Business Requirements Specification

Resource Adequacy Enhancements Track: 1

Document Version: ~~3~~3.1

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Revision History

Date	Version	Description
3/18/2021	1.0	Initial Document release for Planned Outage Substitution Obligation
3/18/2021	2.0	Document updated to reflect Operationalizing Storage scope
4/12/2021	2.1	Document updated to reflect Operationalizing Storage policy scope change regarding providing the capability for operators to deactivate of minimum end of hour state of charge requirements in real-time.

5/14/2021	3.0	Updated the following:
		• RAE-BRQ024
		  ○ Revised to only apply to CAISO outages and added notes to it to apply to planned generation outages.
		• RAE-BRQ025
		  ○ Added to cover prevention of outage expansion (increasing the MW derate on outage) after the outage has started to match Tariff §9.3.3(6).
		  ○ Revised to only apply to CAISO outages and added 2nd bullet to clarify curtailment limitation when outages are extended and added notes to it apply to planned generation outages.
		  ○ Revised to allow outage breakpoints addition / deletion / update limited by the max curtailment of that trade date
		• RAE-BRQ026
		  ○ Added for allowing outage overlapping for specific nature of works
		• RAE-BRQ027
		  ○ Added for restricting specific nature of works to forced outages only.

Date	Version	Description

		• RAE-MKT003
		  ○ Changed T to T+1
		• Appendix-B (MSOC Algorithm)
		  ○ Replaced β with β(h+1) and revised the verbiage to reflect hourly β.

6/21/2021	3.1	• RAE-BRQ022:
		  ○ Removed CIRA from Impacted Applications.
		  ○ Revised the Exception to that BRQ with regards to CIRA not handling the exclusion of outages that have started and WebOMS not denying them.
		• RAE-BRQ128:
		  ○ Updated to allow RUC Under Supply Infeasibility and Enforced Constraints OASIS report to publish for all trade dates and hours.

Table of Contents

1 Introduction

1.1 Purpose

A historic heat storm impacted western US for several consecutive days in mid-August 2020, causing energy supply shortages that led to two rotating power outages in the ISO footprint on August 14th and 15th.

ISO commits to the development of actions to prevent supply gaps in advance of Summer 2021.

This initiative will make modifications to the backstop capacity procurement provisions to align backstop authority with the resource adequacy counting rules and adequacy assessments. This project will also propose to implement that all Planned Outages for Resource Adequacy (RA) resources must be accompanied by full substitute capacity for the outages to be approved. The only exemptions here are Transmission Induced Generation Outages (TIGO). Planned outages will require substitution upon submission of RA showings. The Scheduling Coordinators will provide substitution and the outages are accepted into the system, if the substitution is not provided then the system will deny the outage.

This initiative proposes that the minimum state of charge requirement tool be implemented in the real-time market that sets a minimum threshold state of charge for each resource adequacy storage resource with a day-ahead discharge award. This requirement would be observed and maintained by the real-time market, which may optimally schedule storage resources to charge or hold state of charge to meet these requirements.

The ISO does not intend to impose the minimum state of charge requirement every day. The ISO will only impose the minimum state of charge if the residual unit commitment (RUC) process results in an infeasibility. These infeasibilities are very infrequent and an indicator of tight system conditions. In 2018, there was only a single day (July 25) when a residual unit commitment process infeasibility occurred, and only a single day in 2019 (June 7). There was very hot weather in 2020 and infeasibilities occurred during 23 days including: August 13-21, August 24, September 5-7, and September 28-October 3, October 5, and October 14-16. Infeasibilities represent days when the system is stressed and there may be challenges meeting load in the real-time market.

The minimum state of charge will not be applicable for all hours of the day. The operations team will be able to specify critical hours for each day, which would generally be in the evening surrounding the peak net-load, where the minimum state of charge will be applied. If the storage resource receives a discharge schedule during the hours specified, then the minimum state of charge will be set prior to hours with discharge schedules.

The ISO will report on how frequently the minimum state of charge is used, when it was triggered, and may report on the estimated impact that the requirement has on the storage resources on the system. In

the event that the ISO rescinds a minimum state of charge requirement in the real-time market, the ISO will include those details in the report as well.

Scope for Phase- 1:

- CPM (for local availability limitations): BPM & Tariff Changes (Fall 2021)
- Planned Outage Process Enhancements Phase: 1 (Summer 2021)

Scope for RA Enhancements: Operationalizing Storage-

- Operationalizing Storage: Minimum State of Charge Requirements (Summer 2021)
- Reporting on the minimum EOH SOC requirements enforced in the RTM, critical hours used to calculate the minimum EOH SOC requirements and RUC under-gen infeasibility MW for each hour of the trade day. (Summer 2021)

1.2 References

All references represent external requirements documents or stakeholder requests, developed and submitted by the Business Units.

Information related to this RA Enhancements: Track 1 can be found on the following CAISO web page at:

http://www.caiso.com/InitiativeDocuments/ResourceAdequacyEnhancements-Phase1FinalProposal.pdf

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 Guidelines

Intellectual Property ownership must be considered by all applicable stakeholders before the services are performed. The level of analysis is two-fold:

1. One, the business owner must determine if the Intellectual Property necessary to perform the services is owned by the California ISO or whether it must be obtained from a third party. Once the California ISO has secured the proper Intellectual Property rights to perform the services (i.e., the Intellectual Property is owned by the California ISO or we have licensed it from a third party), the California ISO can undertake the next step.
2. The second step in the analysis is to consider whether new Intellectual Property will be created as a result of the business requirements or service requirements to be performed, and how that Intellectual Property will be owned and protected by the California ISO.

In order to assist the business owner in the analysis previously described, refer to the California Intellectual Property Policy available at: http://www.caiso.com/rules/Pages/LegalPoliciesNotices/Default.aspx, which provides a brief tutorial on what Intellectual Property is and how the California ISO can protect its Intellectual Property. Contact the Legal Department if you have any questions regarding Intellectual Property.

There are no impacts to intellectual property based on the requirements stated in this document.

2.2 Glossary

Acronyms definitions are listed in **Appendix-A – Acronym Definition**.

