequacy (RA) supply plan), user interface (UI), and application programming interface (API) (e.g., retrievals of new shadow settlement data).
3. **New application/report**: Changes that cause addition/modification of market software or reports, especially when market data input is required by the market participant.
4. **New system process**: Modification of data flow in systems, especially if the new process requires the market participant to demonstrate proficiency prior to production.
5. **New/Modified model data**: Addition or substantial modification of model data as a market solution or export provided by the ISO.
6. **New user role**: The addition or modification of access permissions for a user role applied to specific business units within a WEIM entity or market participant organization (e.g., Load Serving Entity (LSE) as a Local Regulatory Authority (LRA) role). Scenarios are beneficial for market participants taking on a new function or process within their organization.

5.12.1 Business Requirements

ID#	Guidance on Market Participant Impacts	Source System	Sink System	Reason for Potential Scenario
DAME-MSIM-15020	**ISO SCs Submit IRU/IRD & RCU/RCD Bids**	• SIBR	• CMRI • OASIS • MRI-S	1. Rule Impacts 2. Interface changes

ID#	Guidance on Market Participant Impacts	Source System	Sink System	Reason for Potential Scenario

	• Set up a scenario where SCs for resources within CAISO BAA submit bid combinations, including IRU/IRD and RCU/RCD bids.
	• Run DAM (IFM and RUC).
	• Run Settlements
	• Follow the results in sink systems to verify market results:
	  ○ OASIS
	  ▪ IR/RC Bid-Related Data
	  ▪ IFM IR and RUC RC Nodal Prices
	  ▪ IFM-MPM IR and RUC-MPM RC Nodal Prices
	  ▪ IFM IR and RUC Binding Constraints Shadow Prices
	  ▪ IFM IR and RUC RC Nomogram/Branch and Interties Shadow Prices
	  ▪ IFM-MPM IR and RUC-MPM RC Nomogram/Branch and Interties Shadow Prices
	  ▪ IFM-MPM IR and RUC-MPM RC MPM Nomogram/Branch and Intertie Constraint Competitive Path
	  ▪ IFM IR and RUC RC Aggregate Awards
	  ▪ IRU/IRD Requirements (IRUR/IRDR)
	  ▪ IRU/IRD Surplus (IRUS/IRDS)
	  ▪ Associated Imbalance Demand Hub/IR Surplus Zone Apnode
	  ▪ IRU/IRD Requirement Thresholds
	  ▪ IRU/IRD Requirements Input Polynomials
				3. new application /report
				4. New system process

ID#	Guidance on Market Participant Impacts	Source System	Sink System	Reason for Potential Scenario
	▪ IRU/IRD Requirements Uncertainty Histograms ▪ IRU/IRD Forecasts ▪ IRU/IRD Demand Curves ▪ ~~IFM Forecast Movement~~ ▪ Payment and No-Payments of IR/RC-Charge Code Settlements Amounts Data ○ CMRI ▪ IR and RC DAB Curves ▪ IFM-MPM IRU and RUC-MPM RCU Mitigated Bids ▪ IFM IR and RUC RC Resource Awards ▪ IFM IR and RUC RC Resource Prices ▪ IFM IR and RUC RC LSE Resource Awards ▪ IRU/IRD Overlapping RA Capacity ▪ RCU/RCD Overlapping RA Capacity ▪ IRU/IRD LOC for Overlapping RA Capacity ▪ DA/Base Schedule Forecasted Movement Data ▪ DA Schedule Virtual Forecasted Movement Data ○ MPP ▪ Shift Factors Data for IR Deployment Scenarios ○ Settlements ▪ IFM IR & RUC RC Payments ▪ IFM IR & RUC RC Cost Allocation ▪ IR DA and RC RT BCR Settlements			

