




Business Requirements Specification

Extended Short-Term Unit Commitment

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Revision History

Date	Version	Description
6/6/2018	1.0	Initial draft.



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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 determining the scope of projects and to all Business Process Modeling and System Requirements Specifications efforts.

Business requirements are what must be delivered to provide value for the Users and Business Stakeholders. Systems, software, and processes are the ways (how) to delivery, satisfy or meet the business requirements (what). The Initial BRS will provide sufficient information to determine the scope of the project and will provide the functional business requirements so that the Architecture Decision can be made. Following the Architecture Decision, the remaining non-functional business requirements, such as data, performance, web services, and security can be added to complete the Final BRS.

The purpose of this initiative is to extend the time horizon of the real-time market's short-term unit commitment (STUC) process. The short-term unit commitment is one of two resource commitment processes in the real-time market and currently used to optimize resources with combined start-up and minimum up times (SUT + MUT) less than 4.5 hrs. (the current STUC horizon). By broadening the STUC horizon from 4.5 to 18 hours, long-start units (i.e. generators with start-up times from 5 to 18 hrs.) could now be included for real-time unit commitment consideration.


Extension of the STUC horizon allows several market benefits, specifically:

- Provides real-time market's optimization horizon the ability to consider both daily load peaks for resource startup
- Enhances real-time market through ability to include long-start, in addition to short- and medium-start, resource startups not previously awarded binding starts during the Day-Ahead Market
- Revises real-time Bid Cost Recovery (BCR) rules to include long-start resources with real-time start decisions
- Provides advanced market notice to long-start resources first receiving starts in the real-time market

NOTICE: While the extended STUC stakeholder process is ongoing, it is possible policy changes may result and be reflected in subsequent BRS version(s).

2 Intellectual Property Ownership

Intellectual property ownership must be considered by all applicable stakeholders before the services are performed. The level of analysis is two-fold. 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 it has been determined that 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), then 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

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Intellectual Property is and how the California ISO can go about protecting its intellectual property. Please contact the Legal Department if you have any questions regarding intellectual property.

2.1 Checklist

Intellectual property ownership must be considered by all applicable stakeholders before the services are performed. The level of analysis is two-fold. 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 it has been determined that 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), then 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 go about protecting its intellectual property. Please contact the Legal Department if you have any questions regarding intellectual property.


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Specifically, CAISO retains intellectual property ownership of the following:

- Design of Extended STUC; includes mathematical formulation of design principles
- Related Business Practice Manuals
- Software codes to implement the Extended STUC design


2.2 Acronym Definitions

Acronym	Definition
ALFS	Automated Load Forecast System
API	Application Programming Interface
BAA	Balancing Authority Area
BCR	Bid Cost Recovery
BRS	Business Requirements Specification
BSAP	Base Schedule Aggregation Point
CAISO	California Independent System Operator
CISO	California Independent System Operator
CMRI	CAISO Market Results Interface
DA	Day-Ahead
DAM	Day-Ahead Market
DAME	Day-Ahead Market Enhancements
DEB	Default Energy Bids
ECIC	Energy Costs and Indices Calculator
EIM	Energy Imbalance Market
ELS	Extra-Long Start

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Acronym	Definition
ETCC	Existing Transmission Contract Calculator
FSP	Forecast Service Provider
IFM	Integrated Forward Market
ISO	Independent System Operator
LSR	Long-Start Resource
MDS	Maximum Daily Startups
MDT	Maximum Daily Transitions
MF	MasterFile
MPM	Market Power Mitigation
MSG	Multi-Stage Generation
MSR	Medium-Start Resources
MUT	Minimum Up Time
OASIS	Open Access Same Time Information System
OMS	Outage Management System
RTCD	Real-Time Contingency Dispatch
RTD	Real-Time Dispatch
RTDD	Real-Time Disturbance Dispatch
RTM	Real-Time Market
RTMO	Real-Time Market Operator
RTPD	Real-Time Pre-Dispatch
RTUC	Real-Time Unit Commitment
RUC	Residual Unit Commitment
SCUC	Security-Constrained Unit Commitment
SIBR	Scheduling Infrastructure and Business Rules
STUC	Short-Term Unit Commitment
SUT	Start-Up Time

