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**MRTU Participating Load Users Guide**

 <b>California ISO</b> <small>Your Link to Power</small>	<b>DRAFT</b> Technical Standard	Revision Date	12/9/2008
		Revision No.	1.4
<b>MRTU - Participating Load Users Manual</b>		Print Date	1/20/2009
		Effective Date	TBD

### REVISION HISTORY

REVISION NO.	DATE	DESCRIPTION
1.0	9/18/2008	Document Created
1.1	10/22/2008	Section updates
1.2	11/04/2008	Section rewrites
1.3	11/30/2008	Section updates
1.4	12/09/2008	Section Updates

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## 1. INTRODUCTION

### 1.1. Background and Overview

This document provides the procedures and standards required for Loads to participate as Participating Loads in the CAISO markets under MRTU (Market Design and Technology Upgrade) Release 1.

Under the MRTU design, Participating Loads must be scheduled and settled at Custom Load Aggregation Points (CLAP). A CLAP consists of a set of one or more load nodes designated by the Load Aggregator and approved by CAISO. A CLAP must, at minimum, be entirely within a Local Capacity Area.<sup>1</sup> The term Aggregated Participating Loads is sometimes used to distinguish Participating Loads scheduled at Custom LAPs from Pumping (pumped storage) Participating Loads. In this manual, Participating Load with no qualifier means Aggregated Participating Load.

Under MRTU Release 1, Participating Loads may bid only into the Day-ahead Energy market, and the Day-ahead Non-Spinning Reserve Ancillary Services (A/S) market. They may not participate in the Residual Unit commitment (RUC) or real-time A/S markets. Also their participation in the Real-time Imbalance Energy (RIE) market is limited to Energy associated with the awarded Day-ahead Non-spinning Reserve capacity. CAISO is considering enhancements to allow Participating Loads to bid into the Real-time Imbalance Energy market (beyond awarded Non-spinning Reserve capacity) a few months after the start of the MRTU market.

Under MRTU Release 1, Participating Loads must register and use a “load” resource and a “pseudo-generator” resource, both defined at the Custom LAP. The pseudo-generator would be used to schedule or bid A/S (Non-spinning Reserve), and bid Imbalance Energy. In the day-ahead scheduling process under MRTU Release 1 the load and pseudo generation resources representing a Participating Load are treated independently. Thus, to ensure adequate load is scheduled to cover the Non-spinning Reserve award (and avoid potential A/S No-Pay charges), the Scheduling Coordinator (SC) for the Participating Load would want to self schedule adequate amount of load to cover its Non-spinning Reserve bid quantity. However, this is not mandatory; if adequate load is not self scheduled, then the SC incurs the risk of insufficient load to cover the Non-Spinning Reserve award.

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<sup>1</sup> A Local Capacity Area is a transmission constrained area as defined in the study referenced in CAISO Tariff section 40.3.1.

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## 1.2. Definitions

Unless the context otherwise indicates, any word or expression defined in the Master Definitions Supplement, Appendix A to the CAISO MRTU Tariff, and capitalized herein, has the same meaning where used in this Users Guide. Some of these are defined below for ease of reference. In addition, other words and expressions used in this Users Guide with initial capitalization have the meanings set forth below:

**Aggregated Loads (or Aggregated Participating Loads):** Multiple Loads represented as a Participating Load resource that meet CAISO standards specified in this Users Guide, and that are approved by the CAISO to schedule and bid Energy and Ancillary Services as a single resource using some combination of individual Loads.

**CAISO Certified Meter:** One of a class of revenue metering devices that is capable of providing an interface for Operational Data from a CAISO Metered Entity

**CAISO Metered Entity:** In this context, a Participating Load representing a Load that is directly connected to CAISO Controlled Grid or representing a Load or Loads that are otherwise required to provide Meter Data to the CAISO through CAISO-certified metering directly polled by the CAISO.

**Custom LAP:** A Custom Load Aggregation Points or Custom LAP (CLAP) consists of a set of one or more load nodes (with specific LDFs) and is used for scheduling, pricing, and settlement with Participating Loads. Participating Loads must follow specified procedures to request for CLAPs that they wish to use to schedule, or bid into CAISO markets.

**DNP 3.0:** Distributed Network Protocol, Version 3.0, a process monitoring and control data communications protocol between a master and remote devices used for real-time data exchange. DNP 3.0 protocol is widely used for field data acquisition and substation applications within the utility industry. This is a communication protocol the CAISO's Energy Management System understands. (See [www.dnp.org](http://www.dnp.org) for more information on this protocol.)

**eDAC (Energy Data Acquisition and Concentrator):** An energy data collection device or system that is capable of both acquiring and concentrating energy data and timely communicating that data to the CAISO's Energy Management System

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with the appropriate protocol, security level and timing as set forth in the CAISO's standards for Participating Loads.

**Energy Communications Network (ECN):** The CAISO's private digital network comprised of multiple subnet, wide area, and local network segments.

**Energy Management System (EMS) Telemetry:** A process for measuring a quantity as a real time instantaneous value (amps, volts, MW, etc.) and transmitting the result via a communication system (leased line, radio, microwave, etc.) to a remote location for indication or recording.

**LAP:** A Load Aggregation Point (LAP) consists of a number of pre-designated load nodes with specific Load Distribution Factors (LDFs) and is used for scheduling, pricing, and settlement with Non-Participating Loads. The Default LAPs are the service territories of the three California IOUs (PG&E, SCE, and SDG&E). Other pre-defined LAPs are those for Metered Subsystem (MSS) loads (MSS LAPs).

**Load Aggregator:** means a Load-serving Entity (LSE), Energy Service Provider (ESP), municipality, or other non-CPUC jurisdictional load-serving entity representing single or multiple loads under a Participating Load Agreement with the CAISO. The Load Aggregator can be a separate entity from the Scheduling Coordinator that is responsible for scheduling and bidding the Load Aggregator's Participating Load into the CAISO markets.

