

Business Requirements Specification

Energy Storage Enhancements Track 2

Document Version: 1.5


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Revision History

Date	Version	Description
5/25/2023	1.0	Document Created
6/27/2023	1.1	Updates in red reflect State of Charge scope: 1.1 Purpose Statement 2.1 Description 3.1 BPMs 3.2 Other Added the following BRQs: 102, 103, 104, 113, MSIM-001, MSIM-002

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Date	Version	Description
8/8/2023	1.2	Updates in red: <ul style="list-style-type: none"> • Added requirements BRQ250, BRQ251, BRQ252, BRQ253, and BRQ254. • Updated BRQ030 with Tariff Section. • Updated Section 3.1 for BPM changes from additional requirements.
8/17/2023	1.3	Updates in red: <ul style="list-style-type: none"> • Updated BRQ103 • Added Section 4.10 with the following BRQs: BRQ076 – BRQ087, BRQ093, BRQ094, and BRQ203. • Added MSIM–003.
9/12/2023	1.4	Updates in red: <ul style="list-style-type: none"> • Removed BRQ094
10/11/2023	1.5	Updates in red: Updated BRQ093, BRQ077, BRQ078.

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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 (SRS) 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).

Project Background

Storage developers are rapidly deploying new utility-scale resources onto the California grid to provide replacement capacity for retiring resources and to meet procurement mandates authorized by the California Public Utilities Commission.

The purpose of this initiative is to enhance reliability tools and the co-located model with regards to storage resources. The reliability enhancements includes updates to bidding rules, exceptional dispatch of storage resources, storage resource opportunity costs, and local area minimum online constraints. The co-located model enhancements include preventing co-located resources from charging when beyond generation levels for on-site resources and allowing pseudo-tied resources to use the co-located model.

Project Scope

Reliability Enhancements

- Allow for Exceptional Dispatches (EDs) to be issued for storage resources to hold SOC
 - Develop functionality within ED User Interface; automate existing excel tool functionality
 - Storage may receive a traditional ED or an SOC ED, but not both
- **Moved from Track 1 to Track 2:** Include lost opportunity cost from not generating in storage resource compensation due to Exceptional Dispatch (ED) to hold SOC (i.e. 0 MW ED)
 - Calculate counterfactual energy revenues with and without the SOC Hold ED
 - If prices are below bids counterfactuals will not include discharges
 - Use actual LMPs (the ISO will not generate counterfactual LMPs)
 - Include SOC Hold ED period through the end of the day in time horizon
 - Different Settlement process than traditional ED

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Co-Located Model Enhancements

- Develop an electable co-located model available to all storage resources
 - Storage schedules to never exceed renewable schedules (i.e. no grid charging)
 - Storage may deviate down to match solar, when solar is producing less than schedules in real-time
 - Deviations to be subject to imbalance energy charges
 - Require storage resources to submit outages when depleted and unable to charge
 - Require all resources to respond to operator and ED instructions within physical bounds of operation
- Allow for co-located pseudo-tie resources to apply Aggregate Capability Constraint (ACC)
 - Resources under an ACC must be pseudo-tied from the same BAA

2 Details of Business Need/Problem

2.1 Description

Business Opportunity/Problem Statement:	
What:	This initiative includes enhancements to the ED UI to allow Operators to better manage energy storage resource state of charge. In addition, this initiative includes a new counter-factual opportunity cost methodology to settle EDs to hold SOC. The initiative also includes enhancements and to the co-located model to support storage resource VER grid charging only (i.e. no grid charging).
Why do we have this opportunity/problem:	The number of storage resources interconnecting to the ISO grid is rapidly growing. Storage resources can charge and discharge; therefore they function inherently differently from one-way generation and load. Current operator tools, bidding rules, market optimization, and settlement rules require enhancements to accommodate the influx of storage resources to the grid.

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3 Project Impact Assessment (IA)

3.1 Business Practice Manuals (BPM)

BPM	Description of Impact(s)
Market Instruments	<ul style="list-style-type: none"> Updates for external reporting of ED SOC changes
Market Operations	<ul style="list-style-type: none"> Reflect new SOC Hold and SOC Charge ED reason codes for storage resources Reflect Storage resource ED SOC opportunity cost Reflect co-located model update to support “no grid charging” Impacts to regulation for co-located resources when hourly withdrawal limit = 0MW

3.2 Other

Impact	Description (optional)
Market Simulation	Yes
Market Participant Impact	ISO BA, WEIM BA
External Bid Publication	<ul style="list-style-type: none"> Reflect new EDs on OASIS Operator Initiated Commitment OASIS Report Impacts to CMRI for reporting of ACC for pseudo-tied resources.
Customer Readiness Impact	<i>Yes, see below.</i>
<ul style="list-style-type: none"> External Communication Needed 	Yes
<ul style="list-style-type: none"> External Onboarding and Maintenance 	No
<ul style="list-style-type: none"> External Training 	Yes
<ul style="list-style-type: none"> External Computer Based Training 	Potential Impacts (Storage CBT)
Policy Initiative	Yes


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4 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.