3 Details of Business Need/Problem

3.1 Description

Business Opportunity/Problem Statement:	
What:	This initiative will make modifications to the backstop capacity procurement provisions to align backstop authority with the resource adequacy counting rules and adequacy assessments. This project will also propose to implement that all Planned Outages for Resource Adequacy (RA) resources must be accompanied by full substitute capacity for the outages to be approved. The only exemptions here are Transmission Induced Generation Outages (TIGO). Planned outages will require substitution upon submission of RA showings. The Scheduling Coordinators will provide substitution and the outages are accepted into the system. If the substitution is not provided, then the system will deny the outage. This initiative also proposes that the minimum state of charge requirement tool be implemented in the real-time market that sets a minimum threshold state of charge for each resource adequacy storage resource with a day-ahead discharge award. This requirement would be observed and maintained by the real-time market, which may optimally schedule storage resources to charge or hold state of charge to meet these requirements.
When:	June 1, 2021 for Planned Outage Substitution Obligation & Operationalizing Storage The Capacity Procurement Mechanism scope is targeting an implementation date of Fall 2021.
Why do we have this opportunity/problem:	A historic heat storm impacted western US for several consecutive days in mid-August 2020, causing energy supply shortages that led to two rotating power outages in the ISO footprint on August 14th and 15th. ISO commits to the development of actions to prevent supply gaps in advance of Summer 2021.
Who does this opportunity/problem impact:	Market Participants, Customer Service.

4 Business Impacts

4.1 Business Practice Manuals (BPM)

BPM	Description of Impact(s)
Reliability Requirements	• Time constraints will need to be established for planned outage provisions. • Backstop Capacity Procurement Provisions (no system impacts for Track 1): CPM type remains the same (local individual/collection). On the technical study side, an extra reason will be added why a CPM can be triggered but no system implication due to this reason addition.
Outage Management	• Time constraints will need to be established for planned outage provisions.
Market Operations	Update for EOH MinSOC calculations and enforcement.
Market Instruments	Update for CMRI and OASIS reports to support EOH MinSOC functionality.

4.2 Other

Impact	Description (optional)
Market Simulation	**Yes** – See Market Sim section 5.7 of BRS for more information.
Market Participant Impact	**Yes**
External Training	**Yes**
Policy Initiative	Part of RA Enhancements 2021.

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: Manage Resource Implementation

5.1.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application (s) Impacted
RAE-BRQ002	System shall provide the user a UI to configure the following parameters of the RA Planned Outage Substitution Process: • Substitution Evaluation Window • Substitution Show Period	Core	CIRA
RAE-BRQ003	The System shall treat the new 'Substitution Evaluation Window' parameter as a configurable parameter with an initial default setting of "45" (days). **Implementation Note**: Parameter is the number of days prior to the start of the month the system will begin to assess the RA Planned Outage Substitution Process. The window always ends at the end of the month.	Core	CIRA
RAE-BRQ004	The System shall treat the new 'Substitution Show Period' parameter as a configurable parameter with an initial default setting of "24" (hours). **Implementation Note**: Parameter is the duration a participant has before the system determines the outage should be denied.	Core	CIRA
RAE-BRQ005	The system shall determine if the RA Planned Outage Substitution Process applies to a submitted resource outage.	Core	CIRA

ID#	Business Feature	Requirement Type	Potential Application (s) Impacted
	Implementation Note: Eligible outages are planned resource outages where any portion of the outage duration overlaps with the resource shown as an RA resource.		
RAE-BRQ006	System shall exempt Planned Transmission Induced Generation Outages and Off Peak Opportunity Outages from the Planned Substitution Obligation. The outages that are exempt from POSO shall be configurable based on the Nature of Work.	Core	CIRA
RAE-BRQ007	System shall provide the capability for an internal user to designate prior to the end of the show period an Outage not subject to auto denial.	Core	CIRA
RAE-BRQ008	On a daily basis, the system shall calculate a substitution Obligation for eligible resource outages where the duration between the evaluation date and outage start date is equal to or less than the “Substitution Evaluation Window”. **Implementation Note**: The system may calculate a new substitution Obligation if the outage spans multiple months and after a new RA plan is loaded into the system.	Core	CIRA
RAE-BRQ009	The System shall recalculate the substitution requirement if the date range of the outage is changed.	Core	CIRA
RAE-BRQ010	For the current month, the System shall only calculate the Planned Outages Substitution Obligation from T+1 to the end of the current month. **Note**: This is to ensure that the Planned Outage Substitution Obligation is only being assigned for Future dates.	Core	CIRA
RAE-BRQ011	System shall determine the POSO obligation MW when the RA Capacity range overlaps with the planned outage curtailment. RA Capacity shall be stacked from the bottom of the resource up to PMAX. Outage curtailment shall be	Core	CIRA

ID#	Business Feature	Requirement Type	Potential Application (s) Impacted
	stacked from earliest submitted outage to most recent from PMAX down to zero.		
RAE-BRQ012	At the end of the substitution show period: • If the outage is not started and the RA substitution is not provided, the system shall deny the outage. • If the outage is started, the outage cannot be denied but will be subject to RAAIM.	Core	CIRA
RAE-BRQ013	On a daily basis, the system shall determine when the RA Planned Outage Substitution Process has ended using the following criteria: 1) Valid substitution(s) are entered for each substitution requirement into the system. 2) When the duration of the RA Planned Outage Substitution process is equal to or greater than the 'Substitution Show Period'. **Implementation Note 1**: The RA Planned Outage Substitution Process begins when the first substitution requirement on the resource is created. **Implementation Note 2**: The duration of the RA Planned Outage substitution process is between the creation of the first substitute requirement and the current time.	Core	CIRA
RAE-BRQ014	The new Planned Outage substitution process identified in this BRS will be in effect starting with the RA month of June 2021 (configurable). **Note:** The current Planned Outage Substitution process will be executed in May 2021.	Core	CIRA
RAE-BRQ015	The System shall publish when an outage with a RA Planned Outage Substitution Obligation does not enter a substitution by the end of the Substitution Show Period.	Core	CIRA

ID#	Business Feature	Requirement Type	Potential Application (s) Impacted
RAE-BRQ019	System should provide a UI to display the Planned Outage Substitution Obligation and their statuses. **Implementation Note**: This UI shall be accessible by both Internal and External users.	Core	CIRA

5.2 Business Process: Capacity Procurement Mechanism RA Requirements (Fall 2021)

5.2.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
RAE-BRQ020	During the Annual Local Deficiency Analysis, the Business Unit will add an additional evaluation by confirming that the Local RA capacity procured meets the Local energy need.	Business Process	N/A