ID#	Guidance on Market Participant Impacts	Source System	Sink System	Reason for Potential Scenario
	▪ Inclusion of IR & RC in GMC Settlements ▪ IRU/IRD & RCU/RCD Unavailability No-Pay Charges ▪ IR and RC Unavailability No-Pay Charges Priority ▪ IR – FRP RTM Ramp Deviation Settlements ▪ FMM Forecasted Movement Deviation Settlements ▪ Settlements of Overlapping RA Capacity for True-Up Settlements Mechanism ▪ Accounting IRU/IRD in CRR Settlements for CAISO and EDAM BAAs			
DAME-MSIM-15040	**Change Setting of IRU/IRD Deployment Factors** • Set up a scenario where CAISO set the IRU/IRD Deployment Factors to 50%. • Follow same scenario setup as the one described in DAME-MSIM-15020.	• DAM • SIBR	• CMRI • OASIS • MRI-S	1. Rule Impacts 2. Interface changes 3. new application /report 4. New system process
DAME-MSIM-15060	**Change Set of Activated Transmission Constraints in the IRU/IRD Deployment Scenarios** • Set up a scenario where CAISO BAA Operator changes set of activated transmission constraints that are monitored in the IRU/IRD deployment scenarios. • Follow same scenario setup as the one described in DAME-MSIM-15020.	• DAM • SIBR	• CMRI • OASIS • MRI-S	1. Rule Impacts 2. Interface changes 3. new application /report 4. New system process

6 Appendices

6.1 Appendix-A – Acronym Definition

Acronym	Definition
A2A	Application-to-Application
ABC	Available Balancing Capacity
ABS	Absolute value
AC	Alternating Current
ACL	Access Control List
ACPF	Alternating Current Power Flow
ADS	Automatic Dispatch System
AGC	Automatic Generation Control
AIM	Access and Identity Management
ALFS	Automated Load Forecast System
Anode	Aggregate Node
API	Application Program Interface
Apnode	Aggregate Pricing Node
AS	Ancillary Services
ASSOC	Ancillary Services State Of Charge
AUX	Auxiliary
B2B	Business-to-Business
BA	Business Analyst
BAA	Balancing Authority Area

Acronym	Definition
BAAOP	Balancing Authority Area Operations Portal
BARC	Balancing Area Requirement Calculator
BCR	Bid Cost Recovery
BPM	Business Process Manual
BRS	Business Requirement Specifications
BS	Base Schedule
BSAP	Base Schedule Aggregation Portal
BSC	Base Schedule Coordinator
BSSD	(WEIM) Base Schedule Submission Deadline
CAISO	California Independent System Operator
CB	Convergence Bidding
CC	Commitment Cost
CC	Charge Code
CCDEBE	Commitment Costs and Default Energy Bid Enhancements
CDN	Conformed Dispatch Notice
CF	Capacity Factor
CIDI	Customer Inquiry, Dispute and Information system
CIM	Common Information Model
CIP	Critical Infrastructure Protection
CIRA	Customer Interface for Resource Adequacy
CISO	California Independent System Operator
CLAP	Custom Load Aggregation Point

Acronym	Definition
CMRI	Customer Market Results Interface
CMT	Commitment
Cnode	Connectivity Node
COG	Constrained-Output Generator
CPM	Capacity Procurement Mechanism
CRN	Contract Reference Number
CRR	Congestion Revenue Rights
CRR1B	Congestion Revenue Rights Auction Efficiency 1B Project
CRRS	Congestion Revenue Rights Settlements (aka CRR Clawback system)
CSS	Critical Systems Support
CSV	Comma Separated Value
D	Day
D+1	Trading Day plus 1 day
D+2	Trading Day plus 2 days
DA	Day-Ahead
DAB	Default Availability Bid
DACA	Day-Ahead Contingency Analysis
DAES	Day-Ahead Energy Schedule
DAM	Day-Ahead Market
DAME	Day-Ahead Market Enhancements
DART	Day-Ahead Reliability Tool
DCC	Default Commitment Cost

Acronym	Definition
DCPA	Dynamic Competitive Path Assessment
DCPF	Direct Current Power Flow
DEB	Default Energy Bid
Dec	Decremental
DER	Distributed Energy Resource
DF	Demand Forecast
DGAP	Default Generation Aggregation Point
DIRD	Imbalance Reserve Down Deployment Factor (used in IRU Deployment Scenarios)
DIRU	Imbalance Reserve Up Deployment Factor (used in IRD Deployment Scenarios)
DMLC	Default Minimum Load Cost
DMM	Department of Market Monitoring
DOP	Dispatch Operating Point
DOT	Dispatch Operating Target
DR	Demand Response
DRP	Demand Response Program
DSA	Dynamic Stability Analysis
DSTC	Default State Transition Cost
DSUC	Default Start Up Cost
DUIT	Detailed Unit Information Tool
EA	Energy + Ancillary Services
ECIC	Energy Costs and Index Calculator
ED	Exceptional Dispatch