**Metering Facilities:** means revenue quality meters, instrument transformers, secondary circuitry, secondary devices, meter data servers, related communication facilities and other related local equipment.

**Metering Protocol:** means the Metering Protocol of the ISO Tariff on the subject of revenue quality metering which sets forth the requirements and procedures that SCs, amongst others, shall meet and follow in order to comply with their obligations under Section 10 of the ISO Tariff.

**Operational Data:** Data (such as, but not limited to kV, MW, Mvar, status) collected at defined periods by CAISO EMS Telemetry that is immediately available as instantaneous quantities, and not quantities averaged over time, for CAISO system operator's use in determining system conditions.

**Ramp Rate:** The measured rate, expressed in MW per minute, of a Participating Load's ability to adjust its Demand.

**Residual Unit Commitment (RUC):** The process conducted by the CAISO in the

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Day-ahead Market after the IFM has been executed to ensure sufficient resources are committed to meet the CAISO Forecast of CAISO Demand.

**RMDAPS**: means the ISO's Revenue Metering Data Acquisition and Processing System.

**Scan Rate**: Predefined rate for receiving or sending data.

**SC Metered Entity**: In this context, a Participating Load that is not a CAISO Metered Entity.

**Secure Socket Layer (SSL)**: A security protocol that uses symmetrical and public key cryptography to secure communication over the Internet.

**Transmission Control Protocol / Internet Protocol (TCP / IP)**: IP is used at the network layer of the Objective Systems Integrators (OSI) stack for routing packets. TCP is used at the transport layer of the OSI stack and works with IP for packet routing.

**X.509v3**: Digital certificate public key format defined by the International Telecommunications Unit (ITU) X.509 Standard.

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## 2. OVERVIEW- PARTICIPATING LOADS UNDER MRTU RELEASE 1

Participating Loads provide Curtailable Demand under a Participating Load Agreement<sup>2</sup> between CAISO and the Load Aggregator. Curtailable Demand is Demand from a Participating Load that can be curtailed per a dispatch instruction of CAISO.

Under MRTU Release 1 a Scheduling Coordinator (SC) with (or representing) Participating Loads (certified by the CAISO) can bid into the following markets:

- Day-ahead energy market
- Day-ahead Non-Spinning Reserve market
- Real-time Imbalance Energy market (initially limited to real-time Energy associated with awarded Day-ahead Non-spinning capacity).

The Participating Load model under MRTU Release 1 relies on (1) a simple price-sensitive demand curve submitted in the DA market, and (2) an accompanying pseudo-generator supply curve for use in the Real-time Market that represents the demand response resource's real-time energy dispatch capability.

The SC for the Participating Load resource can bid or schedule all or part of the Participating Load in the Custom LAP for Energy in the Day-ahead Market (DAM) using the unique load Resource ID provided by and registered with the CAISO. The SC's Demand curve for the Participating Load resource may include segments from different Demand Response (DR) programs, at the Load Aggregator's discretion, if they share the same Custom LAP. However, this identification is for the Load Aggregator's internal bookkeeping and does not affect the CAISO's market clearing and pricing process.

In the RUC process, the day-ahead PL schedule is used as the forecast for PL's consumption so that RUC will factor PL in and not over-commit resources.

There will be no RUC payment to the DR resource.

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<sup>2</sup> In this Users Guide the terms Dispatchable Demand and Curtailable Demand are used synonymously. A subtle distinction may however be made between the two terms in the future, whereby Curtailable Demand is amenable to CAISO control in only one direction (with manual restoration); whereas Dispatchable Demand provides for bi-directional CAISO control (load increase vs. reduction). This distinction does not currently exist in the MRTU Tariff.

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The SC for the Participating Load resource can chose to self-schedule (as a price taker) sufficient load in the Custom LAP under its load Resource ID to cover all of the Non-spinning Reserve MWs it bid in the day-ahead market. However, whether self-scheduled or not, if the amount of Custom LAP load that clears the IFM is not enough to cover the awarded day-ahead Non-spinning Reserve, and also the metered consumption (plus any Energy deployed from awarded A/S capacity) is not enough to cover the awarded day-ahead Non-spinning Reserve, then, the SC for the PL resource will be subject to Ancillary Service “No Pay” charges.

Stated differently, Ancillary Service No pay will apply if any of the following occur:

- (a) the Non-spinning Reserve is not deployed, but the metered consumption of the Participating Load is not adequate to support the awarded AS.
- (b) the Non-spinning Reserve is deployed and delivered (based on telemetry), during a contingency, but the hourly metered consumption of the Participating Load is not adequate to cover the Energy associated with the total awarded Non-spinning Reserve capacity for the hour less the deployed Energy.

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### 3. PARTICIPATION REQUIREMENTS

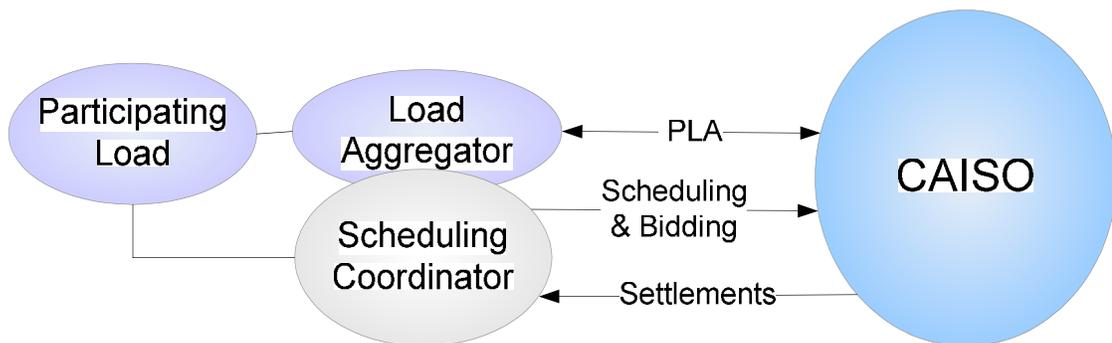
#### 3.1. General Overview

The CAISO MRTU Tariff states that a Participating Load is “An entity (a Load Aggregator in this document), including an entity with Pumping Load or Aggregated Participating Load, providing Curtailable Demand, which has undertaken in writing by execution of a Participating Load Agreement to comply with all applicable provisions of the CAISO Tariff.”