5.3 Business Process: Manage Outage Management System

Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
RAE-BRQ022	Upon receiving that a Resource Outage has failed to meet their RA Outage Substitution, the System shall deny the Outage. **Implementation Note:** WebOMS should provide the reason for the denial of the Planned outage. **Exception:** An outage that has already started. CIRA ~~will~~shall not handle the exclusion of outages that have started and will ~~not~~ include these in the new "Outage Denial Request" payload. WebOMS shall not deny the outages that have begun.	Core	webOMS~~, CIRA~~
RAE-BRQ023	System shall receive the RA Substitution Obligation dataset payload from CIRA. The set of outages for denial will be sent in a new payload called "Outage Denial Request".	Core	webOMS
RAE-BRQ024	System shall update processing all CAISO planned outages to prevent extension of the outage beyond the EOD of the planned end date, after the outage has started. **Notes:** • Outage origin applicability shall be configurable by the system and defaulted to CAISO planned outages but shall be expandable in the future to RC CAISO planned outages. • This applies to planned generation outages only.	Core	webOMS

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
RAE-BRQ025	• System shall update processing all CAISO planned outages to prevent expansion of the outage (increasing the MW derate on outage), after the outage has started. Any interim breakpoints added/deleted/updated shall not exceed maximum curtailment for that trade date. • In case of an extension of a planned outage, system shall limit the curtailment to the previously approved maximum curtailment on the trade date of the planned end date. **Notes:** • Outage origin applicability shall be configurable by the system and defaulted to CAISO planned outages but shall be expandable in the future to RC CAISO planned outages. • This applies to planned generation outages only.	Core	webOMS
RAE-BRQ026	System shall be updated to allow users the capability to submit overlapping outages for the following natures of work: • Ambient Due to Temp • Ambient Not Due To Temp • Ambient Due to Fuel Insufficiency • RIMS Testing **Note:** • This applies to generation outages only.	Core	webOMS

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
RAE-BRQ027	System shall be updated to restrict users' submission of the following natures of work to forced outages only: • Ambient Due to Temp • Ambient Not Due To Temp	Core	webOMS

5.4 Business Process: Manage Real Time & Day Ahead Markets

5.4.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
RAE-BRQ100	At the end of RUC process, system shall automatically calculate Minimum EOH SOC requirements (MinSOC) for each hour of the next trade day for each storage resource that ensure deliverability of RUC discharge schedules during critical hours. **Note:** • Refer to **Appendix-B – Formulas, Calculation Details, and Examples (Min EOH SOC Requirements Algorithm and Examples)**.	Core	DAM
RAE-BRQ101	System shall support the global activation and deactivation of the automatic MinSOC calculation after RUC.	Core	DAM
RAE-BRQ102	System shall initialize (once) the start and end of the contiguous critical hours to 16:00 and 20:00, respectively.	Core	DAM
RAE-BRQ103	System shall provide the capability for operators to configure the start and end of the contiguous critical hours prior to running RUC. The same start and end times shall be used for all future days in the absence of new configuration changes.	Core	DAM
RAE-BRQ104	System shall provide the capability for operators to configure an attenuation parameter “alpha” in (0,1], with default value of 1, to attenuate the rates at which the calculated minimum EOH SOC requirements increase in the hours leading up to the first critical hour. **Note:** • Refer to **Appendix-B – Formulas, Calculation Details, and Examples (Min EOH SOC Requirements Algorithm and Examples).**	Core	DAM RTM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
RAE-BRQ105	System shall automatically identify and flag storage resources that are eligible for automatic enforcement of MinSOC in RTM when triggered: • Generic and/or Flex RA storage resources	Core	DAM
RAE-BRQ108	• System shall allow operators to manually approve, and then transfer the following information to RTM, after publishing DAM results: ○ Binding MinSOC for all hours of the next trade day for all storage resources for which these minimum EOH SOC requirements will be enforced. • System shall provide the capability for operators to perform this multiple times, overwriting previously transferred results.	Core	DAM
RAE-BRQ109	When transferring DAM results, system shall communicate the following information to RTM: • Start and end of critical hours for the next trade day. • Attenuation factor used. • Indicators specifying whether each storage resource is RA or not (**Note:** A resource is indicated as RA if it is Generic RA and/or Flex RA resource).	Core	DAM
RAE-BRQ113	• The binding minimum EOH SOC requirements, that are transferred from DAM (unless cancelled in RTM), shall be enforced as constraints in all RT markets • In particular, system shall have the capability to apply the minimum EOH SOC requirement constraints to the last market interval before the end of an hour (e.g. [00:45-01:00] for FMM and [00:55-01:00] for RTD).	Core	RTM
RAE-BRQ114	System shall have the capability to create implied binding End-of-Horizon MinSOC constraints in RTED to align binding MinSOC constraints between RTUC/FMM and RTED, using	Core	RTM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	the binding MinSOC constraint and the schedule MW from RTUC/FMM, if the following condition is met: • RTED end-of-horizon is earlier than the last interval of the hour where binding EOH MinSOC exists. **Note:** • Binding End-Of-Horizon MinSOC constraint shall follow the same business rules as those for binding EOH Min SOC, except that it applies to end-of-horizon in RTED instead of end of hour.		
RAE-BRQ115	• System shall provide the operators the capability of global deactivation of enforcement of binding MinSOC in the real-time markets (RTD, RTPD, and STUC) per current trade day. • System shall provide operators with double checking confirmation capability of the deactivation of enforcement of binding MinSOC in RTM to guard against accidental deactivation. • The deactivation of enforcement of binding MinSOC shall be applicable to all upcoming RTM market runs for all current as well as future trade hours within the trade day where deactivation is invoked. • Once enforcement of binding MinSOC in RTM is deactivated for a trade date, it cannot be re-activated again for same trade day. • Enforcement of binding MinSOC in RTM shall be defaulted to active for each trade day.	Core	RTM
	System shall have the capability to automatically dispatch resources economically or uneconomically to satisfy the enforced minimum EOH SOC requirements.	Existing	RTM
RAE-BRQ116	System shall have the capability to model binding minimum EOH SOC requirements (MinSOC) constraint priority as follows: • Satisfying binding MinSOC constraint shall take precedence over economic outcome of the	Core	RTM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
	optimization, including but not limited to energy bid curve and ancillary services bid. • Respecting ancillary services awards, schedules, and obligations (from same market or lower markets) shall take precedence over satisfying binding MinSOC constraints. • Existing functionality of MW ED or MD shall take precedence over satisfying binding MinSOC constraints.		
RAE-BRQ117	• In every RTPD6, System shall calculate advisory MinSOC for all storage resources using the latest OMS derate and rerate information, and adjusting RUC schedules by an hourly factor "beta" that reflects changes in demand forecast for each hour. • The factor "beta" shall be calculated as follows: o Beta = ((average RTPD demand forecast plus FRU requirement over the Trading Hour) + (maximum RUC Schedule losses due to outages and derates over the Trading Hour)) / (RUC demand forecast for the Trading Hour) • The calculated advisory EOH MinSOC shall be for every remaining hour of the current trade day (including the current hour), and for all hours of the next trade day after RUC results become available. **Note:** • Refer to **Appendix-B – Formulas, Calculation Details, and Examples (Min EOH SOC Requirements Algorithm and Examples).** • The parameter "beta" will be used to scale the RUC discharge schedules EN^{+}, respecting the Pmin and Pmax values of the resource.	Core	RTM