Also refer to the [BPM for Acronyms and Descriptions.](#)

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3 Details of Business Need/Problem

3.1 Description

Once the extended STUC horizon is implemented, ISO will enhance its reliability and operational capabilities to ensure market-driven unit commitment decisions are made in real-time such that

- (1) sufficient capacity is on-line during the daily drop-off of solar resources during the evening load peak, and
- (2) real-time unit commitments will have considered both daily peaks (instead of each one separately)
- (3) system hardware and software architecture will upgrade to accommodate the increasing computational and data storage requirements for current and future market enhancements

The STUC unit commitment optimization will not de-commit resources with binding RUC-commitments. Medium and Long-start resources may now receive real-time startups from STUC, under the following conditions:


- (1) resource did not receive a binding Day-Ahead Market commitment, and
- (2) resource had submitted bids for the Real-Time Market, and
- (3) resource's total time for start-up and minimum up time (SUT + MUT) is less than 18 hours

Extra Long-Start (ELS) resources, units which the Day-Ahead Market cannot provide sufficient time to start-up, will not be impacted by this initiative.


4 Business Impacts

4.1 Business Process Manual (BPM) Changes:

BPM	Description of Impact(s)
Energy Imbalance Market (EIM)	Yes EIM Base Schedules (bids and base schedule submission provides STUC process with rolling 20-hour period of market data)
Market Instruments	Yes SIBR (requirements for provision of bids) BSAP (requirements for provision of base schedules) STUC (revised definition)

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BPM	Description of Impact(s)
Market Operations	Yes Revised STUC time period Resource eligibility for commitment cost rules will apply to new expanded STUC horizon
BPM Change Management	N/A
Candidate CRR Holder	N/A
Compliance Monitoring	N/A
Congestion Revenue Rights	N/A
Credit Management and Market Clearing	N/A
Definitions & Acronyms	N/A
Direct Telemetry	N/A
Distributed Generation for Deliverability	N/A
Generator Interconnection and Deliverability Allocation Procedures	N/A
Generator Interconnection Procedure (GIP)	N/A
Generator Management	N/A
Managing Full Network Model	N/A
Metering	N/A
Outage Management	N/A
Reliability Requirement	N/A
Rules of Conduct Administration	N/A
Scheduling Coordinator Certification & Termination	N/A
Settlements & Billing	N/A
Transmission Planning Process	N/A

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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: Managing Day-Ahead Markets


5.1.1 Business Requirements

ID#	Business Feature	Req Type	Potential Application(s) Impacted
ESTUC-BRQ001	Day-Ahead market rules shall not be impacted by the extended STUC run horizon.	Existing Function – Not in Scope	IFM, RUC

5.2 Business Process: Managing EIM Markets

5.2.1 Business Requirements


ID#	Business Feature	Req Type	Potential Application(s) Impacted
ESTUC-BRQ010	<p>EIM participant must supply EIM Markets with their respective BAA's resource base schedules and bids that span a rolling 20-hour horizon each hour to support extended STUC data input requirements.</p> <p>Missing interval base schedules will not be approximated or inserted, as they will impact unit commitment decisions and settlement in the real-time markets.</p>	Core Tariff, BPM Training	BSAP, SIBR

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5.3 Business Process: Managing Real-Time Markets