4.1 Policy and Tariff Requirements

Business Feature	Requirement Type	Potential Application(s) Impacted
This proposal includes new functionality that will allow dispatch to storage resources to hold a certain state of charge (MWh), in addition to the traditional (MW) exceptional dispatch. A tool will allow for dispatch of storage resources to charge to and hold a specific level of state of charge for a specific duration of time in the real-time market.	Policy	RTM
The proposal includes an electable functionality to limit dispatch instructions for co-located storage resources to charge to be no greater than the dispatch operating target of their co-located renewable resources in both the day-ahead and real-time markets. 9 This functionality will be electable on an hour by hour basis and offered to any co-located storage resource and will prevent 'grid charging.'	Policy	SIBR IFM/RTM
The proposal includes implementing this change, but only for co-located resources that can be modeled by an aggregate capability constraint and where all resources are pseudo-tied from the same balancing authority area to the ISO.	Policy	CMRI
This proposal includes new functionality that will allow dispatch to storage resources to hold a certain state of charge (MWh), in addition to the traditional (MW) exceptional dispatch. A tool will allow for dispatch of storage resources to charge to and hold a specific level of state of charge for a specific duration of time in the real-time market.	Policy	RTM

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Business Feature	Requirement Type	Potential Application(s) Impacted
<p>Actual signals for exceptional dispatch o resources will continue to be transmitted to storage SCs via dispatch instruction in terms of MW.</p>		
<p>Storage resources receiving exceptional dispatch instructions to hold state of charge will be compensated using a different methodology than traditional exceptional dispatch.</p> <p>This compensation will be based on an opportunity cost methodology and will capture the revenues that the resource would have received had it been optimally participating in the market, during the exceptional dispatch and for a period of time after the exceptional dispatch.</p>	Policy	Settlements OASIS CMRI
<p>The CAISO will settle storage resources that receive an Exceptional Dispatch to hold a State of Charge pursuant to Sections 11.5.6 and 11.5.6.1 for any FMM Instructed Imbalance Energy or RTD Instructed Imbalance Energy to move to the targeted State of Charge plus the resource’s opportunity cost for holding the State of Charge. The CAISO will calculate this opportunity cost starting from the first Operating Interval when the resource met and followed the Exceptional Dispatch through the end of the Operating Day. The CAISO will calculate the difference between the resource’s maximum potential RTM Energy revenues without the Exceptional Dispatch to hold the State of Charge and the resource’s maximum potential RTM Energy revenues with the Exceptional Dispatch to hold State of Charge. If the resource’s maximum potential RTM Energy revenues without the Exceptional Dispatch to hold State of Charge are higher than the resource’s maximum potential RTM Energy revenues with the Exceptional Dispatch to hold State of Charge, then the resource will receive the positive difference between these two values, which is its opportunity cost. The CAISO will calculate the resource’s opportunity costs based on its Master File characteristics, Bids, State of</p>	Tariff	Settlements

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Business Feature	Requirement Type	Potential Application(s) Impacted
Charge, Day-Ahead Schedules, and the applicable Locational Marginal Prices. <i>Section 11.5.6.1.2</i>		
For storage resources that receive an Exceptional Dispatch to hold a State of Charge, the RTM Market Revenue will include revenues from the opportunity cost to hold the State of Charge but not the Exceptional Dispatch Energy to reach the State of Charge. <i>Section 11.8.4.2</i>	Tariff	RTM Settlements
At the request of the Interconnection Customer or Pseudo-Tie Generating Facility, the CAISO may enforce an Aggregate Capability Constraint for Generating Facilities with Co-located Resources that reflects a Generating Facility's maximum and minimum capability or a portion of that capability for purposes of Day-Ahead Market Awards, Real-Time Market Awards, and Real-Time Dispatch as described in the CAISO's Business Practice Manuals. The following resources are not eligible to use the Aggregate Capability Constraint: Multi-Stage Generators, Proxy Demand Response, Pumped Storage Hydro Units, Metered Subsystems, and Use-Limited Resources. <i>Section 27.13</i>	Tariff	CMRI

