

Business Requirements Specification

Local Market Power Mitigation Enhancements (LMPME)

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Owner: Program Management Office Program Office

Local Market Power Mitigation Enl Requirements S	,	Date Created:	3/21/2019	
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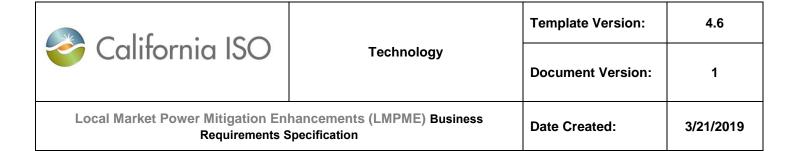


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1 Introduction

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.

This project includes four elements to address cases of mitigation. The mitigation framework enhancements introduce an optional rule for EIM BAAs to limit transfer quantities or avoid cases of economic displacement. Further modifications include modifying the mitigation framework to eliminate the balance of the Fifteen Minute Market (FMM) and balance of the hour mitigation, with reexamination and application of the competitive LMP at every interval. The project includes the creation of a new default energy bid for hydro resources with storage capability. The project also makes changes to the reference level adjustment process originally established within the Commitment Cost Default Energy Bid Enhancements (CCDEBE) initiative. Lastly, the project will make enhancements to the gas price indices used for Mondays.

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2 Business Impacts

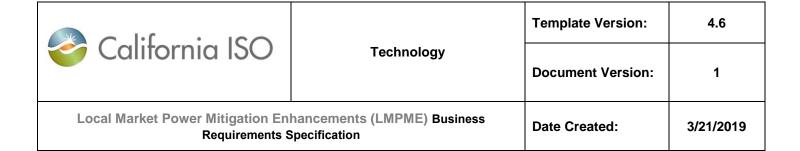
2.1 High Level Description of Business Process

Related Business Process (Level II)	
Facilitate SC & CRR Holder Maintenance (MMR LII)	
Manual Consultation – existing process revision that relates to CCDEBE process work	
Hydro DEB – Validation of Power Hubs and Storage Horizon	
Manage Day Ahead Market (MMG LII)	

2.2 Business Practice Manual (BPM)

BPM Description of Impact(
Managing Full Network Model	N/A
Congestion Revenue Rights	N/A
Market Instruments	Yes. New DEB methodology for hydro resources. Reference level adjustment and reasonableness threshold updates.
Outage Management	N/A
Reliability Requirement	N/A
Market Operations	Yes.

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ВРМ	Description of Impact(s)	
	Reflect consolidation of the gas price indices used to calculate the resource reference levels. MPM and competitive LMP sections must be updated.	
Compliance Monitoring	N/A	
Metering	N/A	
Scheduling Coordinator Certification & Termination	N/A	
Rules of Conduct Administration	N/A	
BPM Change Management	N/A	
Definitions & Acronyms	N/A	
Settlements & Billing	N/A	
Credit Management	N/A	
Candidate CRR Holder	N/A	
Transmission Planning Process	N/A	
Direct Telemetry	N/A	
Distributed Generation for Deliverability	N/A	
Energy Imbalance Market (EIM)	Yes. Flow reversal and economic displacement will need to be spelled out.	
Generator Interconnection Procedure (GIP)	N/A	
Generator Interconnection and Deliverability Allocation Procedures	N/A	
Generator Management	N/A	
Managing Full Network Model	N/A	

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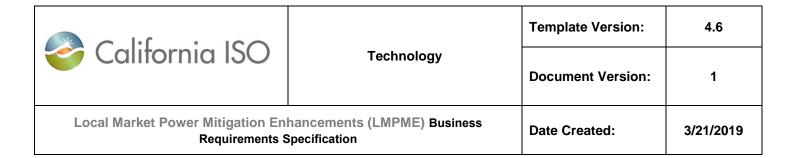
2.3 System:

System Impact:	Description:
RTM	Scope item 1 - Flow Reversal:
	 Fifteen minute market (FMM): MPM shall be applied independently to each 15 minute interval and the mitigated bid shall not persist to the end of the hour. Five minute market (RTD): There is no MPM pass, however, its advisory interval is mitigated for the next RTD run independently. The Competitive LMP plus a small configurable tolerance shall be used for energy bid mitigation above that level. Mitigated bid = Min [submitted bid, MAX (DEB, Competitive LMP + \$0.xx tolerance)]
	Scope item 1 - Economic Displacement:
	After the bids for all resource within a group of EIM BAAs are mitigated in MPM or RTD advisory due to import transfer congestion, the export net transfer out of that BAA is limited in the FMM or the next RTD run to the greater of the net export transfer in the MPM pass or the previous RTD advisory, or the base net export transfer for that EIM BAA and interval, plus the flexible up requirement for that BAA and interval.
SIBR	Scope item 3 – Reference level adjustment:
Internal ISO System	SIBR must have the ability to calculate reasonableness threshold commitment costs after receipt of new payload using updated gas price indices. Scope item 2 – New DEB:
	DEB calculation must be updated to include new DEB option. System must show new DEB option, power price hubs (four hubs), and storage horizon.

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	Scope item 3 – Reference level adjustment:	
	Internal ISO system will need to consider the updated gas prices and recalculate reasonableness threshold for energy bids and publish to SIBR. Internal ISO system will also need to publish updated gas price indices to SIBR for the calculation of commitment cost reasonableness thresholds.	
	Scope item 4 – Gas price indices:	
	Update system to use a minimum of one gas price to determine the blended gas price used in the CAISO market.	
Master File	Scope item 1 - Economic Displacement:	
	Master file option to limiting transfer per a defined rule.	
OASIS	Scope item 1 - Economic Displacement:	
	OASIS report impact.	
CMRI	Scope item 2 – New DEB:	
	CMRI will need to display a new DEB type [existing report – Default Energy Bid].	

2.4 Other

Impact:	Description: (optional)
Market Simulation	Yes
Market Participant Impact	Yes
User Acceptance Testing (UAT)	Yes
Internal Training	Yes
External Training	Yes
Policy Initiative	Yes
Vendor	Yes - Siemens

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3 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.

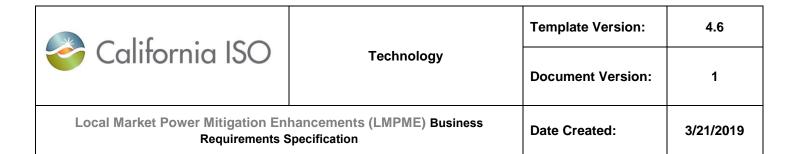
3.1 Business Process: Manage Markets & Grid (MMG)

The requirements in this section pertain to the Prevention of Flow Reversal and Economic Displacement.

3.1.1 Business Requirements

ID#	Business Feature	Requirem ent Type	Potential Application (s) Impacted
LMPME- BRQ001	Market Power Mitigation (MPM) in RTUC (FMM/STUC/HASP) shall be applied independently to each 15 minute interval and the mitigated bid shall not persist to the end of the hour.	Core	RTM (RTUC)
LMPME- BRQ002	Market Power Mitigation in RTD shall be applied independently to each 5 minute interval and the mitigated bid shall not persist to the end of the hour.	Core	RTM (RTD)
LMPME- BRQ003	There is no MPM pass, however, each advisory interval in the current RTD run shall be mitigated independently for the next RTD run.	Core	RTM (RTD)
LMPME- BRQ004	If the last five minute RTD interval(s) does (or do) not have mitigation because it was not present in the previous RTD run, there will be no mitigation for these intervals in the current RTD run. However, they will be evaluated and used in the next RTD run.	Core	RTM (RTD)
LMPME- BRQ005	System shall publish the mitigated bid for each fifteen minute interval of the second hour in HASP.	Core	RTM (HASP)
LMPME- BRQ006	System shall receive and publish externally the mitigated bid for each fifteen minute interval of the second hour in HASP.	Core	CMRI