Acronym	Definition
EDAM	Extended Day-Ahead Market
EDR	Enterprise Data Repository
EE	Expected Energy
EEA	Expected Energy Allocation
EEA	Energy Emergency Alert
EEA2	Energy Emergency Alert Stage-2
EESC	Energy Imbalance Market Entity Scheduling Coordinator
EFC	Effective Flexible Capacity
EMM	Enterprise Model Management
EMMS	Enterprise Model Management System
EMNA	Energy Management Network Application
EMS	Energy Management System
En	Energy
EN	Energy
EPI	Electricity Price Index
ESP	Electronic Security Perimeter
ESR	Energy Storage Resource
ETC	Existing Transmission Contract
ETSR	Energy Transfer System Resources
FERC	Federal Energy Regulatory Commission
FIT	Fully Integrated Tracking (ISO reporting tool that provides system operators various reports for RT operations, such as Capacity Forecast, Day Ahead Reports, Load Shedding, Peak Day, Market Impacts Checker, etc.)

Acronym	Definition
FM	Forecasted Movement
FMCA	Fifteen-Minute Contingency Analysis
FMM	Fifteen-Minute Market
FMU	Frequently Mitigated Unit
FNM	Full Network Model
FODD	FERC Outgoing Data Depository
FRCT	Forbidden Region Crossing Time
FRD	Flexible Ramp Down
FRDMP	Flexible Ramp Down Marginal Price
FRP	Flexible Ramp Product
FRU	Flexible Ramp Up
FRUMP	Flexible Ramp Up Marginal Price
GCARM	Generator Contingency and RAS Modeling
GDF	Generation Distribution Factor
GHG	Green House Gas
GIP	Generator Interconnection Procedure
GMC	Grid Management Charge
GPI	Gas Price Index
GRDT	Generator Resource Data Template
GUI	Graphical User Interface
h	Trading Hour
HASP	Hour-Ahead Scheduling Process

Acronym	Definition
HAVGC	Heat Average Cost (for non-gas resources)
HR	Heat Rate
ICE	InterContinental Exchange
ICM	Infrastructure Contracts and Management
ID	Identifier
IFM	Integrated Forward Market
Inc	Incremental
ISL	Intertie Scheduling Limit
ISO	California Independent System Operator
Isomon	ISO Monitoring application
IOOC	Integrated Optimal Outage Coordination
IR	Imbalance Reserve
IRD	Imbalance Reserve Down (award)
IRD5	IRD Award 5-minute Ramp-Capable Portion
IRD5+	IRD Award excluding 5-minute Ramp-Capable Portion
IRDC	Imbalance Reserve Down allocated Capacity range
IRDC5	Imbalance Reserve Down allocated Capacity range, for the IRD 5-minute Ramp-Capable Portion.
IRDC5+	Imbalance Reserve Down allocated Capacity range, excluding IRU 5-minute Ramp-Capable Portion.
IRDMP	Imbalance Reserve Down Marginal Price
IRDR	Imbalance Reserve Down Requirement
IRDRMP	Imbalance Reserve Down Requirement Marginal Price

Acronym	Definition
IRDS	Imbalance Reserve Down Surplus
IRDSMP	Imbalance Reserve Down Surplus Marginal Price
IRU	Imbalance Reserve Up (award)
IRU5	IRU Award 5-minute Ramp-Capable Portion
IRU5+	IRU Award excluding 5-minute Ramp-Capable Portion
IRUC	Imbalance Reserve Up allocated Capacity range
IRUC5	Imbalance Reserve Up allocated Capacity range, for the IRU 5-minute Ramp-Capable Portion.
IRUC5+	Imbalance Reserve Up allocated Capacity range, excluding IRU 5-minute Ramp-Capable Portion.
IRUMP	Imbalance Reserve Up Marginal Price
IRUR	Imbalance Reserve Up Requirement
IRURMP	Imbalance Reserve Up Requirement Marginal Price
IRUS	Imbalance Reserve Up Surplus
IRUSMP	Imbalance Reserve Up Surplus Marginal Price
ISL	Interchange Scheduling Limit
IT	Information Technology
ITC	Inter-Tie Constraint
ITPD	Information Technology Product Development
ITS	Interchange Transaction Scheduler
ITSM	Information Technology Service Management
JOU	Joint Owned Unit
LACA	Look-Ahead Contingency Analysis