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Business Feature	Requirement Type	Potential Application(s) Impacted
<p>At the request of the Scheduling Coordinator of a Co-Located Resource that is a storage resource, the CAISO will enforce a Charging Constraint that reflects the storage resource’s election not to charge beyond the output of its co-located Variable Energy Resource(s). Where a storage resource has a Charging Constraint registered in the Master File, the CAISO will not issue (a) Day-Ahead Schedules for Energy less than the negative value of the co-located Variable Energy Resource’s Day-Ahead Schedules; or (b) FMM Schedules or RTD Schedules for Energy that are less than the negative value of the co-located Variable Energy Resource’s Dispatch Operating Target, in the same Operating Intervals. The CAISO will not observe Charging Constraints in Operating Intervals where the storage resource receives an Ancillary Service Award to provide Regulation or where the storage resource elects to use Regulation Energy Management.</p> <p><i>Section 27.13</i></p>	Tariff	SIBR IFM/RTM
<p>The CAISO may issue a manual Exceptional Dispatch for all types of Generating Unit.</p> <p><i>Section 34.11.1</i></p>	Tariff	RTM
<p>Co-located Resources that are Non-Generator Resources may deviate from Dispatch Instructions to observe their registered Charging Constraints pursuant to Section 27.14.</p> <p><i>Section 34.13.3</i></p>	Tariff	SIBR IFM/RTM
<p>Charging Constraint</p> <p>A constraint that reflects a storage resource’s election not to charge beyond the output of its co-located Variable Energy Resource.</p> <p><i>Appendix A</i></p>	Tariff	SIBR IFM/RTM

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4.2 Business Process: Manage RIMS

4.2.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ001B INT/EXT BRS	<p>App & Study → Equipment Configuration → Generation Type and Fuel Type shall have a new field (column) for all resources called MWh.</p> <p>Implementation note: This new field will be to the right of Net MW. This is only a numeric field. This new field must be available for entry for existing and new RIMS A&S projects.</p>	Core	RIMS
ESE2-BRQ004A INT/EXT BRS	<p>System (RIMS) must have two new fields of “MWh” and “PMin” within the General Project information under the Fuel Type and Megawatt grid for each fuel type 1-4.</p>	Core	RIMS (NRI)

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4.3 Business Process: Manage SIBR

4.3.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ020 INT/EXT BRS	<p>The system shall have a new bid attribute to identify hours of the day that the sub or standalone ACC withdrawal limit is to be set to 0 MW</p> <p>--B to B: Y/N flag (to ensure market participants are not able to enter a value) --Attribute=Y --Withdrawal limit shall be defined by market type (DAM, RTM)</p>	Core	SIBR
ESE2-BRQ021 INT/EXT BRS	<p>The system shall broadcast to downstream systems the sub or standalone ACC withdrawal limit=0 MW when bid attribute (as described in BRQ020)=Y</p> <p>--A to A: Flag=Y→broadcast sub or standalone ACC withdrawal limit=0 MW</p> <p>--System shall broadcast the withdrawal limit per market type (DAM vs. RTM)</p> <p>Implementation note: If Flag = Y in SIBR, limit of 0 is sent to downstream system. If Flag = N in SIBR, then no limit will be sent to downstream system.</p>	Core	SIBR

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4.4 Business Process: Manage IFM and RTM

4.4.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ030 INT/EXT BRS	<p>The system shall consume sub or standalone ACC withdrawal limit=0 MW in an hourly fashion (Broadcast: BRQ021)</p> <p>--Updated hourly withdrawal limits shall be higher priority than Internal System value, and lower priority than UI override value</p>	Core <i>Compliance: §30.5.6.3</i>	IFM/RTM
ESE2-BRQ250 INT/EXT BRS	<p>During the hours where a standalone or sub ACC constraint has an hourly withdrawal limit = 0 MW, all the LES unit type resources behind the standalone or sub ACC constraint shall not receive regulation up or regulation down awards.</p>	Core <i>Compliance: §30.5.6.3</i>	IFM
ESE2-BRQ251 INT/EXT BRS	<p>During the hours where a standalone or sub ACC constraint has an hourly withdrawal limit = 0 MW, and there is no regulation up or regulation down award from the day ahead market for any of the LES unit type resources behind the standalone or sub ACC constraint, all the LES unit type resources behind such constraint shall not receive regulation up or regulation down awards.</p>	Core <i>Compliance: §30.5.6.3</i>	RTM
ESE2-BRQ252 INT/EXT BRS	<p>The hourly withdrawal limit = 0 MW for the standalone or sub ACC constraint shall not be enforced when there is an LES unit type resource that has an REM flag = Y.</p>	Core <i>Compliance: §30.5.6.3</i>	IFM/RTM