Loads participating in the Energy and Ancillary Services markets shall meet the requirements of CAISO Tariff and enter into a Participating Load Agreement (PLA) with the CAISO. The PLA is executed between the CAISO and the Load Aggregator representing the Participating Load. For purposes of this user guide and under MRTU Release 1, Load Aggregators are Load-serving Entities (LSE), Energy Service Providers (ESP), municipalities or other non-CPUC jurisdictional load-serving entities representing single or multiple loads for the purposes of providing Participating Load to the CAISO.

The CAISO accepts market bids for Energy and Ancillary Services only from Scheduling Coordinators (SC) scheduling on behalf of the Participating Load resource. Each SC is a CAISO certified entity that is eligible to conduct business in the CAISO operated wholesale electricity markets. The CAISO settles all related market transactions directly with the Scheduling Coordinator representing the specific Participating Load.

Participating Load must be represented by a certified Scheduling Coordinator to participate in the CAISO operated wholesale electricity markets.



**Figure 1 - Business Interactions**

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### 3.2. Process Overview

Participating Loads must comply with all applicable requirements in the CAISO Tariff. These requirements involve:

#### I. Application & Certification Process

- Enter into a Participating Load Agreement (PLA) and completing PL resource details in Schedule 1 of the PLA;
- Submit a Participating Load implementation plan and receive approval from the CAISO;
- Comply with the CAISO Metering and Telemetry Requirements, as applicable, including preparation and execution of required A/S telemetry Participating Load Acceptance Test (PLAT)

#### II. Operational Process

- Participate in the CAISO Scheduling and Bidding Process; and
- Submit Settlement Quality Meter Data (SQMD) to the CAISO, and comply with the CAISO Settlements and Market Clearing process

Application and Certification process is discussed in this section. Operational process is discussed in Section 5.

To initiate the PL Application process, the Load Aggregator representing the Participating Load should contact the CAISO's Contract Implementation Project Manager (Mike Boas at (916) 608-5963) to provide the CAISO with required information for the Participating Load facilities. Please have details of the load or load aggregation resource, owner, and contact information readily available. After the initial contact, CAISO Contract Implementation staff will serve as the primary point of contact during the application, implementation, and certification process.

The PL requirements, process and associated reference documents are summarized in Table 1, below.

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**Table 1 - Participating Load Requirements**

Requirements – Participating Load	Estimated Time to Complete
<p><b>Execution of Contractual Agreements with the CAISO</b></p> <ul style="list-style-type: none"> <li>• Complete Participating Load Request For Information Sheet</li> <li>• Execute <a href="#">Participating Load Agreement</a></li> <li>• Complete <a href="#">Resource Data Template</a></li> </ul> <p>As applicable, complete and execute:</p> <ul style="list-style-type: none"> <li>• <a href="#">MSA-ISOME Request For Information Sheet</a></li> <li>• <a href="#">Meter Service Agreement for ISO Metered Entities</a></li> </ul>	<p><i>Up to 30 business days</i></p> <p><i>Please contact your CAISO Contract Representative to initiate preparation of these two contracts.</i></p> <p><i>NOTE: MSA-ISOME applicability is determined during the application process</i></p>
<p><b>Ability to Schedule, Bid and Settle Through a Scheduling Coordinator</b></p> <ul style="list-style-type: none"> <li>• Business Practice Manual for Scheduling Coordinator Certification &amp; Termination found at: <a href="http://www.caiso.com/1c44/1c44cf8a723b0.pdf">http://www.caiso.com/1c44/1c44cf8a723b0.pdf</a></li> </ul>	<p><i>Time Required Varies</i></p> <p><i>To schedule, bid and settle Participating Load, the Participating Load resource must be represented by a Scheduling Coordinator.</i></p> <p><i>For more info on SC certification contact Tish Collins at (916) 608-1246 or <a href="mailto:Lcollins@caiso.com">Lcollins@caiso.com</a></i></p>
<p><b>CAISO Metering Installed (where applicable)*</b></p> <p><u>(Only applicable to a Participating Load that is a CAISO Metered Entities)</u></p> <ul style="list-style-type: none"> <li>• <a href="#">Metering Guidelines</a></li> <li>• <a href="#">CAISO Revenue Meter Deployment Guide</a></li> <li>• Installation of CAISO Specified Metering by a certified installer</li> <li>• Certification of meters by an independent certification company</li> </ul> <p>*Note: Meters for Participating Loads that are NOT CAISO Metered Entities must have interval meters installed that are approved by the applicable Local</p>	<p><i>Up to 40 business days</i></p> <p><i>A CAISO Metering representative will be assigned to facilitate the timely installation and certification of CAISO revenue metering. Connection to the CAISO Energy Communication Network (ECN) is required to establish connectivity with the CAISO Metering and Data Acquisition System (RMDAPS). CAISO RMDAPS will poll each load's meters.</i></p>