5.3.1 Business Requirements

ID#	Business Feature	Req Type	Potential Application(s) Impacted
ESTUC-BRQ030	<p>The following existing STUC market application data inputs shall be supplied for a rolling 24-hour horizon period:</p> <ul style="list-style-type: none"> Load Forecasts Variable Energy Resource (VER) Forecasts, both ISO and EIM Entity FSP sources 	Core	ALFS, SIBR Integration STUC
ESTUC-BRQ031	<p>The following STUC application data inputs shall be supplied to the STUC application for a configurable rolling 20-hour horizon period:</p> <ul style="list-style-type: none"> STUC Generated Bids EIM Base Schedules (voluntary) Generator and Transmission Outages 	Core	SIBR, BSAP, OMS, Integration STUC
ESTUC-BRQ035	<p>In the event the STUC run fails, system shall allow the RTMO to manually execute a user-defined horizon for the STUC commitment run.</p> <p>If bid or base schedule market data inputs are not successfully received contiguously for the entire STUC horizon, system will pre-populate the manual execution display's STUC End Time with the last successful trade hour prior to receiving an unsuccessful market data input.</p> <p><i>For example, STUC is scheduled to run from hours-ending 3 to 21, but the market bids submission failed for hours-ending 8, 10, and 15. If the RTMO manually executes STUC, the display will populate 7 for the STUC End Time. If the user overrides End Time to 16, a validation error is raised and no execution occurs. If the user overrides End Time to 6 (i.e. 3-hour horizon), the execution will be disabled.</i></p> <p>Existing manual run functionality will continue to be available.</p>	Core Regression Test	STUC <i>Inputs:</i> BSAP, SIBR
ESTUC-BRQ040	<p>The following existing daily sets of hourly data inputs shall be delivered on an earlier schedule to accommodate when the STUC period enters the first hours of the next trade day:</p> <ul style="list-style-type: none"> Real-Time AS Requirements ETCC Limits Default Energy Bids Commitment Costs (both as default and bid submission) <p>In cases where the STUC horizon extends across a day boundary, both the current and following trade date values shall be provided to the market application.</p>	Core (existing function needs to account for new STUC horizon)	AS Req Setter, ETCC, MF, Integration STUC (receiving)

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ID#	Business Feature	Req Type	Potential Application(s) Impacted
ESTUC-BRQ060	MasterFile transfer script shall be adjusted to ensure inclusion of all short, medium, and long start units in RTM that are not RUC binding.	Core	Master File, RTM, SIBR
ESTUC-BRQ065	Market participants must supply Real-Time Markets with bids that span a rolling 20-hour horizon each hour to support extended STUC data input requirements. Missing interval base schedules will not be approximated or inserted, as they will impact unit commitment decisions and settlement in the real-time markets.	Core Tariff, BPM Training	SIBR
ESTUC-BRQ070	Market System shall perform STUC Bid Generation for a 20-hour horizon (instead of current 4.5-hour horizon).	Core	SIBR
ESTUC-BRQ125	All terminal conditions shall be reviewed and adjusted, if necessary, according to the new STUC timeline. Additionally, the following resource limits shall be included in the terminal condition logic: <ul style="list-style-type: none"> - Maximum Daily Start - Maximum Daily Transitions 	Core	STUC
ESTUC-BRQ130	STUC markets shall consider unit commitment for resources over a configurable 18-hour horizon (72 fifteen-minute intervals) instead of the current 4.5-hour horizon (18 fifteen-minute intervals). STUC will not re-optimize commitment of long-start resources with existing DAM commitments. It will only consider startups for long-start resources without a DAM commitment and continue to fully re-optimize all short and medium start resources.	Core	STUC
ESTUC-BRQ140	If the STUC horizon extends beyond the latest published results for the Day-Ahead Market, the market system shall shorten the STUC horizon to meet the last-published DA trade hour. This will ensure the Day-Ahead Market always precedes the Real-Time Markets.	Core	STUC

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5.4 Business Process: Manage Market Quality Systems

5.4.1 Business Requirements

ID#	Business Feature	Req Type	Potential Application(s) Impacted
ESTUC-BRQ205	Commitment cost qualification for all eligible resources shall be applied and shall conform to the expanded STUC commitment horizon.	Core	Market Quality Systems (ISO Internal) <u>Note:</u> No Settlement configuration changes will occur as a result