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
RAE-BRQ118	System shall support the global activation and deactivation of the automatic MinSOC calculation in RTPD6.	Core	RTM

5.5 Business Process: Manage CAISO Market Result Interface

5.5.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
RAE-BRQ124	Upon data receipt, system shall have the capability to publish the following data for next trade day: • Binding Min EOH SOC requirements that are generated by DAM and are more restrictive than lower SOC limits. **Note:** • The publishing timeline shall follow similar timeline as CMRI – DA market results reports.	Core	CMRI
RAE-BRQ125	System shall have the capability to publish the report upon production activation.	Core	CMRI

5.6 Business Process: Manage Open Access Same Time Information System

5.6.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
RAE-BRQ127	• Upon data receipt, system shall publicly report the following for the current trade day only if deactivation of Min SOC enforcement event occurred in a trade day: ○ Date/time of global deactivation of enforcement of binding MinSOC in RTM.	Core	OASIS
RAE-BRQ128	• Upon data receipt, system shall publicly report the following for the next trade day~~, only for trade days that have non-zero RUC under-gen infeasibility for at least one trade hour~~: ○ Critical hours used to calculate the minimum EOH SOC requirements ○ RUC under-gen infeasibility hours and MW amounts. **Notes:** • System shall ~~not~~ publish ~~any~~ data for all trade days ~~that~~and hours irrespective of whether they have zero or non-zero RUC under-gen infeasibilities ~~for all trade hours within a trade day~~.	Core	OASIS
RAE-BRQ129	System shall have the capability to publish the report upon production activation.	Core	OASIS

5.7 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.

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.

5.7.1 Business Requirements

ID#	Guidance on Market Participant Impacts	Source System	Sink System	Reason for Potential Scenario
RAE-MKT001	Submit a planned outage on a RA resource and provide the following scenarios:	• CIRA • webOMS	• CIRA • WebOMS	1. Rule Impacts

ID#	Guidance on Market Participant Impacts	Source System	Sink System	Reason for Potential Scenario
	• Provide substitution in CIRA, Validation for Outage card is not denied • Do not provide substitution in CIRA, Validation for Outage is denied in webOMS			4. New system process
RAE-MKT002	**Binding Min EOH SOC Requirements** • Set up a scenario where: ○ RUC under-gen infeasibility is triggered for at least 1 hour in trade day T+1 • Follow the results in the sink systems. Specifically: ○ CMRI: ▪ Verify that DAM binding Min SOC requirements is published for trade date T+1. ○ OASIS: ▪ Verify that RUC under-gen infeasibility is published for trade date T+1. ▪ Verify that Critical Hours are published for trade date T+1.	IFM	• CMRI • OASIS	1. Rule Impact 3. New application Report
RAE-MKT003	**Deactivation of Enforcement of Binding Min EOH SOC Requirements in RTM** • Set up a scenario where: ○ RUC under-gen infeasibility is triggered for at least 1 hour of trade day T+1.	• IFM • RTM	• CMRI • OASIS	1. Rule Impact 3. New application Report

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

	• CAISO operator deactivates enforcement of binding Min EOH SOC requirements in RTM before noon of Trade day T+1.
	• Follow the results in the sink systems. Specifically:
	  ○ CMRI:
	  ▪ Verify that DAM binding Min SOC requirements is published for trade date T+1.
	  ○ OASIS:
	  ▪ Verify that RUC under-gen infeasibility is published for trade date T+1.
	  ▪ Verify that Critical Hours are published for trade date T+1.
	  ▪ Verify that time stamp when CAISO operator deactivated enforcement of binding Min EOH SOC requirements in RTM is published for trade date T+1.			

6 Appendices

6.1 Appendix-A – Acronym Definition

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
AWE	ISO Alerts, Warnings and Emergencies (AWE)
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

Acronym	Definition
BRS	Business Requirement Specifications
BSAP	Base Schedule Aggregation Portal
BSC	Base Schedule Coordinator
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
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
DA	Day-Ahead

Acronym	Definition
DACA	Day-Ahead Contingency Analysis
DAM	Day-Ahead Market
DART	Day-Ahead Reliability Tool
DCPA	Dynamic Competitive Path Assessment
DEB	Default Energy Bid
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
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
EDR	Enterprise Data Repository
EE	Expected Energy
EEA	Expected Energy Allocation
EESC	Energy Imbalance Market Entity Scheduling Coordinator

Acronym	Definition
EFC	Effective Flexible Capacity
EIM	Energy Imbalance Market
EIMNPR	Energy Imbalance Market Non-Participating Resource
EIMPR	Energy Imbalance Market Participating Resource
EMM	Enterprise Model Management
EMMS	Enterprise Model Management System
EMNA	Energy Management Network Application
EMS	Energy Management System
EOH	End Of Hour
EPI	Electricity Price Index
ESL	Energy Storage Limit (in MWh)
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
FRD	Flexible Ramp Down

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
IAIQ	IT Architecture, Integration and QA
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

Acronym	Definition
ITPD	Information Technology Product Development
ITPM	Information Technology Product Management
ITS	Interchange Transaction Scheduler
JOU	Joint Owned Unit
LACA	Look-Ahead Contingency Analysis
LEL	Lower Economic Limit
LMP	Locational Marginal Price
LMPM	Locational Market Power Mitigation
LOL	Lower Operating Limit
LRA	Local Regulatory Authority
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
MF	Master File
MinSOC	Minimum State of Charge
MLAC	Minimum Load Average Cost
MLC	Minimum Load Cost
MLHAVGC	Minimum Load Heat Average Cost (for non-gas resources)

Acronym	Definition
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
MMG	Manage Markets & Grid
MMR	Manage Market & Reliability
MOS	Manage Operations Support & Settlements
MPM	market Power Mitigation
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
MSOC	Minimum State Of Charge
MUT	Minimum Up Time
MV&A	Market Validation & Analysis
MVT	Market Validation Tool
N/A	Not Applicable
NA	Network Application
NDEB	Negotiated Default Energy Bid