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<p>Regulatory Authority. Meter data, for settlement purposes, is submitted to the CAISO through the Scheduling Coordinator. For more information, please refer to the SC BPM and section 10.3 in the CAISO Tariff:  <a href="http://www.caiso.com/1c44/1c44cf8a723b0.pdf">http://www.caiso.com/1c44/1c44cf8a723b0.pdf</a></p>	
<p><b>CAISO Revenue Meter Data Acquisition System (RMDAPS) Connectivity</b></p> <p><u>(Only applicable to Participating Loads that are CAISO Metered Entities)</u></p>	<p><i>About 20 business days</i></p> <p><i>CAISO IT/Telecom and the respective PL IT personnel coordinate the interconnection of the Load's metering with the ECN (CAISO intra-net) and CAISO RMDAPS.</i></p>
<p><b>EMS Visibility – SCADA/Telemetry</b></p> <p><u>(Only applicable to Participating Loads that offer Ancillary Services)</u></p> <ul style="list-style-type: none"> <li>Approval of eDAC device/system to be deployed</li> </ul>	<p><i>Up to 90 business days</i></p> <p><i>CAISO approval of eDAC device/system is incumbent upon sufficient documentation provided in the PL Implementation Plan by the Load Aggregator</i></p> <p><i>Telemetry is required for any load participating in the A/S Non-Spin market.</i></p>
<p><b>Ability to Receive Dispatch Instructions</b></p> <p><u><a href="#">Automated Dispatch System (ADS) Connectivity</a></u></p>	<p><i>15 business days</i></p> <p><i>All CAISO dispatch instructions are delivered electronically to the SC. ADS Connectivity is required for all Participating Loads that are participating in the CAISO's non-spin A/S Market and real-time imbalance energy market.</i></p>

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<p><b>Ancillary Services (A/S) Testing &amp; Certification</b></p> <p>(Only applicable to Participating Loads offering A/S)</p> <ul style="list-style-type: none"> <li>• <a href="#">Participating Load Program Process</a></li> </ul>	<p><i>From 10 to 30 days based on the number and types of tests</i></p> <p><i>Ancillary Services Certification for Participating Load to bid Ancillary Services. (Non-Spinning Reserve)</i></p>
<p><b>Complete and Submit Participating Load Implementation Plan</b></p> <ul style="list-style-type: none"> <li>• See Appendix V to this User Guide</li> </ul>	<p><i>From 10 to 30 business days depending on the completeness of the plan and the complexity of the application</i></p> <p><i>Submit PL Implementation Plan to CAISO's Contract Implementation Project Manager</i></p>

### 3.3. Participating Load Agreement and Registration

#### 3.3.1. Contractual Agreements & Process

Participating Loads must enter into a Participating Load Agreement (PLA) to bind Loads participating in the CAISO's Energy and A/S markets and self-providing A/S to the CAISO Tariff.

A Participating Load and/or the SC for that Participating Load will be required to submit to the CAISO its implementation plan for complying with the applicable requirements for Participating Loads. Once the CAISO has approved the implementation plan, a Participating Load and/or its SC can proceed with implementation of necessary systems. In addition, before A/S can be provided, the Participating Load and/or SC will have to successfully complete Ancillary Services testing and certification.

All Loads for which A/S bids, self-provision Schedules, or Real-time Imbalance Energy bids are submitted to the CAISO must be bound to the CAISO Tariff by the PLA between the Load Aggregator and the CAISO. Several Loads may be represented in a single Participating Load Agreement, with each individual Load (or each contributing Aggregated Load component) listed in Schedule 1 of the

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PLA.

The terms of the PLA will be the same for all types of Loads.

### **3.4. Resource Registration**

After execution of a Participating Load Agreement, the Load Aggregator must complete the CAISO’s Resource Data Template (RDT) and specify its desired Custom Load Aggregation Point (Custom LAP) for each PL resource it desires to initiate. Upon CAISO approval of the requested Custom LAP for each PL resource, the Load Aggregator will receive a unique Resource ID for the load or “demand” resource and a unique Resource ID for the associated pseudo-generator. Thus, the Load Aggregator’s SC, which represents the PL resource for scheduling and bidding purposes, can bid or schedule all or part of the PL resource in the Custom LAP for Energy in the Day-ahead Market (DAM) using the unique load Resource ID. This Demand Bid in DAM for the Custom LAP is presumed to represent actual price-responsive Demand. The SC for the PL resource uses the pseudo-generator Resource ID to submit a Non-spinning Reserve bid into CAISO’s DAM, and energy associated with the Non-spinning Reserve capacity into the Real-time Imbalance Energy Market.

### **3.5. Certification of Services – Ancillary Services**

Any resource wishing to participate in the CAISO Ancillary Services markets must be certified for the services that it intends to provide. Under current WECC standards, properly certified Load resources may participate in the Non-Spinning Reserve market. Ancillary Service certification is not required for participation in the real-time Imbalance Energy market. All Participating Loads wishing to participate in CAISO markets must submit an implementation plan that includes a discussion of how they intend to comply with CAISO Dispatch instructions. The Demand certification procedure section of [CAISO Operating Procedure G-213](#) (Management of Ancillary Services Tests), which is located on the CAISO Web Site (<http://www.caiso.com/thegrid/operations/opsdoc/gcp/>), details both the request for Ancillary Services certification and the testing processes.

#### **3.5.1. Non-Spinning Reserve Requirements**

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Declaration of Certified Demand – The Participating Load must specify the quantity of Demand curtailment that it intends to certify as available for Non-Spinning Reserve. This Demand is the amount of Load that can be interrupted within ten (10) minutes of when the CAISO issues a Dispatch instruction. This Demand is the maximum quantity that may be bid as Non-Spinning Reserve. It is acceptable to bid a quantity less than that which is certified. Any Demand that requires more than ten (10) minutes to interrupt may not be included as the Non-Spinning Reserve certified Demand quantity.