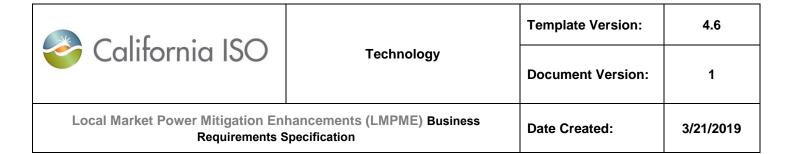
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ID#	Business Feature	Requirem ent Type	Potential Application (s) Impacted
LMPME- BRQ007	System shall mitigate the energy bid in each interval based on the competitive locational marginal price in that interval.	Core	RTM (RTD/RTUC)
LMPME- BRQ008	A resource mitigated in the FMM shall no longer automatically be mitigated in the five minute real-time dispatch in the corresponding intervals.	Core	RTM (RTD)
LMPME- BRQ009	The Competitive LMP plus a small configurable tolerance shall be applied to resources assuming the market bid is higher than the default energy bid.	Core	RTM (RTD)
	Mitigated bid = Min [submitted bid, MAX (DEB, Competitive LMP + \$0.XXX tolerance)]		
	Note: The configurable parameter \$0.XXX shall be initially set at \$0.001.		
	Note: The parameter added to the competitive LMP is nominal used to establish price separation between competitive and non-competitive areas. This price separation will further prevent flow reversal from occurring in cases when a resource is mitigated to either the resource's DEB or competitive LMP.		

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LMPME- BRQ010	are mitig transfer limited in the net t advisory interval, that BAA ramp up adjustm capabilit	bids for all resource within a group of EIM BAAs gated in MPM or RTD advisory due to import congestion, the net transfer of that BAA is a the FMM or the next RTD run to the greater of ransfer in the MPM pass or the previous RTD or or the base net transfer for that EIM BAA and plus the sum of the flexible ramp up awards in and interval in excess of the adjusted flexible requirement in that BAA and interval. The ent is for EIM diversity benefit (net import by) and flexible ramp up demand elasticity. $\max \left(T_{BAA}^{(Base)}, T_{BAA}^{(MPM)}\right) + \max \left(0, \sum_{i \in BAA}^{(MPM)} - FRUR'\right)$	Core	RTM (RTD)
	T_{BAA}	Net EIM Transfer of the mitigated BAA		
	$T_{RAA}^{(Base)}$	Base net EIM Transfer of the mitigated BAA		
	T _{BAA}	Pre-mitigation (market power mitigation run) net EIM Transfer of the mitigated BAA (for RTD, the previous RTD run serves as the market power mitigation run)		
	$FRU_i^{(MPM)}$	Flexible ramping up award for resource i (in the MPM run)		
	FRUR'	Flexible ramping up requirement for the mitigated BAA, adjusted for EIM diversity and demand elasticity		
	market a tested s binding accrue t the defa BAAs. I appropri	nis rule shall be applied in both the 15-minute and real-time dispatch, so that every interval is eparately. In the event the transfer constraint is in the pricing run, the congestion rents shall to the source EIM BAA. Upon implementation, ult setting for this rule will be inactive for all EIM BAAs that choose to enforce the rule must make atte designation within the Master File as part of thal Master File registration process.		



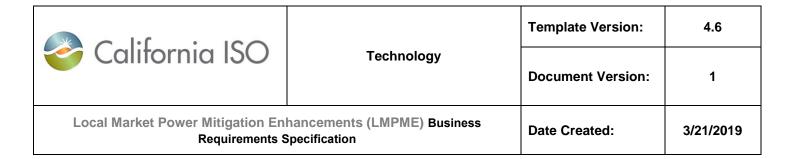
ID#	Business Feature	Requirem ent Type	Potential Application (s) Impacted
LMPME- BRQ011	Energy Imbalance Market (EIM) entities must have the ability to elect to have the constraint. Note: This is a flag at the Balancing Authority Area (BAA).	Core	Master File
LMPME- BRQ059	System must publish the net EIM Transfer limit (high/low) by BAA, market (FMM/RTD) and interval (15/5 minute).	Core	Master File
LMPME- BRQ046	FMM MPM results report must display the actual interval specific results of the MPM process and show all the mitigations within the given interval.	Core	CMRI
LMPME- BRQ047	RTD MPM results report must display the actual interval specific results of the MPM process with no further translation of data needed to capture all the intervals that were impacted.	Core	CMRI
LMPME- BRQ062	Market systems shall calculate and broadcast the Net EIM Transfer Limits for both the import and export directions, as applicable, with each binding 15-minute and 5-minute market interval.	Core	RTPD RTD
	"As applicable" will apply to the following conditions: (LMPME future scenario) EIM BAA export transfers are limited for mitigated intervals (RTPD and RTD), occurs only for export direction.		