Acronym	Definition
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
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
Pmax	Maximum Generation Capacity
Pmin	Minimum Generation Capacity

Acronym	Definition
PMO	Program Management Office
PNM	Public New Mexico
Pnode	Pricing Node
POC	Point Of Contact
POSO	Planned Outage Substitution Obligation
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
RDRR	Reliability Demand Response Resource
RDT	Resource Data Template
RIG	Remote Intelligent Gateway
RIMS	Resource Interconnection Management System

Acronym	Definition
RMR	Reliability Must Run
ROPR	Operating Reserve Ramp Rate
RR	Ramp Rate
RREG	Regulation Ramp Rate
RSE	Resource Sufficiency Evaluation
RT	Real-Time
RTBS	Real-Time Base Scheduler
RTCA	Real-Time Contingency Analysis
RTCD	Real-Time Contingency Dispatch
RTD	Real-Time Dispatch
RTED	Real-Time Economic Dispatch
RTPD	Real-Time Pre-Dispatch
RTM	Real-Time Market
RTUC	Real-Time Unit Commitment
RUC	Residual Unit Commitment
SADS	System And Design Specifications
SAMQ	Security, Architecture, Model Management & Quality
SC	Scheduling Coordinator
SCME	Scheduling Coordinator Meter Entity
SE	State Estimator
SIBR	Scheduling Infrastructure and Business Rules

Acronym	Definition
SME	Subject Matter Expert
SOA	Service-Oriented Architecture
SOC	State Of Charge
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
SUT	Start Up Time
T	Trading Hour
TBD	To Be Determined
TEP	Tucson Electric Power
TG	Tie Generator
TIGO	Transmission Induced Generation Outages
TNA	Transmission Network Application
TNGR	Tie Non-Generating Resource

Acronym	Definition
TOP	Transmission Operator Provider
TOR	Transmission Ownership Contract
UAT	User Acceptance Testing
UEL	Upper Economic Limit
UI	User Interface
UIE	Uninstructed Energy Imbalance
UL	User Limited
UOL	Upper Operating Limit
VER	Variable Energy Resource
VOM	Variable Operations & Maintenance
VOMC	Variable Operations & Maintenance Cost
WebOMS	Web-based Outage Management System
XML	Extensible Markup Language
XSD	XML Schema Definition
ZIL	Zero Impedance Line

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

6.2.1 Min EOH SOC Requirements Algorithm and Examples

6.2.1.1 Algorithm for Calculating Min EOH SOC Requirements:

Given a set of critical hours H, the minimum end-of-hour (EOH) SOC requirements (MinSOC) of a storage resource for ensuring deliverability of RUC discharge schedule during the critical hours, is defined recursively as follows:

For $h = 24,\ MOSC(h) = LSOC(h)$.
For $h = 23, \dots, 1$:

If $h + 1 \in H$:

$$MSOC(h) = min\{\, max\{\, MSOC(h+1) + \beta(h+1)\, EN^{+}(h+1),\ LSOC(h)\,\},\ USOC(h)\}.$$

Else:

$$MSOC(h) = min\{\, max\{\, MSOC(h+1) + \eta\, min\{\, \alpha LOL(h+1), -EN^{-}(h+1)\,\}, LSOC(h)\},\ USOC(h)\},$$

where:

- $MSOC$ are EOH minimum SOC requirements
- $USOC$ and $LSOC$ are registered EOH upper and lower SOC operating limits including latest OMS derates/rerates
- $EN^{+} \geq 0$ and $EN^{-} \geq 0$ are resource RUC discharge and charge schedules, respectively
- $\alpha \in (0,1]$ is an attenuation factor for charging rate
- β are hourly RUC schedule adjustment factors in RTPD6; they are 1 in RUC.
- $\eta \in (0,1]$ is resource's charging efficiency
- $LOL < 0$ are lower operating MW limits.

6.2.1.2 Examples

The ISO outlined two examples of how the minimum state of charge would work given example bids and market prices. These two examples have been updated are presented here. The market prices and bids were left unchanged from the original examples and the only changes were to the minimum charge requirement and the resulting dispatch instructions to the storage resource.

These examples assume a highly simplified system that includes one +/-50 MW storage resource with 200 MWh of storage capability that bids into the day-ahead and real-time markets. This resource has a perfect round-trip efficiency (no losses from charging) and has no parasitic losses while charged.

6.2.1.2.1 Example 1:

For this example the scheduling coordinator bids the resource to charge any time prices are below $30/MWh and discharge anytime prices are above $60/MWh. Assume that the storage resource is fully

charged, either in the market or prior to the day-ahead market, prior to hour ending 9. This implies that the storage resource cannot be charged when prices are low in the morning, and only receives discharge schedules in the afternoon when prices are above the $60/MWh bid price in the market. This results in the resource discharging a total of 180 MWh in the day-ahead market and retaining 20 MWh state of charge at the end of the day-ahead market process.

If this is a critical day where there is an infeasibility in the RUC process, and the ISO assigns hours 19 through 23 as critical hours then a minimum state of charge would be imposed on this storage resource immediately prior to the charging hours, in hours ending 15 through 18. These requirements will only require that the storage resource be fully charged at 180 MWh at the end of hour ending 18, and will decrease to 130 MWh for hour ending 17, and continue back through previous hours. These requirements would then be observed by the real-time market optimization.

In the 5-minute market assume there are high prices, spiking to $1,000/MWh, in hour ending 17. In this example the minimum state of charge requirement previously proposed in the draft final proposal required that the storage resource be fully charged at 180 MWh in the real-time market for the shown morning hours and therefore would prevent the storage resource from fully discharging in the real-time during the price spike in hour ending 17. The new formulation proposed here will not require a 180 MWh state of charge from the storage resource to until hour ending 18, which allows the storage resource to discharge fully (50 MW) during hour ending 17.

The current proposed requirement still requires that the storage resource charge to 180 MWh, or the total of the discharge schedule at hour ending 18 and requires significantly less state of charge in previous hours. In this case hours 15, 16 ad 17 have a minimum state of charge of 30, 80 and 130 MWh respectively. These requirements are significantly lower than the requirements imposed from the previous proposal.

