California ISO

Business Requirements Specification

Variable Operations and Maintenance Cost Review

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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 efforts.

The variable operations and maintenance (VOM) adder and major maintenance adder (MMA) currently in place allow market participants to include their VOM and major maintenance costs in their bids. The CAISO includes these adders in the resource's "proxy costs", which mirror the three parts of market participants' bids into the energy markets: default energy bids (DEBs), minimum load costs, and startup costs. The VOM adder is included in DEBs under the variable cost-based methodology and in minimum load costs under the Proxy Cost option. MMAs are included in minimum load costs and startup costs under the Proxy Cost option. This project proposes to change the structure of how operations and maintenance (O&M) costs are estimated for use in the CAISO markets. This project is composed of three scope items:

- **Scope 1:** Defining the O&M cost components, including how to differentiate between fixed and variable O&M costs.
- **Scope 2:** Redefining the Operations and Maintenance (O&M) adder components.
- **Scope 3:** Allow market participants to bid in all of their variable maintenance costs through a new default maintenance adder in lieu of the current MMA.

1.2 References

Information related to this initiative can be found on the following CAISO web page at:

https://stakeholdercenter.caiso.com/StakeholderInitiatives/Variable-operations-maintenance-cost-review

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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:

- 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.

- 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.

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2.2 Acronyms and Definitions Table

Acronym	Definition
CAISO	California Independent System Operator
CCGT	Combined Cycle Gas Turbine
CT	Combustion Turbine
DEB	Default Energy Bids
MMA	Major Maintenance Adder
MSG	Multi-stage Generator
MW	Megawatt
MWh	Megawatt-hour
O&M	Operations and Maintenance
RDT	Resource Data Template
RMR	Reliability Must Run
VOM	Variable Operations Maintenance
VOM Adder	Variable Operations and Maintenance Adder

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3 Details of Business Need/Problem

3.1 Description

Business Opportunity/Problem Statement:	
What:	• Market participants and the ISO do not have a clear set of O&M cost definitions to use in VOM and MMA negotiations or in the development of default values • Current VOM adder values found in tariff needed to be reviewed as part of triannual review • Need to minimize MMA negotiations as they are burdensome on market participants and ISO
When:	Independent 2021 (Post 4/1/2021)
Why do we have this opportunity/problem:	Due to triannual review, we have the ability to provide greater transparency in these VOM and MMA negotiations
Who does this opportunity/problem impact:	Market Participants

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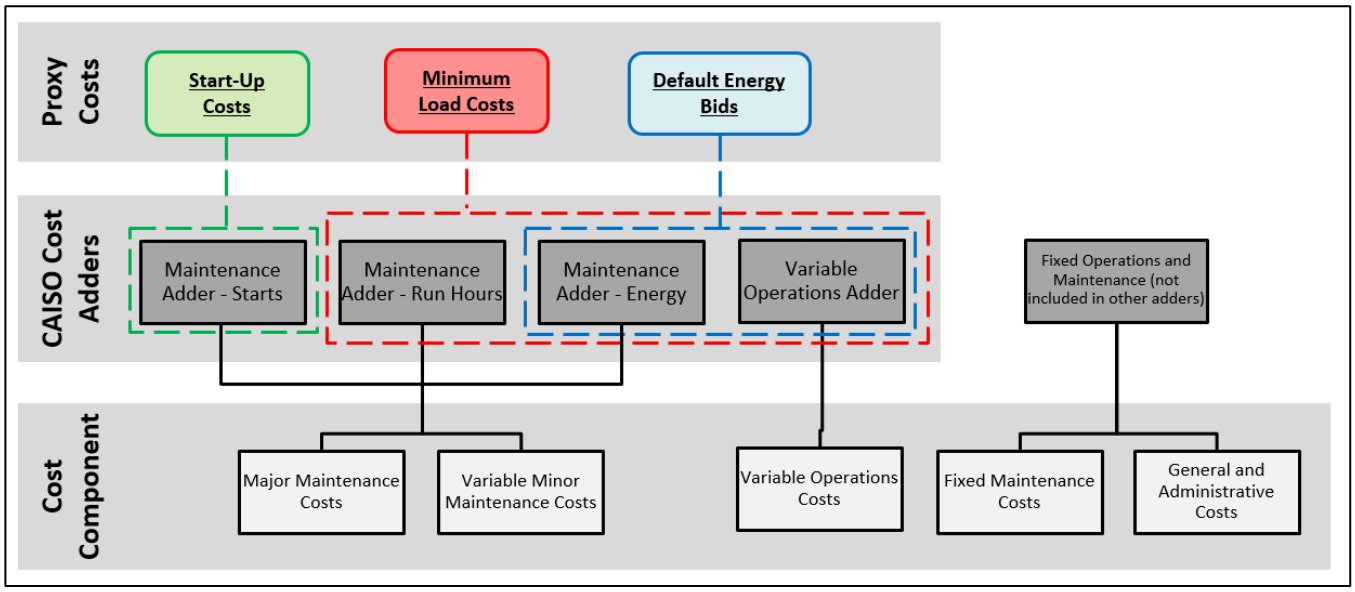
4 Business Impacts

4.1 Visual Aids



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4.2 Business Practice Manual (BPM)

BPM	Description of Impact(s)
Market Instruments	**Yes** Scope 1: Update new and existing tariff terms. This will also reflect the new O&M Adder ($/MWh) values that have been updated. Scope 2: Attachment L: Clarifications and updates to the Major Maintenance adders section.