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Master file / override values shall still apply for the injection/withdrawal limit of the standalone or sub ACC constraint.		
ESE2-BRQ253 INT/EXT BRS	<p>The hourly withdrawal limit = 0 MW for the standalone or sub ACC constraint shall not be enforced when there is an exceptional dispatch on any of the LES unit type resource behind the standalone or sub ACC constraint for the applicable interval.</p> <p>Master file / override values shall still apply for the injection/withdrawal limit of the standalone or sub ACC constraint.</p>	Core <i>Compliance: §30.5.6.3</i>	RTM
ESE2-BRQ254 INT/EXT BRS	<p>The hourly withdrawal limit = 0 MW for the standalone or sub ACC constraint shall not be enforced when there is a regulation up or regulation down award from the day ahead market, or from RTPD, on any of the LES unit type resource behind the standalone or sub ACC constraint</p> <p>Master file / override values shall still apply for the injection/withdrawal limit of the standalone or sub ACC constraint</p>	Core <i>Compliance: §30.5.6.3</i>	RTM

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4.5 Business Process: Manage WEBOMS

4.5.1 Business Requirements


ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ056 INT/EXT BRS	System shall require storage resources to submit outage cards if the co-located VER cannot provide the charging energy as forecasted per Tariff requirements	Existing	WebOMS
ESE2-BRQ057 INT/EXT BRS	System shall require storage resources to submit outage cards if the resource has depleted its SOC and there is no ability to charge the resource per Tariff requirements	Existing	WebOMS

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4.6 Business Process: Manage ITS

4.6.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ060 INT/EXT BRS	System shall model pseudo-tied and dynamic co-located storage resources following the standard NRI pseudo-tie and dynamic rules and practices Note: pseudo-tied and dynamic storage resources <i>must</i> be registered as TNGR resources	Existing	ITS

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4.7 Business Process: Manage CMRI

4.7.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ110 INT/EXT BRS	System shall map pseudo-tied resource to the existing ACC Definition Report	Existing	CMRI
ESE2-BRQ111 INT/EXT BRS	System shall add pseudo-tied co-located resource's ACC MW value to the existing ACC Limits Report	Existing	CMRI


4.8 Business Process: Settlements

4.8.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ102 INT/EXT BRS	System shall compensate the SC for the storage resource that received the ED SOC uplift.	Core <i>Compliance:</i> §11.5.6.1.2 <i>BPM:</i> <i>Settlements & Billing</i>	Settlements

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ103 INT/EXT BRS	System shall allocate the total uplift cost associated with storage resource ED SOC's in two tiers based on: Tier 1: Net Negative Uninstructed Deviations Tier 2: Measured Demand	Core <i>Compliance:</i> §11.5.2.5.2 <i>BPM:</i> Settlements & Billing	Settlements
ESE2-BRQ104 INT/EXT BRS	Modify real-time bid cost recovery (BCR) charge code to account for revenue from storage resources ED SOC uplift.	Core <i>Compliance:</i> §11.8.4.2.1 <i>BPM:</i> Settlements & Billing	Settlements

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4.9 Business Process: OASIS

4.9.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ113 INT/EXT BRS	Moved from Track 1: System shall perform regression testing to confirm that new internal ED reason codes (“SOC Hold” and “SOC Charge”) are included under System Emergency Instruction Type, as “Reason,” on the Operator Initiated Commitment OASIS Report.	Existing <i>Compliance: N/A</i> <i>BPM: Market Instruments</i>	OASIS

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4.10 Business Process: Manage Internal System

4.10.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BR076	<p>The evaluation period (AKA SOC Evaluation Period) during which the counterfactual calculation shall be applied for a specific resource and starts from when a SOC Hold ED for that resource is first applied until the end of the trading day (11:59:59 pm).</p> <p>-Calculation only needs to be performed for resources that have an active SOC Hold ED during the trade day.</p> <p>-If only SOC Charge ED is issued, NO evaluation is necessary.</p>	<p>Core</p> <p><i>Compliance:</i> §11.5.6.1.2</p> <p><i>BPM: Market Operations</i></p>	Internal System
ESE2-BRQ077	<p>The system shall determine where a resource should have been dispatched for each 5-minute interval in the evaluation period, assuming <i>no</i> SOC Hold ED was applied (AKA Counterfactual Effective Dispatch <i>without</i> SOC Hold). This theoretical Effective Dispatch is based on the expected dispatch point using the resource bids, real-time prices, RT SOC, upper and lower market energy capacity limits, and minimum and maximum SOC levels.</p> <p>The Effective Dispatch shall observe the following (in this order):</p> <ul style="list-style-type: none"> • Physical Limitations on the resource: Pmin/Pmax, outage cards • EDs related to SOC Hold or SOC Charge that limit upper operating range of the resource (SOC Hold is NOT observed for counterfactual without hold) • Any other EDs 	<p>Core</p> <p><i>Compliance:</i> §11.5.6.1.2</p> <p><i>BPM: Market Operations</i></p>	Internal System