Acronym	Definition
LAP	Load Aggregation Point
LCL	Lower Capacity Limit
LDF	Load Distribution Factor
LEL	Lower Economic Limit
LEL_{FMM}	Lower Economic Limit (FMM)
LF	Load Forecast
LFD	Load Following Down qualified self-provision capacity
LFD	Load Following Down qualified self-provision capacity
LFDC	Load Following Down allocated Capacity.
LFR	Lower Forbidden Region
LFU	Load Following Up qualified self-provision capacity
LFU	Load Following Up qualified self-provision capacity
LFUC	Load Following Up allocated Capacity.
LMP	Locational Marginal Price
LMPM	Locational Market Power Mitigation
LOC	Lost Opportunity Cost
LOL	Lower Operating Limit
LPF	*Loss Penalty Factor*
LPT	Low Priority Price Taker
LRA	Local Regulatory Authority
LRL	Lower Regulation Limit
LSE	Load Serving Entity

Acronym	Definition
LTCA	Long-Term Contingency Analysis
Max	Maximum
MaxExCap	Maximum Ex-post Capacity
$MaxExCap_{FMM}$	Maximum Ex-post Capacity (FMM)
MCC	Marginal Congestion Cost
MCI	Model and Contract Implementation
MD	Manual Dispatch
MDT	Minimum Down Time
MDS	Maximum Daily Startups
MF	Master File
MIBP	Maximum Import Bid Price
Min	Minimum
MinExCap	Minimum Ex-post Capacity
MLAC	Minimum Load Average Cost
MLC	Minimum Load Cost
MLHAVGC	Minimum Load Heat Average Cost (for non-gas resources)
MLHR	Minimum Load Heat Rate
MMA	Major Maintenance Adder
MMAMLC	Major Maintenance Adder for Minimum Load Cost
MMASUC	Major Maintenance Adder for Start Up Cost
MMASTC	Major Maintenance Adder for MSG State Transition Cost
MMG	Manage Markets & Grid

Acronym	Definition
MMR	Manage Market & Reliability
MOO	Must Offer Obligation
MOS	Manage Operations Support & Settlements
MP	Marginal Price
MP	Market Participant
MPM	Market Power Mitigation
MPP	Market Participant Portal
MQS	Market Quality System
MRID	Master Resource IDentifier
MRI-S	Market Results Interface – Settlements
MSS	Metered Sub System
MSSA	Metered Sub System Agreement
MSG	Multi-Stage Generator
MUT	Minimum Up Time
MV	Materialized View
MV&A	Market Validation & Analysis
MVT	Market Validation Tool
N/A	Not Applicable
NA	Network Application
ND	Net Demand
NDAB	Negotiated Default Availability Bid
NDEB	Negotiated Default Energy Bid

Acronym	Definition
NGR	Non-Generating Resource
NM	Network Model
NPM	Nodal Price Model
NQC	Net Qualifying Capacity
NR	Non-Spinning Reserve award
NS	Non-Spinning Reserve award; it includes qualified self-provision capacity
NSC	Non-Spinning Reserve allocated Capacity range
OASIS	Open Access Same-time information System
OATI	Open Access Technology International
OC	Opportunity Cost
OCC	Opportunity Cost Calculator
ODCP	On Demand Capacity Procurement
OES	Operations Engineering Services
OMS	Outage Management System
OOM	Out Of Market
OTS	Operations Training Simulator
P97.5	97.5% Percentile
PAC	PacifiCorp
PACE	PacifiCorp East
PACW	PacifiCorp West
PAM	Program and Application Management
PBC	Power Balance Constraint

Acronym	Definition
PC	Pre-Calculation
PCA	Price Correction Admin
PDR	Proxy Demand Resource
PF	Power Flow
PI	Plant Information
PL	Participating Load
Pmax	Maximum Generation Capacity
Pmin	Minimum Generation Capacity
PMO	Program Management Office
PNM	Public New Mexico
Pnode	Pricing Node
POC	Point Of Contact
PRSC	Participating Resource Scheduling Coordinator
PSH	Pump Storage Hydro
PSTD	Power Systems Technology Development
PSTO	Power Systems Technology Operations
PT	Price Taker
PT	High Priority Price Taker
PTO	Participating Transmission Owner
QRB	Quality Review Board
RA	Resource Adequacy
RAAIM	Resource Adequacy Availability Incentive Mechanism