4.3 Other

Impact:	Description: (optional)
Market Simulation	No – No impacts to externally facing systems.
Market Participant Impact	**Yes** – The structure of their Major Maintenance Adders will change.
User Acceptance Testing (UAT)	**Yes** – Checking the O&M functionality is calculating correctly (from ECIC and SIBR)
Internal Training	No
External Training	**Yes** – Need to train participants on the new O&M adder components.
Policy Initiative	**Yes** http://www.caiso.com/StakeholderProcesses/Variable-operations-maintenance-cost-review
Vendor	**Yes** – Siemens
Architectural Framework and Roadmap	This project will set out the architectural definition set by the architect.

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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: Manage Day Ahead Market – Master File (MF)

5.1.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
VOM - BRQ004	For Energy O&M Adder Default (D) shall be updated based on the new values contained within Appendix A.	Core	MF
VOM - BRQ005	System shall assign the existing CT tech type (GTUR) to indicate Aeroderivative CTs and create a new type (FTUR) to capture the default values for the Frame CTs. Note: Refer to Appendix B for the technology type to the GEN_TECH_TYPE mapping.	Core	MF

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
VOM - BRQ006	System must have the capability of storing Default values that are effective dated for the adders against the technology types in three new datasets: 1. Default Minimum Load O&M Adder to Technology type Mapping, 2. Default Start O&M Adder to Technology Type Mapping, 3. Default Energy O&M Adder to Technology Type Mapping.	Core BPM – Market Instruments	MF
VOM - BRQ007	System shall have two new flags added at the resource level: 1. Default or Negotiated Energy O&M Adder (naming change), 2. Default or Negotiated Minimum Load & Start Up O&M Adder (New). Please see Appendix C for example.	Core	MF
VOM - BRQ008	System shall have the ability to store energy (existing), minimum load, and start-up O&M Adders at the resource level. For MSG resources the adder values will only be stored at the configuration level.	Core	MF

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ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
VOM - BRQ009	System shall have the two Default/Negotiated (D/N) flags and three O&M adder values that are read-only within the Resource Data Template (RDT).	Core	MF
VOM - BRQ010	System must have three new columns to store the adders at the resource level and configuration level. Each configuration of an MSG resource can have a different adder.	Core	MF

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5.2 Business Process: Manage Day Ahead Market – Opportunity Cost Calculator (OCC)

5.2.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
VOM - BRQ015	System must have the capability of receiving the resource specific or configuration specific O&M adders and O&M type from Master File.	Core	OCC

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5.3 Business Process: Manage Day Ahead Market – Scheduling Infrastructure and Business Rules (SIBR)

5.3.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
VOM - BRQ017	System must have the capability of using the resource-specific or configuration specific (for MSGs) O&M Adder to calculate the proxy minimum load cost and proxy start-up cost (including reasonableness threshold values), where if the resource has elected the default option for min load and start up O&M Adder, the system must perform an automated calculation: Min load O&M Adder = Default Min load O&M Adder * Resource's PMAX or Start up O&M Adder = Default start up O&M Adder * Resource's PMAX Update the minimum load cost to include the min load and energy O&M Adder (default or negotiated based on MF selection). See Appendix D for calculation.	Core	SIBR
VOM - BRQ018	System must have the capability of receiving the resource specific or configuration specific O&M adders from Master File. See Appendix D for calculation.	Core	SIBR

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5.4 Business Process: Manage Day Ahead Market – Market (IFM/RTM)

5.4.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Applications Impacted
VOM - BRQ019	System shall consider both GTUR and FTUR technology types as CTs. Note: Transformation to be done in the transfer script.	Core	IFM/RTM

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6 Appendix

6.1 Appendix A Proposed Default VO Adder Values

Technology Type	Energy O&M Adder *($/MWh)*	Minimum Load O&M Adder *($/run-hour/MW[1])*	Startup O&M Adder *($/start/MW)*
Default values represents:	*Variable Operations Costs*	*Variable Maintenance Costs*	*Variable Maintenance Costs*
Coal	2.69	-	-
Steam Turbines	0.33	-	-
CCGTs	0.59	1.74	-
[Frame] CTs	0.97	-	52.13
Aeroderivative CTs	2.15	4.38	-
RICEs	1.10	-	-
Nuclear	1.08	-	-
Biomass Power Plant	1.65	-	-
Geothermal Power Plant	1.16	-	-
Land Fill Gas	1.21	-	-
Hydro	-	0.65	-
Solar	-	-	-
Wind	0.28	-	-
Storage/NGRs/PDRs/RDRRs	-	-	-

[1] The default Minimum Load and Startup O&M Adders are expressed in $/run-hour/MW and $/startup/MW units, respectively. To arrive at a resource-specific O&M Adder, the CAISO will multiply the proposed default value by the Pmax of the resource or configuration. This results in the resource-specific Minimum Load and Startup O&M Adders being expressed in $/run-hour or $/startup units, respectively.