Successful Completion of Certification Test – Prior to receiving its Ancillary Service certification, the Participating Load must schedule to perform a certification test. Such test shall include, but not be limited to, the following:

- Confirmation of telemetry – The CAISO will observe that the Load telemetry is in place and operational and providing required data points;
- Confirmation of the Load telemetry meets Scan Rates and processing cycle requirements;
- Confirmation of voice communication – The CAISO, the SC, and the Participating Load will test communications on primary and secondary voice communication circuits; and
- Confirmation of Load control performance – The Participating Load will demonstrate its ability to adjust its Demand by a quantity mutually agreeable by the CAISO, Participating Load, and SC.

### **3.5.2. Real-Time Imbalance Energy Requirements**

The resource must state its maximum Demand available for curtailment in response to CAISO’s real-time dispatch instructions. The Participating Load may then bid any quantity of Demand up to and including this maximum value into the real-time imbalance Energy market. However, at the start of MRTU and in response to a CAISO real-time dispatch instruction, the PL resource would have to make available for curtailment an amount of energy equal to the PL’s Non-spinning capacity which was awarded in the day-ahead market. This restriction is expected to be lifted a few months after the start of MRTU, in which case the Demand available for curtailment may exceed the Non-spinning Reserve capacity.

The Participating Load intending to provide real-time imbalance Energy to the CAISO must submit a Load participation implementation plan that is acceptable to the CAISO.

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Although there is no certification test for Real-time imbalance Energy, prior to participating in the Real-time imbalance Energy market, the Participating Load must demonstrate the following:

- Confirmation of voice communication - the CAISO, the SC and the Participating Load shall test communication on primary and secondary voice communications circuits.

### **3.6. Implementation Plan**

The implementation plan describes the steps that each Load Aggregator must take to Dispatch Demand in the time required for the service being delivered. The following considerations should be addressed in the implementation plan:

- The plan shall describe roles and responsibilities of end-use customers, the Load Aggregator, UDC and SC, as appropriate, including detailed contact information for the different parties involved.
- The plan shall indicate if the PL resource will be counted as a Resource Adequacy Resource and which LSE will be counting this resource, including the RA capacity quantity to be counted.
- The plan shall summarize details of the demand resource being developed, including the total peak load of the single or aggregate PL resource, the peak-load reduction capability of the PL resource, the end-use types to be curtailed, the PL resources geographic location, the UDC service territory, the PL resources operating characteristics and limitations, availability, and sensitivities, such as weather, day-types, etc.
- The plan shall describe metering data and metering data interfaces and the process for submitting Settlement Quality Meter Data (SQMD) to the CAISO.
- For Participating Loads providing Ancillary Services, the plan shall detail how the eDAC device or system will satisfy the CAISO's telemetry requirements so that the CAISO has visibility to the Participating Load when providing ancillary services.
- The plan shall indicate how the resource will respond to a CAISO initiated ADS dispatch signal, i.e. the manual and/or automated steps required to

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curtail the Demand. Describe the automated DR function, technology and capability that are employed to effectuate the dispatch.

- The plan shall include, as appropriate, data acquisition, data aggregation and control data flow diagrams to demonstrate systems and key touchpoints with PL metering and demand response capabilities.

The CAISO reserves the right to perform a dry run (no actual curtailment of Demand will occur) of the operator actions required to curtail the Demand.

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## 4. OPERATIONAL REQUIREMENTS

Participating Loads shall meet the CAISO metering and telemetry requirements in accordance to the CAISO Tariff.

All loads that participate in the CAISO energy market shall provide Settlement Quality Meter Data (SQMD). Loads that participate in the Ancillary Service market, in addition to the revenue quality metering, shall comply with the CAISO telemetry requirements.

### 4.1. Metering Requirements

Participating Loads are represented in the CAISO markets as either:

- (a) A CAISO Metered Entity, or
- (b) A Scheduling Coordinator (SC) Metered Entity.

As defined above, a Participating Load is a CAISO Metered Entity if it represents a Load that is directly connected to the CAISO Controlled Grid or Load or Loads that are otherwise required to provide Meter Data to the CAISO through the CAISO certified metering directly polled by the CAISO. A Participating Load is an SC Metered Entity if it is not a CAISO Metered Entity.

Participating Loads that are CAISO Metered Entities are required to obtain, install, and have inspected CAISO Certified Meters as outlined in the CAISO Metering Protocol.

Participating Loads that are SC Metered Entities must have a certified interval meter based on the relevant Local Regulatory Authority requirements.

Additional information on CAISO metering requirements can be found in MRTU Business Practice Manual for Metering at:

<http://www.caiso.com/1840/1840b2f9238c0.html>.

The specific requirements for ISO Metered Entities and details regarding the “Load Only” ISO Certified Meter can be found in the ISO Metering section on the ISO Home Page at <http://www.caiso.com/docs/2005/10/01/2005100114481329995.html> .

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The MRTU Business Practice Manual for Metering states that subject to any exemption granted by CAISO, CAISO Metered Entities and Scheduling Coordinator Metered Entities must record Meter Data in Standard Time as follows:

- At five minute intervals for Participating Loads providing Ancillary Services and/or Real-time Imbalance Energy
- At one hour intervals for all other Meter Data