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3.2 Business Process: Hydro DEB – Validation of Power Hubs and Storage Horizon (new business process)

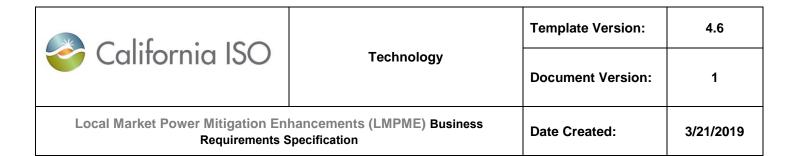
3.2.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
LMPME- BRQ012	The new default energy bid (hydro DEB) shall be for any hydro resource in the CAISO or EIM area that has storage available and has the ability to be dispatchable and biddable in the real-time market. The new default energy bid (hydro DEB) shall have a bid curve with only one segment with Pmin as the starting value and Pmax as the ending value.	Core	Internal ISO System
LMPME- BRQ060	System must have the ability to manage hydro DEB eligibility at the resource level.	Core	Master File
LMPME- BRQ013	System must have a field to select and rank the new default energy bid (hydro DEB) option.	Core	Master File
LMPME- BRQ014	In order to be eligible for the new default energy bid (hydro DEB) the resource owner must submit the resource's maximum storage horizon along with supporting documentation.	Business Process BPM – Market Instruments	Not applicable

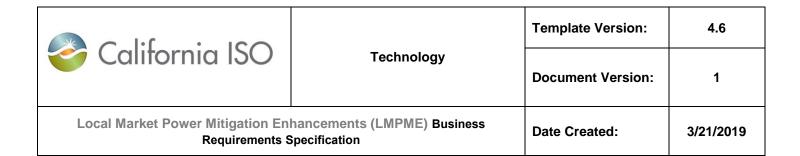


ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
LMPME- BRQ015	System must store the resource's maximum storage horizon. Note: Maximum storage horizon represents the maximum length of storage a hydro resource has when cycling reservoirs during typical hydro year conditions.	Core	Master File

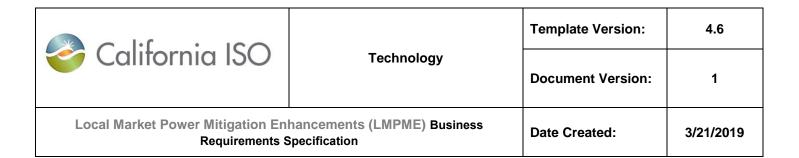
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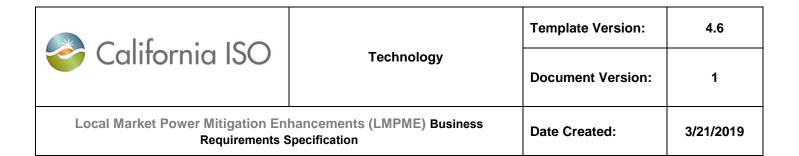
ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
LMPME- BRQ017	The new default energy bid (hydro DEB) shall be capped at the market bid cap of \$1,000/MWh.	Core	Internal ISO System
LMPME- BRQ018	The CAISO shall calculate the new default energy bid (hydro DEB) once per trade date per market for each eligible resource.	Core	Internal ISO System
LMPME- BRQ019	The short term floor shall be computed using Default Power Hub prices. A multiplier (set at 1.40) shall be applied to this calculated value so that it can be used to ensure that the DEB is not higher than local EIM prices on a frequent basis. Note: This requirement relates to inputs denoted within BRQ016.	Core	Internal ISO System
LMPME- BRQ020	The gas floor shall be calculated similar to a variable cost DEB for a gas resource. For example, the heat rate for a peaker resource is multiplied by the gas price index for a similar gas resource if it were located in the same fuel region. This calculation shall use a 110% multiplier. Note: This requirement relates to inputs denoted within BRQ016.	Core	Internal ISO System