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	<ul style="list-style-type: none"> • Limitations due to awarded AS (all products) • Limitations due to SOC: operating range limited by insufficient SOC due to exceeding MinSOC or MaxSOC • Economic signals from the market: Compare LMPs and bid curves <p>➔ Given the remaining operating range of the resource, and bid curves for energy in that range, system shall determine Effective Dispatch based on a comparison of the locational marginal price and the resource bid.</p> <p>The counterfactual dispatches shall be further constrained to account for upward and downward AS awards. Internal System shall calculate the limits of the MEC (Market Energy Capacity calculated by the Internal System Commodity Allocation process, as detailed in Market Operations BPM Appendices) for purposes of the ESE formula. The counterfactual dispatches shall not exceed these MEC Limits.</p> <p>Dispatch direction shall be based on a comparison of LMP vs bid price; the existing RT Lower/Upper Economic Dispatch (RTL/UED) calculations can be used.</p> <p>Theoretical dispatch MW shall be based on any EDs (other than SOC Hold EDs) and the RTL/UED value. These values are limited above by: (SOC - Min SOC) * 12), And limited below by: (Max SOC-SOC) * - 12)/RTE</p>		

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	<p>If RT Lower Economic Dispatch <> RT Upper Economic Dispatch, indicating the resource is on the margin, use an RTL/UED at the average output of the bid segment.</p> <p>Five-minute interval final dispatch MW = ED MW if there is an active ED in place, other than SOC Hold ED instructions.</p> <p>Effective Dispatch shall also respect any max GOTO or min GOTO ED instructions.</p> <p>Note: if resource does not provide a bid for a trade hour, the resource is assumed to be dispatched to zero for intervals during that hour in which an ED is not active.</p> <p>Note: Use RTD LMP</p> <p>Note: See BRQ203 for calculation of upper and lower market energy capacity limits</p>		
ESE2-BRQ078	<p>The system shall determine where a resource should have been dispatched for each 5-minute interval in the evaluation period, assuming SOC Hold EDs were applied (AKA Counterfactual Effective Dispatch <i>with</i> SOC Hold). This theoretical Effective Dispatch is based on the expected dispatch point using the resource bids, real-time prices, RT SOC, SOC Hold ED, SOC Charge ED, upper and lower market energy capacity limits, and minimum and maximum SOC levels.</p> <p>The Effective Dispatch shall observe the following (in this order):</p>	<p>Core</p> <p><i>Compliance:</i> §11.5.6.1.2</p> <p><i>BPM: Market Operations</i></p>	<p>Internal System</p>

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	<ul style="list-style-type: none"> • Physical Limitations on the resource: Pmin/Pmax, outage cards • EDs related to SOC Hold or SOC Charge that limit upper operating range of the resource (SOC Hold IS observed for counterfactual with hold) • Any other EDs • Limitations due to awarded AS (all products) • Limitations due to SOC: operating range limited by insufficient SOC due to exceeding MinSOC or MaxSOC • Economic signals from the market: Compare LMPs and bid curves <p>➔ Given the remaining operating range of the resource, and bid curves for energy in that range, system shall determine Effective Dispatch based on a comparison of the locational marginal price and the resource bid.</p> <p>Dispatch direction shall be based on a comparison of LMP vs bid price; the existing RT Lower/Upper Economic Dispatch (RTL/UED) calculation value can be used.</p> <p>The counterfactual dispatches shall be further constrained to account for upward and downward AS awards. Internal System shall calculate the limits of the MEC (Market Energy Capacity calculated by the Internal System Commodity Allocation process, as detailed in Market Operations BPM Appendices) for purposes of the ESE formula. The counterfactual dispatches shall not exceed these MEC Limits.</p>		