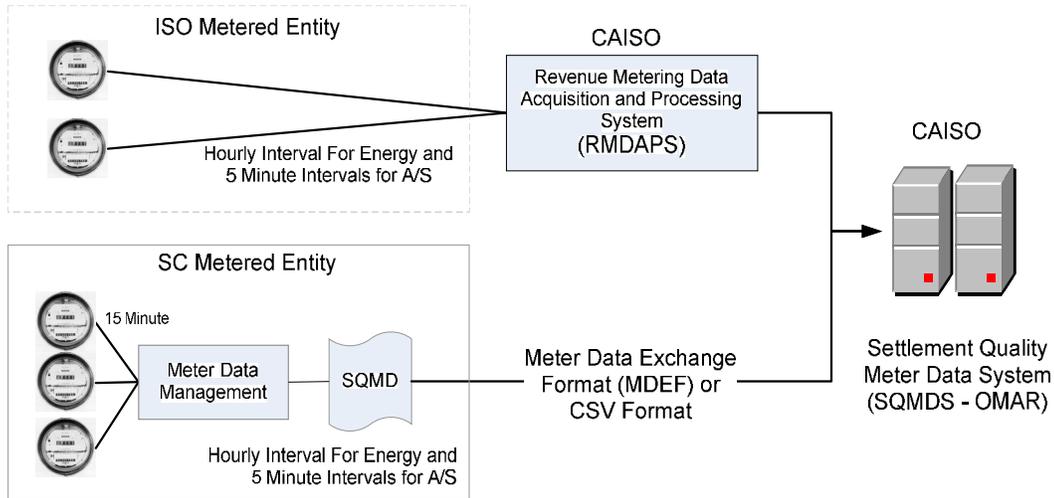
For the MRTU Release 1, the 5 minute interval reading needed for ancillary services may be constructed by dividing a 15-minute interval reading into three equal values.

For CAISO metered entities, CAISO uses RMDAPS to read the meters on a daily basis. CAISO also retrieves data from these meters that provides information on the health of the meter (i.e., error logs, back up battery status, etc.). CAISO is responsible for taking the raw unedited Meter Data and performing the Validation, Estimation, and Editing (VEE) procedures to produce SQMD.

For Scheduling Coordinator Metered Entities, SCs must submit SQMD to the CAISO no later than the day specified in the CAISO Payment Calendar, as specified in the BPM for Settlements and Billing. The most current CAISO Payment Calendar is posted on the CAISO website at: <http://www.aiso.com/docs/2001/09/21/200109210951225246.html>. The meter data is submitted using one of CAISO's approved Meter Data Exchange Formats (MDEF) or CSV format. MDEF and CSV formats are available on the CAISO Website at: <http://www.aiso.com/docs/2005/10/01/2005100119030422946.html>.

Figure 2 provides an overview of metering requirements.

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**Figure 2 - Metering Requirements for Settlement Purposes**

Settlement for Ancillary Services and real-time Imbalance energy provided by Participating Loads will be based on SQMD prepared by the CAISO in the case of CAISO Metered Entities and by the SC in the case of SC Metered Entities. Operational Data obtained through CAISO EMS Telemetry will be used to validate SQMD, but will not be used for financial settlement purposes. Discrepancies, if any, related to a difference between the CAISO settlement interval and the retail meter data storage interval must be resolved at the direction of the CAISO.

## 4.2. Telemetry Requirements

Participating Loads that provide Ancillary Services must provide CAISO EMS Telemetry data. The DNP 3.0 protocol is used for communicating the telemetry data with the CAISO EMS. For a secure communications with the CAISO EMS, Participating Loads will require an Energy Data Acquisition and Concentration (eDAC) device. eDAC, is a DNP-capable field device with capability for secure DNP communications over the Internet, or communications through the CAISO Energy Communications Network (ECN).

Certification of the communication link and the eDAC device by CAISO is a prerequisite for participation in the CAISO Ancillary Service markets.

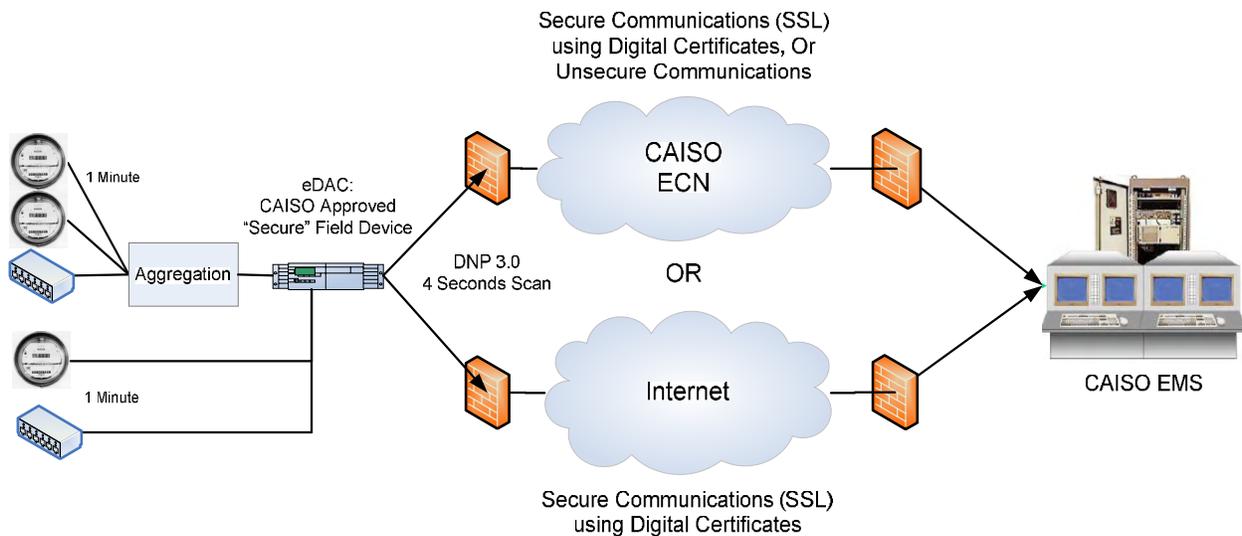
For Ancillary Services, CAISO EMS Telemetry must be available on a four-second scan rate. If an aggregation function is utilized, each meter behind the server must

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be polled no less frequently than once per minute.

Figure 3 provides a high level overview of the Participating Load telemetry data flow options. Loads directly communicating with an eDAC, an approved CAISO field device.