Figure 1: MSOC Example 1

Hour	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Load	190 MW	190	190	200	215	235	255	280	300	330	335	345	350	340	280	210
DA Bid ↓	$30/MWh	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30
DA Bid ↑	$60/MWh	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60
DA Price	$50/MWh	$50	$50	$50	$50	$52	$55	$58	$60	$60	$80	$80	$100	$100	$80	$60
DA Sched	0	0	0	0	0	0	0	0	0	0	20	30	50	50	30	0
DA SOC	200 MWh	200	200	200	200	200	200	200	200	200	180	150	100	50	20	20
RT Bid ↓	$50/MWh	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
RT Bid ↑	$100/MWh	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
RT Price	$60/MWh	$60	$60	$60	$60	$60	$60	$60	$1,000	$60	$100	$100	$100	$100	$100	$70
RT Sched	0 MW	0	0	0	0	0	0	0	50	-30	20	30	50	50	30	0
RT SOC	200 MW	200	200	200	200	200	200	200	150	180	160	130	80	30	0	0
Min Chrg	0 MW	0	0	0	0	0	30	80	130	180	160	130	80	30	0	0

6.2.1.2.2 Example 2:

In the second example, the storage resource is charged to 80 MWh in the morning and discharged by 30 MW and 50 MW in hours ending 20 and 21 in the day-ahead market. In the real-time market the storage

resource has a minimum sate of charge requirement imposed at 50 MWh at hour ending 20, 80 MWh at hour ending 19, and 30 MWh at hour ending 18. Low prices in the real-time market result in the storage resource being charged to 130 MWh, beyond the minimum charge requirement. This resource is able to respond to high prices in hour ending 18, when prices spike to $200/MWh. Price later in the day never materialize at levels higher than the bids and the resource does not receive instructions to discharge below 80 MWh for the remainder of the day, and always has enough energy to meet state of charge requirements.

Figure 2: MSOC Example 2

Hour	9	10	11	12	...	17	18	19	20	21	22	23	24
Load	190 MW	190	190	200	...	300	330	335	345	350	340	280	210
DA Bid ↓	$30/MWh	$30	$30	$30		$30	$30	$30	$30	$30	$30	$30	$30
DA Bid ↑	$60/MWh	$60	$60	$60		$60	$60	$60	$60	$60	$60	$60	$60
DA Price	$50/MWh	$50	$25	$50		$60	$60	$60	$70	$70	$60	$60	$60
DA Sched	0	0	-50	0		0	0	0	30	50	0	0	0
DA SOC	30 MWh	30	80	80		80	80	80	50	0	0	0	0
RT Bid ↓	$25/MWh	$25	$30	$25		$25	$25	$25	$25	$25	$25	$25	$25
RT Bid ↑	$70/MWh	$70	$75	$72		$72	$72	$72	$72	$72	$72	$72	$72
RT Price	$60/MWh	$20	$27	$60		$60	$200	$60	$60	$60	$60	$60	$60
RT Sched	0 MW	-50	-50	0		0	50	0	0	0	0	0	0
RT SOC	30 MWh	80	130	130		130	80	80	80	80	80	80	80
Min Chrg	30 MWh	0	0	0		0	30	80	50	0	0	0	0

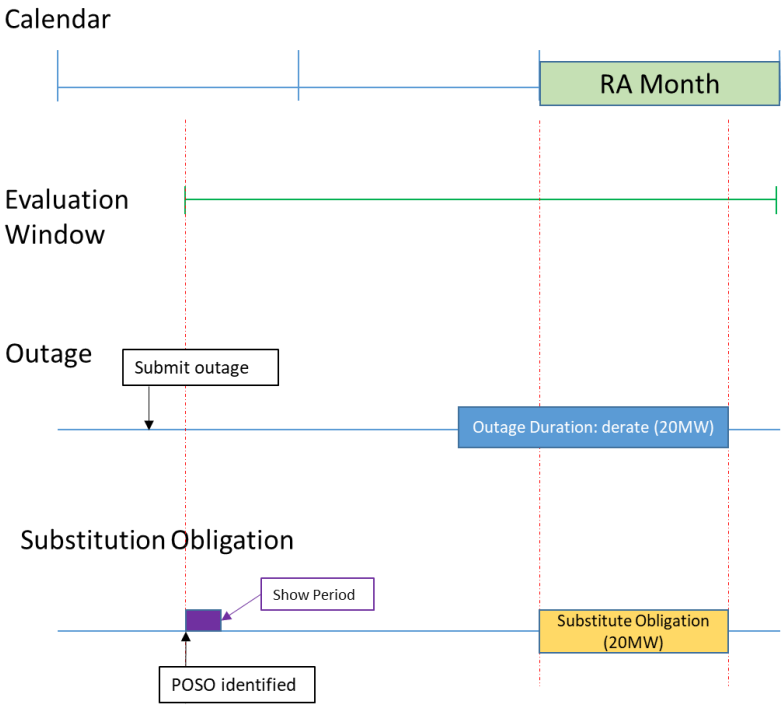
6.2.2 Planned Outages Timeline

6.2.2.1 Planned Outage with POSO Obligation in middle of the Outage:

1A) Planned Outage with POSO obligation in middle of the outage

Outage: Submitted prior to the evaluation window.

POSO: On first day of the evaluation window, system identifies an obligation of 20MW. Participant has until the end of the show period to complete a substitution that covers the obligation.

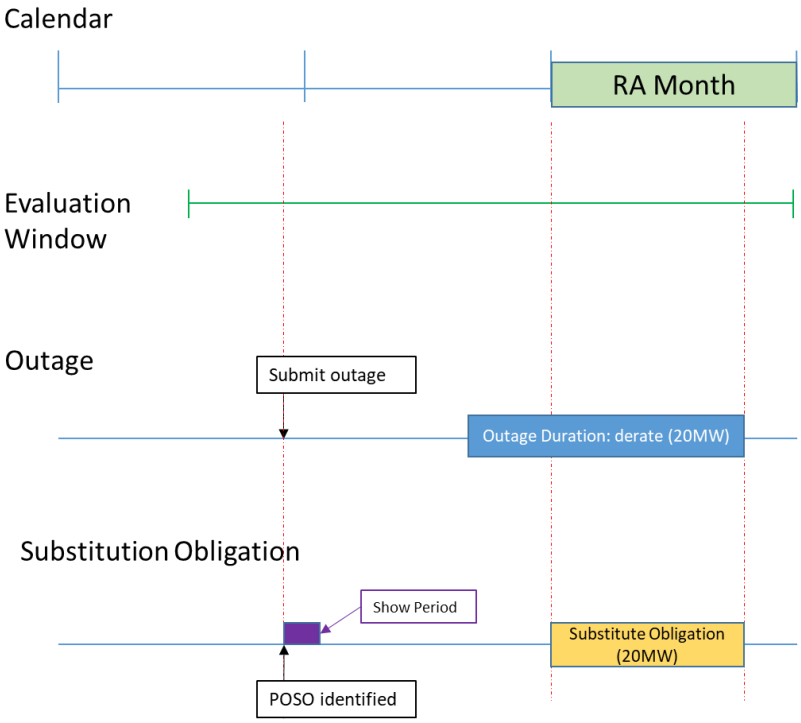


6.2.2.2 Planned Outage with POSO Obligation in the middle of the Outage:

1B) Planned Outage with POSO obligation in middle of the outage

Outage: Submitted within the evaluation window.