Acronym	Definition
RAS	Remedial Action Schemes
RC	Reliability Coordinator
RC	Reliability Capacity
RC-BSAP	Reliability Coordinator - Base Schedule Aggregation Portal
RCD	Reliability Capacity Down (award)
RCDC	Reliability Capacity Down allocated Capacity range (FMM).
RCDMP	Reliability Capacity Down Marginal Price
RCSA	Reliability Coordinator Service Agreement
RCU	Reliability Capacity Up (award)
RCUMP	Reliability Capacity Up Marginal Price
RCUC	Reliability Capacity Up allocated Capacity range
RD	Regulation Down (award)
RDC	Regulation Down allocated Capacity.
RDOT	Ramping Dispatch Operating Target (a continuous piecewise linear curve connecting consecutive *DOT*s using their mid-interval points, from RTD, RTCD, or RTDD runs, as applicable)
RDRR	Reliability Demand Response Resource
RDT	Resource Data Template
RegD	Regulation Down (award)
RegU	Regulation Up (award)
REN	Reliability Energy (another alternative terminology of RUC Schedule)
RIG	Remote Intelligent Gateway
RIMS	Resource Interconnection Management System

Acronym	Definition
RMR	Reliability Must Run
ROPR	Operating Reserve Ramp Rate
RR	Ramp Rate
RRD	Ramp Rate that corresponds to $DAES_{DAM} - IRD_{DAM}$
RREG	Regulation Ramp Rate
RRU	Ramp Rate that corresponds to $DAES_{DAM} + IRU_{DAM}$
RSE	Resource Sufficiency Evaluation
RSEE	Resource Sufficiency Evaluation Enhancements
RT	Real-Time
RTBS	Real-Time Base Scheduler
RTCA	Real-Time Contingency Analysis
RTCD	Real-Time Contingency Dispatch
RTD	Real-Time Dispatch
RTDD	Real-Time Disturbance Dispatch
RTPD	Real-Time Pre-Dispatch
RTM	Real-Time Market
RTN	Real-Time Nodal (Market)
RTUC	Real-Time Unit Commitment
RU	Regulation Up (award)
RUC	Residual Unit Commitment
RUC	Regulation Up allocated Capacity.
SADS	System And Design Specifications

Acronym	Definition
SC	Scheduling Coordinator
SCME	Scheduling Coordinator Meter Entity
SDF	Solar Distribution Factor
SE	State Estimator
SF	Shift Factor
SIBR	Scheduling Infrastructure and Business Rules
SME	Subject Matter Expert
SOA	Service-Oriented Architecture
SOC	State Of Charge
SP	Scheduling Point
SPCE	Siemens Price Correction Engine
SQMD	Settlements Quality Meter Data
SR	Spinning Reserve (award)
SRC	Spinning Reserve allocated Capacity range
SRS	System Requirement Specifications
SS	Self-Schedule
SSAE	Statement on Standards for Attestation Engagements
STC	State Transition Cost
STF	Short-Term Forecast
STC	State Transition Cost
STT	State Transition Time
STUC	Short-Term Unit Commitment

Acronym	Definition
SUC	Start Up Cost
SUE	Start Up Energy
SUF	Start Up Fuel
SURT	Start Up Ramp Time
SUT	Start Up Time
T	Trading Day
TBD	To Be Determined
TEP	Tucson Electric Power
TG	Tie Generator
TNA	Transmission Network Application
TOP	Transmission Operator Provider
TOR	Transmission Ownership Contract
TEE	Total Expected Energy
TTEE	Total Target Expected Energy (based on RDOT)
UAT	User Acceptance Testing
UCL	Upper Capacity Limit
UEL	Upper Economic Limit
UFR	Upper Forbidden Region
UI	User Interface
UIE	Uninstructed Energy Imbalance
UL	User Limited
UOL	Upper Operating Limit