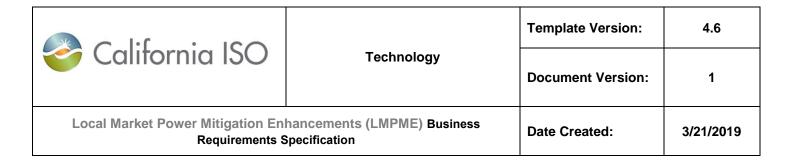
ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
LMPME- BRQ021	The long term/geographic floor shall be calculated as the maximum of the day-ahead, balance of the month, and month ahead indices for the resource. Resources shall be eligible for future monthahead power prices, up to the amount of the maximum storage horizon. Example: If a resource has three months of storage, the month ahead index for the successive month, two months in advance, and three months in advance are used. Note: This requirement relates to inputs denoted within BRQ016.	Core	Internal ISO System
LMPME- BRQ022	System must have the ability to use hubs in addition to the local hub in the calculation of long term/geographic floor. Resources shall be eligible for future month-ahead power prices, up to the amount of the maximum storage horizon.	Core	Internal ISO System
LMPME- BRQ023	Market Participants shall submit proof of firm transmission rights to additional hubs through a submittal to the CAISO on an annual basis. Note: If firm transmission rights are shown for multiple hubs, a resource shall receive the maximum of these values which will be determined each day.	Core	CIDI



ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
LMPME- BRQ024	System must provide the ability for market participants to request changes to additional hubs. These additional hubs must be stored. Note: There shall be an option to select from one default and four additional bilateral energy-trading hubs for hydro resources with the new Hydro DEB option. The bilateral energy-trading hubs shall be limited to Palo Verde, Alberta, Mid-Columbia, north-of-path 15, and south-of-path 15.	Core	Master File
LMPME- BRQ061	System must receive the DEB rankings, default bilateral hub, additional bilateral hubs, and maximum storage horizon.	Core	Internal ISO System
LMPME- BRQ026	The additional bilateral energy-trading hubs shall be included in the long term/geographic floor component of the DEB.	Core	Internal ISO System
LMPME- BRQ027	The default trading hub for a hydro resource with storage shall be determined and stored based on the BAA to default bilateral energy hub mapping.	Core	Master File



ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
LMPME- BRQ028	System shall receive the new default energy bid (Hydro DEB) type and include this within the Default Energy Bid report.	Core	CMRI
LMPME- BRQ029	System shall publish the new default energy bid (hydro DEB) type in outgoing payload for downstream systems.	Core	Internal ISO System
LMPME- BRQ030	For resources that are eligible to receive the new default energy bid (hydro DEB), the system shall revert to the hydro DEB used in the same market on the prior day if the DEB calculation fails.	Core	Internal ISO System
LMPME- BRQ034	The CAISO must have the authority to audit the additional power price hubs, request additional information, and require a resource owner to attest to the correctness of submitted data. If information is found to be inaccurate, eligibility for the use of the new default energy bid (hydro DEB) may be suspended and the resource owner may be referred to FERC.	Tariff requirement	Not applicable
LMPME- BRQ035	For a resource with additional approved bilateral hubs, if the scheduling coordinator (SC) changes, the resource shall no longer be eligible to receive the additional bilateral hubs. The new SC must request to receive the additional bilateral hubs with required supporting documentation spelled out within the Market Instruments Business Practice Manual (BPM).	Business Process BPM – Market Instruments	Not applicable



ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
LMPME- BRQ050	System must validate the administrator entered value for the maximum storage horizon. The acceptable value is either null or a whole number between the numbers of 1-12. NULL shall indicate that the resource is not eligible for Hydro DEB.	Core	Master File

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3.3 Business Process: Manage Market & Grid (Gas Price Indices)