POSO: On outage submission system, identifies an obligation of 20MW. Participant has until the end of the show period to complete a substitution that covers the obligation.

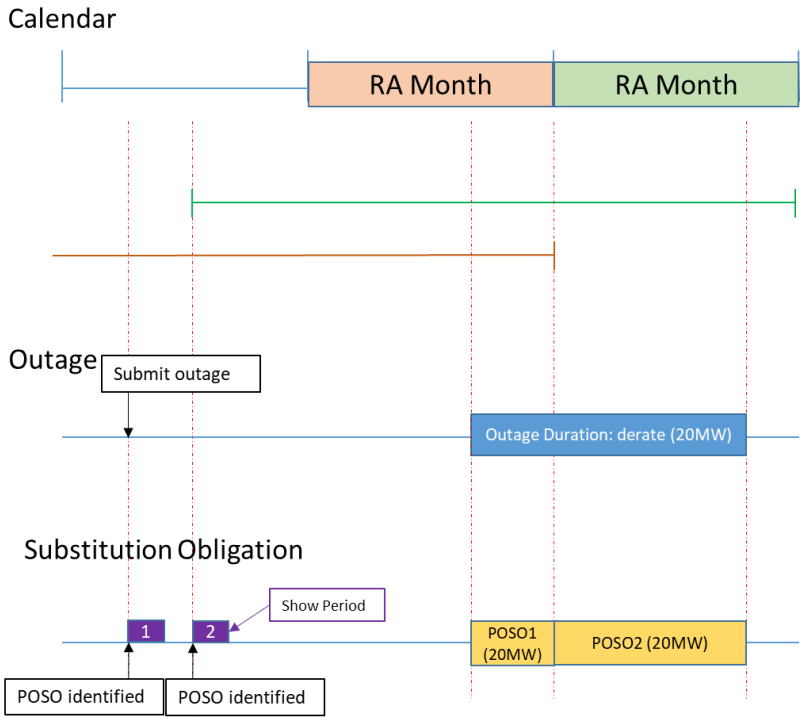


6.2.2.3 Planned Outage with POSO Obligation in multiple months:

2) Planned Outage with POSO obligation in multiple months

Outage: Submitted within the evaluation window.

POSO: On outage submission system, identifies an obligation of 20MW. Participant has until the end of the show period to complete a substitution that covers the obligation. At the evaluation of the next month, system identifies a second POSO obligation.

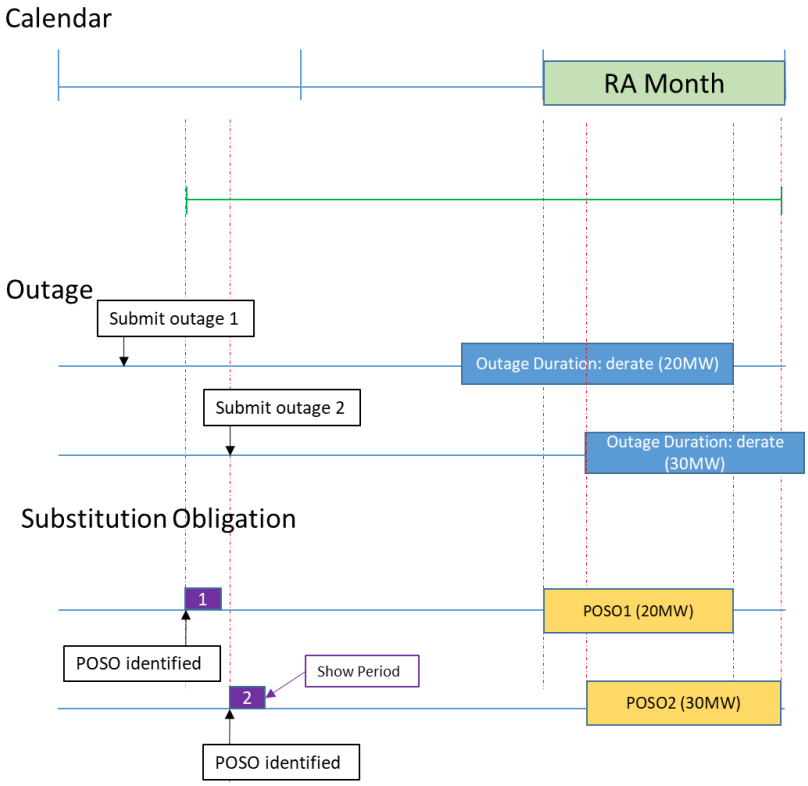


6.2.2.4 Overlapping Planned Outages with POSO Obligation:

3) Overlapping Planned Outages with POSO obligation.

Outage: 2 planned outage submitted on same resource

POSO: On evaluation window, outage submission system identifies an obligation of 20MW for the first outage submitted. Participant has until the end of the show period to complete a substitution that covers the obligation. Submission of the second outage, system identifies a new substitution obligation.