The exact implementation for providing CAISO EMS Telemetry shall be at the discretion of the Load Aggregator, subject to approval by the CAISO.



**Figure 3 - Participating Load Ancillary Service Telemetry Requirements**

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## 5. SCHEDULING AND BIDDING

### 5.1. Scheduling & Bidding Requirements

Participating Loads must be bid and/or scheduled at Custom Load Aggregation Points (Custom LAPs).

Under MRTU Release 1, a Participating Load must have a CAISO approved maximum Demand available for curtailment of 0.1 MW or greater to participate in CAISO markets. Smaller Loads may be aggregated together to achieve the 0.1 MW threshold. The bid segments may be as low as .01 MW. .

The CAISO may adjust the A/S and Real-time Imbalance Energy requirements temporarily to take into account, among other things, variation in conditions, real time dispatch constraints, contingencies, and voltage and dynamic stability assessments.

The Loads of Participating Loads providing A/S or Real-time Imbalance Energy must be scheduled separately from other Loads scheduled by a Scheduling Coordinator, and SQMD must be provided at the same granularity. For example, if a Scheduling Coordinator represents a total of 500 load meters, and 10 of those load meters represent loads aggregated as a Participating Load, the SC will schedule the 10 Loads of the Participating Load separately from the other 490 Loads. The SC will submit aggregated SQMD for the 10 load meters of the Participating Load separate from the SQMD for the other 490 load meters, but at the same granularity as scheduled.

### 5.2. Process for PL in MRTU R1

For the MRTU Release 1, a Load Aggregator's SC can bid Participating Load DR programs into the CAISO markets, with the following possibilities and limitations:

- The Price Responsive Demand can submit up to 10 bid segments (price-quantity bid pairs) under the PL's load Resource ID at the PL's Custom LAP. Associated meter data for Settlement purposes is submitted for the same

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Custom LAP for this demand resource. The Custom LAP load distribution factors are preserved in the IFM market-clearing process.<sup>3</sup>

- The DR curve may include segments from different DR programs, at the Load Aggregator’s discretion, if they share the same Custom LAP. However, this identification is for the Load Aggregator’s internal bookkeeping and does not affect the CAISO’s market clearing and pricing process.
- The CAISO will use the day-ahead PL schedule as the forecast for PL’s consumption; so RUC will factor PL in and not over-commit resources.
- There will be no RUC payment to the DR resource. However, when PL performs (curtails consumption in real-time according to its day-ahead schedule), assuming there is no day-ahead under-scheduling of PL DR demand, the PL resources are exempt from Tier 1 RUC<sup>4</sup> charges<sup>5</sup>.
- There is no PL DR performance requirement in CAISO’s Energy markets.<sup>6</sup> To the extent the PL consumes more or less than its day-ahead schedule (based on its metered demand), the difference from its day-ahead schedule is settled at the real-time price for its Custom LAP.
- PL resources are eligible to participate in AS markets for non-spinning reserve. In MRTU Release 1, non-spinning reserves must be bid as contingency-only reserves.
- Real-time dispatch instructions may be given (for the pseudo generator to produce Energy from any Non-spinning Reserve capacity awarded to the pseudo-generator) under contingency conditions. However, for settlement purposes, the response of the pseudo-generator is tracked by comparing the change in the Custom LAP load before and after the dispatch instruction.

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<sup>3</sup> Load distribution factors for a CLAP specify the percentage of the CLAP load allocated to each load node within the CLAP. They are specified by the Load Aggregator as part of the CLAP registration, and can be updated as part of the Master File update.

<sup>4</sup> The Tier 1 RUC charge rate is computed as the RUC cost divided by the maximum of RUC capacity procured in RUC or underscheduled load; this rate is applied to underscheduled load. Any unrecovered RUC costs left over after Tier 1 cost allocation is recovered pro rata from all CAISO metered demand as Tier 2 RUC. Exports are exempted from RUC charges and are not included in Tier 1 or Tier 2 rate computations.

<sup>5</sup> In rare cases where ISO dispatches the PL to increase consumption in real-time, the instructed consumption increase is exempt from Tier 1 RUC charges.

<sup>6</sup> However, there will be reporting obligations to the extent the Price Sensitive DR is claimed by the LSE as part of its DR/RA obligation.

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### 5.2.1. Bid Submission for Aggregated Participating Load

Aggregated Participating Load and single Participating Load<sup>7</sup> that is modeled at an individual Pnode<sup>8</sup> may participate in the CAISO Day-Ahead market as a non-participating load for energy in pair with a pseudo generator to provide non-spinning reserve.

As stated earlier, the scheduling coordinator will submit two bids for the trading day that includes the following:

1. Non-Participating load bid for the load resource of the PL that may include a Day-Ahead Self-schedule for Energy and/or an energy bid curve up to 10 segments
2. Generating bid to represent the demand reduction portion of the Non-Spinning reserve provided by the Participating Load that may include a bid to provide Non-Spinning Reserve or a submission to Self-Provide Non-Spinning Reserve

The Non-Participating Load bid should include the following information:

- Scheduling Coordinator Identifier code
- Resource ID
- Demand Bid Curve – A staircase curve with up to ten segments, monotonically decreasing, defined by 11 pairs of a MW quantity and price, expressed in \$/MWh, and/or;
- Self Schedule for Energy – expressed in MW
- The location of the load is registered in the master file along with the Resource ID and does not need to be submitted with the bid. The Non-Participating Load bid is submitted in the Day-Ahead Market only.
- The Generator bid submitted to the CAISO represent the Non-Spinning Reserve portion of the Participating Load should include the following information:
  - Scheduling Coordinator Identifier code

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<sup>7</sup> Participating Load that is modeled as an individual p-node can also participate in the CAISO markets under the Pump Storage Hydro Model (PSHM) if it can be modeled in the same ON/OFF state as a pump. Under this option the Generator side of the PSHU would be unavailable. The Pump Storage Hydro Model is described in the BPM for Market Operations in section 2.1.5.1

<sup>8</sup> Pnode stands for Pricing Node and is a single node or a collection of nodes for which Locational Marginal Prices are computed and published.