3.3.1 Business Requirements

ID#	Business Feature	Requirement Type	Potential Application(s) Impacted
LMPME-	System must no longer reference ICE gas price data for real-time market gas price indices calculations. Note: The CAISO shall continue to reference S&P Global Platts as a source of gas indices that now contain information about ICE trades.	Core	Internal ISO
BRQ037		Tariff	System
LMPME-	System must use a minimum of one gas index to determine the blended gas price. If no gas price index available, the system shall fallback to the prior real-time market gas price index. Note: The CAISO Tariff and Market Instruments BPM shall be the source for which publications that CAISO shall use. Currently, the CAISO uses Natural Gas Intelligence, SNL Energy/BTU's Daily Gas Wire, and Platt's Gas Daily.	Core	Internal ISO
BRQ039		Tariff	System
LMPME-	System shall use ICE's Monday-only index for the real-time market on Mondays depending on availability.	Core	Internal ISO
BRQ040		Tariff	System

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3.4 Business Process: Market/Business Simulation

This section shall provide a basis for the development of the Market/Business Simulation Structured Scenarios. These requirements will provide guidance on the market participant impacts, inputs into the Structured Scenarios, endpoints to the Structured Scenarios, and reasons for potential Structured 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 Structured Scenario column will be to offer guidance regarding what potential Structured 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.

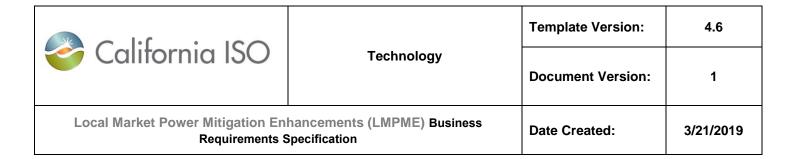
In the Reason for Potential Structured Scenario column, the Business Analyst must select one or more of the following reasons:

- **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 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). Structured Scenarios would be beneficial for market participants taking on a new function or process within their organization.

3.4.1 Business Requirements

ID#	Guidance on Market Participant Impacts	Source System	Sink System	Reason for Potential Structured Scenario
LMPME- BRQ041	Market participants will have the ability to view the parameters and ranking of an approved Hydro DEB.	CIDI	Master File	Rule Impacts; Interface Changes

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ID#	Guidance on Market Participant Impacts	Source System	Sink System	Reason for Potential Structured Scenario
LMPME- BRQ042	Market participants will have the ability to view their Hydro DEB on a daily basis on CMRI.	Market Participant	CMRI	Rule Impacts
LMPME- BRQ043	Mitigation will be performed on an interval by interval basis.	Market Participant	CMRI	Rule Impacts; New application/Report
LMPME- BRQ044	Market Participants may see a small impact to their mitigated bid due to the tolerance added to the Competitive LMP.	Market Participant	CMRI	Rule Impacts
LMPME- BRQ045	In the scenario where two EIM BAAs will be mitigated while one exports in the MPM pass to the other, the ISO wants to demonstrate that after the mitigation the exported energy value isn't increasing in the FMM pass.	Market Participant	CMRI	Rule Impacts

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4 Web Services and Data Requirements

4.1 Service Artifacts

The tables below define the Data requirements and its respective impacted artifacts. Each Data requirement is assigned a unique ID starting with the system acronym plus a prefix of "DAT" followed by a 3 digit number with leading zeros if necessary.

4.1.1 External Web Services

This table lists the web services between systems external to the CAISO (market participants) and CAISO-based systems:

Data ID	Data Set Name	Description of Data Set/Context of the data set/Use case	Trigger Event/Frequency
LMPME	Default Bid Curve	This is an existing XSD in which we will change	Existing
-		the enumeration to string for DefaultBidType.	Event/Frequency (as
DAT001			in production)
LMPME	Generator RDT	Add a new enumeration to the ranking. Created a	Event/Frequency (as
-		Hydro DEB curve option. Added maximum	in production)
DAT002		storage horizon data element. Created default	
		bilateral hub and alternative trading hub.	

4.2 System Impact

The tables below map the Data requirements and its respective impact on a system level. Each data requirement must reference at least one Business Requirement, Functional Requirement or Use Case. Requirement(s) ID(s) will be listed in the second left column.

4.2.1 External Web Services

This table identifies the provider and consumer system/s impacted by the data requirement:

DATA ID	Data Set Name	Provider System (Source Application)	Consumer System (Sink Application)
LMPME- DAT001	Default Bid Curve	Market Participant	CMRI
LMPME- DAT002	Generator RDT	Market Participant	Master File

Owner: Program Management Office Program Office

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