Acronym	Definition
URL	Upper Regulation Limit
VER	Variable Energy Resource
VOM	Variable Operations & Maintenance
VOMC	Variable Operations & Maintenance Cost
WDF	Wind Distribution Factor
WebOMS	Web-based Outage Management System
WEIM	Western Energy Imbalance Market
XML	Extensible Markup Language
XSD	XML Schema Definition

6.2 Appendix-B: Formulas, Calculation Details, and Examples

6.2.1 Eligibility Tables

6.2.1.1 Resource Eligibility Table

Reference BRQs

- DAME-BRQ-01000
- DAME-BRQ-01010
- DAME-BRQ-04008
- DAME-BRQ-04020

	EN	RCU	RCD	EN needed for RCU/D award	IRU	IRD	EN needed for IRU award	EN needed for IRD award
Non-Participating Load	Yes	Not Eligible	Not Eligible	N/A	Not Eligible	Not Eligible	N/A	N/A
Virtual Supply	Yes	Not Eligible	Not Eligible	N/A	Not Eligible	Not Eligible	N/A	N/A
Virtual Demand	Yes	Not Eligible	Not Eligible	N/A	Not Eligible	Not Eligible	N/A	N/A
Hourly Block Import	Yes	Eligible	Eligible	None	Not Eligible	Not Eligible	N/A	N/A
Hourly Block Export	Yes	Eligible	Eligible	None	Not Eligible	Not Eligible	N/A	N/A
15-Min Import	Yes	Eligible	Eligible	None	Eligible	Eligible	None	EN >= IRD
15-Min Export	Yes	Eligible	Eligible	None	Eligible	Eligible	EN >= IRU	None
Dynamic Import	Yes	Eligible	Eligible	None	Eligible	Eligible	EN >= Pmin	EN <= Pmax

	EN	RCU	RCD	EN needed for RCU/D award	IRU	IRD	EN needed for IRU award	EN needed for IRD award
							EN <= Pmax - IRU	EN >= Pmin + IRD
Long-Start Generator	Yes	Eligible	Eligible	EN >= Pmin	Eligible	Eligible	EN >= Pmin EN <= Pmax - IRU	EN <= Pmax EN >= Pmin + IRD
Short-Start Generator	Yes	Eligible	Eligible	None	Eligible	Eligible	EN >= Pmin EN <= Pmax - IRU	EN <= Pmax EN >= Pmin + IRD
Participating Load w/ 15-Min dispatch capability	Yes	Eligible	Eligible	None	Eligible	Eligible	EN >= Pmin EN <= Pmax - IRU	EN <= Pmax EN >= Pmin + IRD
Participating Load w/ Hourly dispatch capability	Yes	Eligible	Eligible	None	Not Eligible	Not Eligible	N/A	N/A
Variable Energy Resources (Wind/Solar)	Yes	Eligible	Eligible	TBD	Eligible	Eligible	TBD	TBD
Non-Generator	Yes	Eligible	Eligible	N/A	Eligible	Eligible	N/A	N/A

	EN	RCU	RCD	EN needed for RCU/D award	IRU	IRD	EN needed for IRU award	EN needed for IRD award
Resources (Storage)		(only for positive range)	(only for negative range)		(only for positive range)	(only for negative range)		
Hybrid Resource	Yes	Eligible	Eligible	N/A	Eligible	Eligible	N/A	N/A
Co-Located Resource	--- Eligibility determined by individual storage and VER components ---							
Energy Storage Resource	Yes	Eligible	Eligible	N/A	Eligible	Eligible	N/A	N/A
60-Minute Proxy Demand Resource	Yes	Eligible	Eligible	None	Not Eligible	Not Eligible	N/A	N/A
15-Minute Proxy Demand Resource	Yes	Eligible	Eligible	None	Eligible	Eligible	EN >= Pmin EN <= Pmax – IRU	EN <= Pmax EN >= Pmin + IRD
5-Minute Proxy Demand Resource	Yes	Eligible	Eligible	None	Eligible	Eligible	EN >= Pmin EN <= Pmax – IRU	EN <= Pmax EN >= Pmin + IRD
Reliability Demand Response Resource	Yes	Not Eligible	Not Eligible	None	Not Eligible	Not Eligible	N/A	N/A