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	<p>Theoretical dispatch MW shall be based on any EDs (other than SOC Hold EDs) and the RTL/UED value. These values are limited above by:</p> <p>$(SOC - \text{Min SOC}) * 12$,</p> <p>And limited below by:</p> <p>$(\text{MAX SOC} - \text{SOC}) * -12 / \text{RTE}$</p> <p>If RT Lower Economic Dispatch <> RT Upper Economic Dispatch, indicating the resource is on the margin, use RTL/UED at the average output of the bid segment.</p> <p>Five-minute interval final dispatch MW = ED MW if there is an active ED in place, other than SOC Hold ED instructions.</p> <p>Effective Dispatch shall also respect any max GOTO or min GOTO ED instructions.</p> <p>Note: if resource does not provide a bid for a trade hour, the resource is assumed to be dispatched to zero for intervals during that hour in which an ED is not active.</p> <p>Note: Use RTD LMP</p> <p>Note: See BRQ203 for calculation of upper and lower market energy capacity limits</p>		
ESE2-BRQ079	<p>Counterfactual Dispatch calculations shall use the following SOC limits. SOC limits shall be calculated for every 5-minute period during the SOC Evaluation Period.</p>	<p>Core</p> <p><i>Compliance:</i></p> <p>§11.5.6.1.2</p> <p><i>BPM: Market Operations</i></p>	Internal System

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	Min SOC=max (Minimum SOC, Lower Charge Limit) Max SOC= min(Maximum SOC, Upper Charge Limit)		
ESE2-BRQ080	<p>For the Counterfactual Dispatch calculations, system shall separately track storage resource SOC based on Effective Dispatch MW values. Initial SOC shall be the actual SOC (received via payload) corresponding to the beginning of the SOC Evaluation Period. After each dispatch, SOC shall be reduced by the following formula:</p> <p>If Effective Dispatch < 0 $SOC_t = SOC_{t-1} - (EffDispatch * RTE / 12)$ Else: $SOC_t = SOC_{t-1} - (EffDispatch / 12)$</p> <p>Note: RTE=resource specific round trip-efficiency</p> <ul style="list-style-type: none"> • For discharging instructions, efficiency factor = 1. • For charging instructions, efficiency factor = value received from master file. <p>Note: discharging instructions (positive MW) shall reduce the SOC, charging instructions (negative MW) shall increase the SOC.</p> <p>Note: The tracked SOC shall be used as an input into determining the expected dispatch point for all intervals in the SOC Evaluation period after the first interval.</p>	Core <i>Compliance:</i> §11.5.6.1.2 <i>BPM: Market Operations</i>	Internal System
ESE2-BRQ081	IF ED crosses over into the next day, then a new SOC Evaluation Period shall be initiated for the following day starting at 00:00	Existing	Internal System

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
		<i>Compliance:</i> §11.5.6.1.2 <i>BPM: Market Operations</i>	
ESE2-BRQ082	Based on the Counterfactual Dispatches <i>without</i> SOC Hold (BRQ077 above), the system shall calculate the storage resource revenue without SOC Hold ED, which is equal to: $[(\text{Effective Dispatch MW}) * (\text{LMP})] / 12$ Note: Use the RTD LMP Note: The value will be calculated on a 5-minute basis for settlement purposes, thus the product above must be divided by 12.	Core <i>Compliance:</i> §11.5.6.1.2 <i>BPM: Market Operations</i>	Internal System
ESE2-BRQ083	Based on the Counterfactual dispatches <i>with</i> SOC Hold (BRQ078 above), the system shall calculate the storage resource revenue with SOC Hold ED over the same time period, which is equal to: $[(\text{Effective Dispatch MW}) * (\text{LMP})] / 12$ Note: Use the RTD LMP Note: The value will be calculated on a 5-minute basis, thus the product above must be divided by 12	Core <i>Compliance:</i> §11.5.6.1.2 <i>BPM: Market Operations</i>	Internal System
ESE2-BRQ084	System shall calculate the total revenue <i>without</i> SOC Hold ED from the interval specific calculations within the SOC Evaluation Period.	Core <i>Compliance:</i> §11.5.6.1.2	Internal System



ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
		<i>BPM: Market Operations</i>	
ESE2-BRQ085	System shall calculate the total revenue <i>with</i> SOC Hold ED from the interval specific calculations within the SOC Evaluation Period.	Core <i>Compliance: §11.5.6.1.2</i> <i>BPM: Market Operations</i>	Internal System
ESE2-BRQ086	If, for a particular resource, the total revenue <i>without</i> SOC Hold > total revenue <i>with</i> SOC Hold, then the difference shall be stored as an uplift. Otherwise, the uplift shall be zero.	Core <i>Compliance: §11.5.6.1.2</i> <i>BPM: Market Operations</i>	Internal System
ESE2-BRQ087	System shall distribute the total uplift equally across all settlement intervals in the SOC Evaluation Period. -If there is no uplift, the system shall use a value of 0.	Core <i>Compliance: §11.5.6.1.2</i> <i>BPM: Market Operations</i>	Internal System
ESE2-BRQ093	System shall broadcast the following information to downstream systems: <ul style="list-style-type: none"> • ED start time • ED end time • Resource ID • SOC Hold instruction Reason Code • Instruction Type of the first SOC Hold ED of the day, listed for all intervals of the evaluation period. • Counterfactual dispatch MW with hold • Counterfactual dispatch MW without hold 	Core <i>Compliance: N/A</i> <i>BPM: N/A</i>	Internal System (CMRI)