6.2.2.5 Simple Example:

Use Case		Outage	Outage Start	Outage End	Pmax	Pmin	NQC	RA	Max Curt MW	Min Avail MW	Impact to RA	System Short?	POSO as IS	POSO to BE
	Res A				100	5	70	55						
1a		A-PO1	6/1/2021	6/30/2021					60	40	Yes	Yes	15	15
1b		A-PO1	6/1/2021	6/30/2021					60	40	Yes	No	N/A	15
2a		A-PO1	6/1/2021	6/30/2021					60	40	Yes	No	No	15
		A-PO2	6/1/2021	6/30/2021					15	25	Yes			15
2a'		A-PO1	6/1/2021	6/30/2021					60	40	Yes	Yes	55	60
		A-PO2	6/1/2021	6/30/2021					15	25	Yes		N/A	15
2a"		A-PO1	6/1/2021	6/30/2021					15	85	Yes	Yes	0	0
		A-PO2	6/1/2021	6/30/2021					60	25	Yes		30	30

6.2.2.6 Critical Examples:

Use Case			Outage	Outage St	Outage End		Pmax	Pmin	NQC	RA	Max Curt I	Min Avail	Impact to	POSO to BE
	Res A						150	5	70	55				
1a		Planned	O1	6/1/2021	6/30/2021									
						6/1/2021					60	90	Yes	0
						6/2/2021					120	30		25
						6/3/2021					70	80		0
						6/4/2021					55	95		0
						6/5/2021 thru 6/30/21					60	90		0
1a		Planned	O2	6/1/2021	6/30/2021									
						6/1/2021					40	50	Yes	5
						6/2/2021					20	10		20
						6/3/2021					50	30		25
						6/4/2021					8	87		0
						6/5/2021 thru 6/30/21					5	85		0
1c		Forced	O3	6/1/2021	6/30/2021									
						6/1/2021					45	5	Yes	
						6/2/2021					5	5		
						6/3/2021					10	20		
						6/4/2021					8	79		
						6/5/2021 thru 6/30/21					5	80		
1a		Planned	O1	6/1/2021	6/30/2021									
						6/1/2021					60	90	Yes	0
						6/2/2021					120	30		25
						6/3/2021					70	80		0
						6/4/2021					55	95		0
						6/5/2021 thru 6/30/21					60	90		0
1a		Forced	O2	6/1/2021	6/30/2021									
						6/1/2021					40	50	Yes	5
						6/2/2021					20	10		20
						6/3/2021					50	30		25
						6/4/2021					8	87		0
						6/5/2021 thru 6/30/21					5	85		0
1c		Planned	O3	6/1/2021	6/30/2021									
						6/1/2021					45	5	Yes	45
						6/2/2021					10	0		10
						6/3/2021					10	20		10
						6/4/2021					35	52		3
						6/5/2021					30	55		0
						6/6/2021 thru 6/30/21					45	40		15

Use Case			Outage	Outage St	Outage End		Pmax	Pmin	NQC	RA	Max Curt	Min Avail	Impact to	POSO to B
	Res A						150	5	70	55				
1a		Planned	O1	6/1/2021	6/30/2021									
						6/1/2021					60	90	Yes	0
						6/2/2021					120	30		25
						6/3/2021					70	80		0
						6/4/2021					55	95		0
						6/5/2021 thru 6/30/21					60	90		0
1a		Planned	O2	6/1/2021	6/30/2021									
						6/1/2021					40	50	Yes	5
						6/2/2021					20	10		20
						6/3/2021					50	30		25
						6/4/2021					8	87		0
						6/5/2021 thru 6/30/21					5	85		0
1c		Forced	O3	6/1/2021	6/30/2021									
						6/1/2021					45	5	Yes	
						6/2/2021					5	5		
						6/3/2021					10	20		
						6/4/2021					8	79		
						6/5/2021 thru 6/30/21					5	80		
1a		Planned	O1	6/1/2021	6/30/2021									
						6/1/2021					60	90	Yes	0
						6/2/2021					120	30		25
						6/3/2021					70	80		0
						6/4/2021					55	95		0
						6/5/2021 thru 6/30/21					60	90		0
1a		Forced	O2	6/1/2021	6/30/2021									
						6/1/2021					40	50	Yes	5
						6/2/2021					20	10		20
						6/3/2021					50	30		25
						6/4/2021					8	87		0
						6/5/2021 thru 6/30/21					5	85		0
1c		Planned	O3	6/1/2021	6/30/2021									
						6/1/2021					45	5	Yes	45
						6/2/2021					10	0		10
						6/3/2021					10	20		10
						6/4/2021					35	52		3
						6/5/2021					30	55		0
						6/6/2021 thru 6/30/21					45	40		15

6.2.2.7 Substitution Example:

Use Case			Outage	Outage St	Outage End		Pmax	Pmin	NQC	RA+CPM+Sub	Max Curt	Min Avail	Impact to RA	POSO to BE	Outage Substituion Obligation	Evaluation Window
	Res A						150	5	70	55						T-45
1a		Planned	O1	6/1/2021	6/30/2021											4/15/2021
						6/1/2021					60	90	Yes	0	0	
						6/2/2021					120	30		25	25	
						6/3/2021					70	80		0	0	
						6/4/2021					55	95		0	0	
						6/5/2021 thru 6/30/21					60	90		0	0	
1a		Forced	O2	6/1/2021	6/30/2021											
						6/1/2021					40	50	Yes	5	NA	
						6/2/2021					20	10		20	15	
						6/3/2021					50	30		25	NA	
						6/4/2021					8	87		0	NA	
						6/5/2021 thru 6/30/21					5	85		0	NA	
								6/2/2021	Substitution	25			Sub Date			
									RA	30			O3 Date			
1c		Planned	O3	6/1/2021	6/30/2021											4/17/2021
						6/1/2021					45	5	Yes	45	45	
						6/2/2021					10	0		10	10	
						6/3/2021					10	20		10	10	
						6/4/2021					35	52		3	3	
						6/5/2021					30	55		0	0	
						6/6/2021 thru 6/30/21					45	40		15	15	
Sub was provided for 01 only			25													
Sub was provided for O2 only			15													
Evaluation Run	4/14/2021	4/16/2021														
Show Period	4/15/2021															
Trade date	6/2/2021															
	supply	45														
	cpm	10														
	RA	55														
	transferred	40														
	final RA	15														

6.2.2.8 Evaluation Times:

RA Month	Jun-21					
Evaluation Window	T-45	4/17/2021				
Evaluation windows Ends	T+30	6/30/2021				
O1 Submission		3/10/2021				
O2 submission		3/30/2021				
Run Day		**Show Period End**		**TradeDate**	**Outages**	**Obligation**
4/17/21 8:00 AM		4/18/21 8:05 AM		6/1/2021	O1	25
				6/1/2021	O2	10
*If Obligation is not substiutted before 4/18/2021, Notify OMS to Deny the outage both O1 and O2						
Run will be once a day, POSO is calculated at 8 AM(configurable) for all the outages that are submitted before 8 AM						
O3 Submitted	20 Curt	4/18/21 7:00 AM				
4/18/21 8:00 AM		4/19/21 8:05 AM		6/1/2021	O3	20
O3 is Substituted for 6/4/2021						
4/19/2021 8:00		4/20/2021 8:05				
6/5/2021						