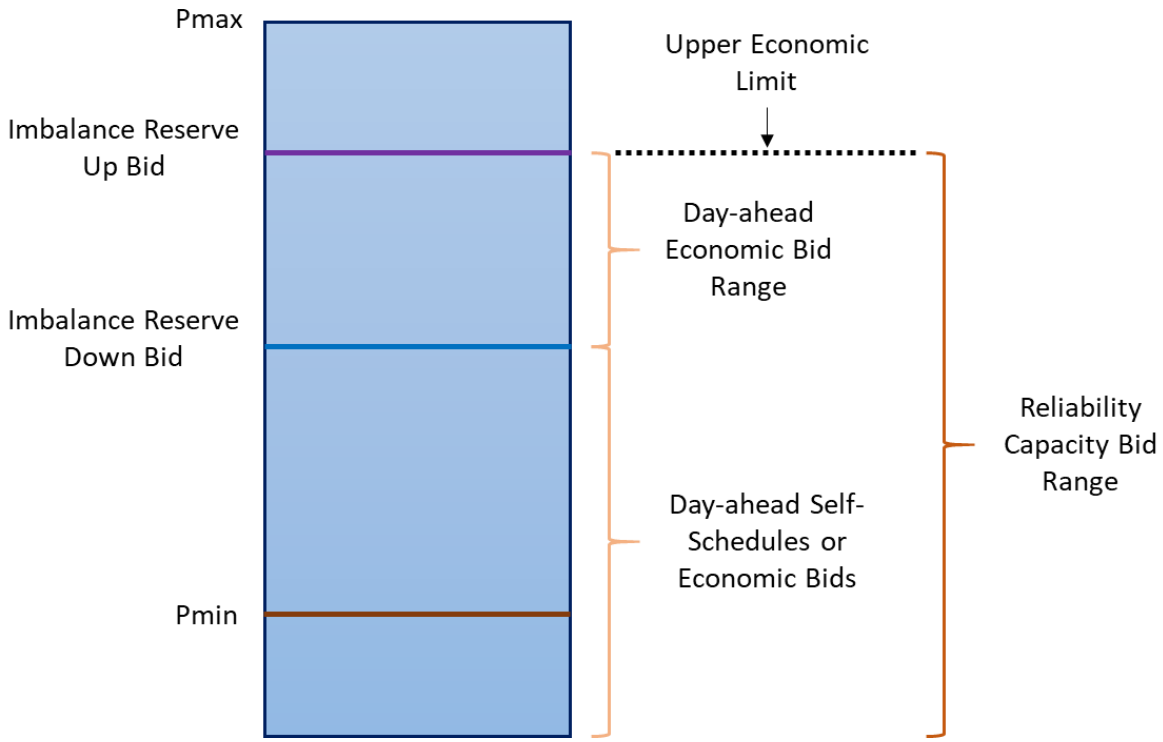
6.2.1.2 Proposed and Existing DAM Products

Title	Acronym	Time Granularity	Purpose	Eligibility*	Procured In	Status
Energy	EN	Hourly	Energy schedules cleared to meet bid-in demand	All resources	IFM	Existing
Reliability Capacity, Up	RCU	Hourly	Incremental capacity procured to meet the positive difference between the net load forecast and cleared non-VER physical supply	Physical resources based on 60-minute ramp capability	RUC	Replaces RUC awards
Reliability Capacity, Down	RCD	Hourly	Decremental capacity procured to meet the negative difference between net load forecast and cleared non-VER physical supply	Physical resources based on 60-minute ramp capability	RUC	Proposed
Imbalance Reserves, Up	IRU	15-min	Incremental capacity procured relative to the net load forecast to meet the upward uncertainty requirement	15-minute dispatchable physical resources, award based on 15-minute ramp capability	IFM	Proposed

Title	Acronym	Time Granularity	Purpose	Eligibility*	Procured In	Status
Imbalance Reserves, Down	IRD	15-min	Decremental capacity procured relative to the net load forecast to meet the downward uncertainty requirement	15-minute dispatchable physical resources, award based on 15-minute ramp capability	IFM	Proposed
Ancillary Services	AS	10-min	Incremental capacity procured and reserved to meet real-time regulation and contingency reserve requirements	Resources certified to provide the respective service	IFM	Existing

6.2.2 Bidding Obligation

6.2.2.1 Day-Ahead Bidding Rules for Imbalance Reserves and Reliability Capacity



6.2.2.2 Real-Time Bidding Obligations