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
ESE2-BRQ203	<p>The system shall calculate the limits (upper and lower) of the Market Energy Capacity (MEC) for storage resource counterfactual calculations.</p> <p>These limits shall mark the operational MW values bracketing the MEC currently calculated by the Internal System Commodity Allocation Process.</p> <p>Note: MEC limits are utilized in BRQ077 and BRQ078</p>	<p>Core</p> <p><i>Compliance: §11.5.6.1.2</i></p> <p><i>BPM: Market Operations</i></p>	Internal System

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4.11 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, Energy Imbalance Market (EIM) implementations, and Reliability Coordination (RC) service implementations. If the project team has deemed that no structured testing is needed, an end-to-end test case must be specified.

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 an EIM 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.

4.11.1 Business Requirements


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ID#	Guidance on Market Participant Impacts	Source System	Sink System	Reason for Potential Scenario
ESE2-MSIM-001 INT/EXT BRS	Moved from Track 1: Operator shall issue ED for storage resource to hold SOC, thus triggering the requirements to calculate counterfactual for storage resource settlement	RTM (ED Instructions)	Settlements CMRI	Confirm proper settlement for EDs to hold storage resource SOC
ESE2-MSIM-002 INT/EXT BRS	Moved from Track 1: Operator shall issue ED for storage resource to hold SOC, followed by an ED to move SOC to confirm different ED types for storage resource are being settled properly	RTM (ED Instructions)	Settlements CMRI	Confirm proper settlement for EDs to hold storage resource SOC, and for EDs to charge storage resource SOC
ESE2-MSIM-003 INT/EXT BRS	Unstructured Market Sim, End-to-End: Market Participants to confirm on their end that the interaction between the hourly withdrawal limit = 0 MW and regulation up and down awards for the standalone or sub ACC constraint is behaving as outlined in BRQ250, BRQ251, BRQ253, and BRQ254. Note: Market Participants should expect this item to be implemented after formal market sim for this initiative due to timeline constraints.	SIBR	IFM/RTM	Rule Impacts

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5 Acronyms and Definitions


Acronym	Definition
A2A	Application-to-Application
ABC	Available Balancing Capacity
ACL	Access Control List
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
AUX	Auxiliary
B2B	Business-to-Business
BA	Business Analyst
BAA	Balancing Authority Area
BAAOP	Balancing Authority Area Operations Portal
BCR	Bid Cost Recovery
BPM	Business Process Manual
BRS	Business Requirement Specifications

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Acronym	Definition
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
CCDEBE	Commitment Costs and Default Energy Bid Enhancements
CDN	Conformed Dispatch Notice
CIM	Common Information Model
CIP	Critical Infrastructure Protection
CIRA	Customer Interface for Resource Adequacy
CISO	California Independent System Operator
CLAP	Custom Load Aggregation Point
CMRI	Customer Market Results Interface
Cnode	Connectivity Node
COG	Constrained-Output Generator
CPM	Capacity Procurement Mechanism
CRN	Contract Reference Number
CRR	Congestion Revenue Rights
CRRS	Congestion Revenue Rights Settlements (aka CRR Clawback system)
CSS	Critical Systems Support

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Acronym	Definition
DA	Day-Ahead
DACA	Day-Ahead Contingency Analysis
DAM	Day-Ahead Market
DART	Day-Ahead Reliability Tool
DCPA	Dynamic Competitive Path Assessment
DEB	Default Energy Bid
DER	Distributed Energy Resource
DCC	Default Commitment Cost
DGAP	Default Generation Aggregation Point
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
ECIC	Energy Costs and Index Calculator
ED	Exceptional Dispatch
EDAM	Extended Day-Ahead Market

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Acronym	Definition
EDR	Enterprise Data Repository
EE	Expected Energy
EEA	Expected Energy Allocation
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
EPI	Electricity Price Index
ESP	Electronic Security Perimeter
ETC	Existing Transmission Contract
ETSR	Energy Transfer System Resources
FERC	Federal Energy Regulatory Commission
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