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6.2 Appendix B: New Gen Tech Types

Technology Type	Gen Tech Type	Fuel Type	Comments
Coal	N/A	COAL	
Steam turbines	STUR	GAS	
CCGTs	CCYC	GAS	
CT (Frame CT)	New	GAS	New – FTUR
Aeroderivative CT	GTUR	GAS	Continue to use GTUR
RICE	RECP	GAS	
Nuclear	N/A	NUCL	
Biomass	N/A	BIOM	
Geothermal	N/A	GEOT	
Landfill	N/A	BGAS, WAST	
Hydro	<>PUMP	WATR	
Solar	N/A (PHOT, OTHR)	SOLR	Same as Photovoltaic
Wind	WIND	WIND	
Storage	N/A	LESR	It is not impacted with the VOM effort. No default values.

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6.3 Appendix C: Two New Flags Example (BRQ008)

Res ID	Default or Negotiated Min Load & Start Up O&M Adder	Min Load O&M Adder	Start Up O&M Adder	Default or Negotiated Energy O&M Adder	Energy O&M Adder ($/MWh)
Res A	Default	0.00 ($/run-hour/**MW**)	52.89 ($/Starts/**MW**)	Default	0.97
Res B	Default	1.69 ($/run-hour/**MW**)	0.00 ($/Starts/**MW**)	Negotiated	0.69
Res C	Negotiated	123 ($/run-hour)	0.00 ($/Starts)	Default	0.33
Res D	Negotiated	107 ($/run-hour)	43.20 ($/Starts)	Negotiated	1.20
Res E – Config1	Default	1.69 ($/run-hour/**MW**)	0.00 ($/Starts/**MW**)	Default	0.97
Res E – Config 2	Default	1.69 ($/run-hour/**MW**)	0.00 ($/Starts/**MW**)	Default	0.97
Res F – Config 1	Negotiated	123 ($/run-hour)	52.20 ($/Starts)	Negotiated	3.69
Res F – Config 2	Negotiated	246 ($/run-hour)	21.20 ($/Starts)	Negotiated	5.20

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6.4 Appendix D: Updated Proxy Cost Formulas

This section clarifies the proposed proxy cost formulas under this initiative. In this case, the primary formulas being proposed for modification are the DEB under the Variable Cost option and the Minimum Load Bid Cap and the Startup Bid Cap under the Proxy Cost option. The CAISO is also proposing updates to the formulas Maximum Registered Minimum Load Costs and Maximum Registered Start-up Costs under the Registered Cost option. Those changes are substantially the same as those proposed for the Proxy Cost option and, as the Registered Cost option is much less commonly used than the Proxy Cost option, the CAISO excludes these for brevity's sake.

6.4.1 Variable Cost Default Energy Bid formula

Current DEB =

*1.10 * [(Incremental Heat Rate/1000 x Fuel Region Price)*

+ VOM adder + GMC adder + (Incremental Heat Rate/1000 x Emission Rate x GHG Allowance Price)] + FMU adder (if eligible) + Variable Energy Opportunity Cost (if eligible)

Proposed Variable Cost DEB =

*1.10 * [(Incremental Heat Rate/1000 x Fuel Region Price)*

+ Energy O&M adder + GMC adder + (Incremental Heat Rate/1000 x Emission Rate x GHG Allowance Price)] + FMU adder (if eligible) + Variable Energy Opportunity Cost (if eligible)

6.4.2 Proxy Minimum Load Cost formula

Current MLC =

*1.25 * [(Minimum Load Heat Rate/1000 x Pmin x Fuel Region Price)*

+ (VOM adder x Pmin) + (GMC adder x Pmin) + (Pmin x Minimum Load Heat Rate/1000 x Emission Rate x GHG Allowance Price) + Major Maintenance Adder] + Minimum Load Opportunity Cost (if eligible)

Proposed MLC =

*1.25 * [(Minimum Load Heat Rate/1000 x Pmin x Fuel Region Price)*

+ (Energy O&M adder x Pmin) + (GMC adder x Pmin) + (Pmin x Minimum Load Heat Rate/1000 x Emission Rate x GHG Allowance Price) + Minimum Load O&M Adder] + Minimum Load Opportunity Cost (if eligible)

6.4.3 Proxy Startup Cost formula

Current SUC =

*1.25 *[(Start-Up Fuel x Fuel Region Price) + (Start-Up Energy x*

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Electricity Price Index) + (Pmin x Start-Up Time Period x GMC adder / 2) + (Start-Up Fuel x GHG Emission Rate x GHG Allowance Price) + Major Maintenance Adder] + Startup Opportunity Cost (if eligible)

Proposed SUC =

*1.25 *[(Start-Up Fuel x Fuel Region Price) + (Start-Up Energy x*

Electricity Price Index) + (Pmin x Start-Up Time Period x GMC adder / 2) + (Start-Up Fuel x GHG Emission Rate x GHG Allowance Price) + Startup O&M Adder] + Startup Opportunity Cost (if eligible)

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