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Acronym	Definition
FRU	Flexible Ramp Up
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
HASP	Hour-Ahead Scheduling Process
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
ISL	Intertie Scheduling Limit
ISO	California Independent System Operator
IOOC	Integrated Optimal Outage Coordination
IT	Information Technology
ITC	Inter-Tie Constraint
ITPD	Information Technology Product Development

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Acronym	Definition
ITS	Interchange Transaction Scheduler
ITSM	Information Technology Service Management
JOU	Joint Owned Unit
LACA	Look-Ahead Contingency Analysis
LAP	Load Aggregation Point
LDF	Load Distribution Factor
LEL	Lower Economic Limit
LFR	Lower Forbidden Region
LF	Load Forecast
LMP	Locational Marginal Price
LMPM	Locational Market Power Mitigation
LOL	Lower Operating Limit
LRA	<i>Local Regulatory Authority</i>
LRL	Lower Regulation Limit
LSE	Load Serving Entity
LTCA	Long-Term Contingency Analysis
MCI	Model and Contract Implementation
MD	Manual Dispatch
MDT	Minimum Down Time
MDS	Maximum Daily Startups
MIBP	Maximum Import Bid Price

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Acronym	Definition
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
MMR	Manage Market & Reliability
MOS	Manage Operations Support & Settlements
MPM	market Power Mitigation
MRID	Master Resource IDentifier
MRI-S	Market Results Interface – Settlements
MSSA	Metered Sub System Agreement
MSG	Multi-Stage Generator
MUT	Minimum Up Time
MV&A	Market Validation & Analysis
MVT	Market Validation Tool
N/A	Not Applicable
NA	Network Application

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Acronym	Definition
NDEB	Negotiated Default Energy Bid
NGR	Non-Generating Resource
NM	Network Model
NQC	Net Qualifying Capacity
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
PAM	Program and Application Management
PBC	Power Balance Constraint
PC	Pre-Calculation
PCA	Price Correction Admin
PCT	Price Correction Tools
PDR	Proxy Demand Resource
PI	Plant Information
PL	Participating Load

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Acronym	Definition
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
PTO	Participating Transmission Owner
QRB	Quality Review Board
RA	Resource Adequacy
RC	Reliability Coordinator
RC-BSAP	Reliability Coordinator - Base Schedule Aggregation Portal
RCD	Reliability Capacity Down
RCSA	Reliability Coordinator Service Agreement
RCU	Reliability Capacity Up
RDOT	Ramping Dispatch Operating Target (a continuous piecewise linear curve connecting consecutive <i>DOTs</i> using their mid-interval points, from <i>RTD</i> , <i>RTCD</i> , or <i>RTDD</i> runs, as applicable)
RDRR	Reliability Demand Response Resource

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Acronym	Definition
RDT	Resource Data Template
RIG	Remote Intelligent Gateway
RIMS	Resource Interconnection Management System
RMR	Reliability Must Run
ROPR	Operating Reserve Ramp Rate
RR	Ramp Rate
RREG	Regulation Ramp Rate
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
RTUC	Real-Time Unit Commitment
RUC	Residual Unit Commitment
SADS	System And Design Specifications
SC	Scheduling Coordinator

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Acronym	Definition
SCME	Scheduling Coordinator Meter Entity
SE	State Estimator
SIBR	Scheduling Infrastructure and Business Rules
SME	Subject Matter Expert
SOA	Service-Oriented Architecture
SQMD	Settlements Quality Meter Data
SRS	System Requirement Specifications
STC	State Transition Cost
STF	Short-Term Forecast
STC	State Transition Cost
STT	State Transition Time
STUC	Short-Term Unit Commitment
SUC	Start Up Cost
SUE	Start Up Energy
SUF	Start Up Fuel
SURT	Start Up Ramp Time
SUT	Start Up Time
T	Trading Hour
TBD	To Be Determined
TEP	Tucson Electric Power
TG	Tie Generator

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Acronym	Definition
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
UEL	Upper Economic Limit
UFR	Upper Forbidden Region
UI	User Interface
UIE	Uninstructed Energy Imbalance
UL	User Limited
UOL	Upper Operating Limit
URL	Upper Regulation Limit
VER	Variable Energy Resource
VOM	Variable Operations & Maintenance
VOMC	Variable Operations & Maintenance Cost
WebOMS	Web-based Outage Management System
WEIM	Western Energy Imbalance Market
XML	Extensible Markup Language
XSD	XML Schema Definition