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- Resource ID
- Non-Spinning Reserve Bid or Non-Spin Self-Provision
  - Non-Spinning Reserve capacity, expressed in MW
  - Non-Spinning Reserve price, expressed as \$/MW (for economic bid only)
  - Operating Reserve Ramp Rate, expressed in MW/Min
  - Contingency Dispatch Indicator = “YES”
  - Energy Bid Curve (Real-Time Market Only) – A staircase curve with up to ten segments, monotonically increasing, defined by 11 pairs of a MW quantity and price, expressed in \$/MWh. Represents offer to curtail Demand associated with the Non-Spinning Reserve.

Additional information will be stored in CAISO’s master file for the pseudo generating resource that is used to represent the Non-Spinning Reserve capacity for the Participating Load. This information is provided to the CAISO by the market participant. The following chart<sup>9</sup> (Table 2) describes how the Generator attributes map to the aggregated Participating Load attributes.

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<sup>9</sup> This chart was taken from the BPM for Market Instruments which is located on the CAISO website at: [http://www.caiso.com/2054/20547f93417f0.doc#\\_Toc210694681](http://www.caiso.com/2054/20547f93417f0.doc#_Toc210694681)

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Table 2 – Mapping of Generator attributes to the aggregated Participating Load attributes

Generator Bid Components And Attributes	Corresponding Aggregated Participating Load Attributes
Start-Up Cost	Demand curtailment cost, e.g. Pump Shut Down Cost (\$/curtailment event)
Start-Up Time	Demand curtailment time
Minimum Load	Must be <b>zero</b> to prevent unit commitment in the DAM
Minimum Load Cost	Set to <b>zero</b> since Minimum Load is set to zero
Maximum Capacity	Certified Non-Spinning Reserve capacity
Slowest/Fastest Operating Reserve Ramp Rate	Certified Non-Spinning Reserve Ramp Rate
Slowest/Fastest Operational Ramp Rate	Slowest/Fastest Demand curtailment rate (Note: Since Generating Units do not have different Ramp Rates for Ramping up and down, the Demand pickup rate is ignored.)
Minimum Run Time	Minimum Demand curtailment time
Minimum Down Time	Must be <b>zero</b> (Note: Minimum Base Load time is not used because doing so would require the IFM/RTM to link the Generator resource with the Non-Participating Load resource.)
Maximum Daily Start-Ups	Maximum number of daily curtailments

Participating Load may be submitted through the SIBR (Scheduling Infrastructure Business Rules) web based user interface or by using CAISO web services which provides the ability for SCs to submit bids in batch mode in XML format using an automated process.

Instructions for submitting bids manually through the SIBR web based user interface are located in the *Scheduling Coordinator User Guide* which is located at the following link: <http://www.caiso.com/1b6a/1b6a729b122d0.pdf>

Instructions for interfacing with the CAISO's web services using XML format is located in the *MRTU Interface Specification for Bidding Services* which is located at the following link: <http://www.caiso.com/203f/203fc01e47e60.pdf>

The CAISO will not dictate the mechanism by which the SC communicates instructions to its Participating Loads. Participating Loads that fail to comply with CAISO Dispatch instructions will be subject to the same financial consequences that apply in the case of any other resource providing A/S or Real-time Imbalance Energy that fails to comply with a CAISO Dispatch instruction.

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## 6. SETTLEMENT AND VALIDATION

### 6.1. Settlement Timeline

The CAISO Settlement process involves Settlements Quality Meter Data (SQMD) collection, Settlement calculations for applicable charges based on scheduled and as operated data, billing calculations summing up charges associated with one or more Bill Period in “invoice ready” format, Invoicing and creating Payment Advices associated with one or more Billing Runs, and Financial Clearing.

Table 3 below provides a summary of the publication dates for the various Settlement Statement types:

**Table 3 – Summary of Settlement Publication Dates**

Settlement Statement Types	Publication Date
Credit Settlement Statement (to minimize credit risks)	T + 7B
Initial Settlement Statement T + 38B	T + 38B
Initial Settlement Statement Reissue	T + 51B, pre-Initial Invoicing
Recalculation Settlement Statement	T + 51B, post-Initial Invoicing
Recalculation Settlement Statement	T + 60B, only for those Trading Days published as Initial Settlement Statement Reissues
Recalculation Settlement Statement T + 76B	T + 76B
Subsequent Recalculation Settlement Statements T > 76B	Settlement Statement Reruns scheduled as needed

Within two to six months after MRTU start-up the CAISO will implement payment acceleration which will reduce the MRTU average cash clearing time from 56 to 17 business days. In addition, the initial Settlement Statement publication timeline will decrease to 7 business days from 38. The final proposal for Payment Acceleration is located at:

<http://www.caiso.com/2094/2094d6796f840.pdf>

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## 6.2. Participating Load Settlements

This section presents the key charges associated with Participating Load Day-ahead energy and ancillary services using a set of simple scenarios. Participating Loads are subject to several of the MRTU settlement charge codes. Among these, the following represent the main charge codes:

- 6011 Day Ahead Energy
- 6200 Day Ahead Non-Spinning Reserve Capacity
- 6224 No Pay Non-Spinning Reserve
- 6294 Non-Spinning Reserve Obligation
- 6296 Non-Spinning Reserve Neutrality
- 6475 Real Time Uninstructed Imbalance Energy
- 6477 Real Time Imbalance Energy Offset
- 6482 Real Time Excess Cost for Instructed Energy

A list of the applicable charge codes for PL is provided in Appendix VIII.

To clarify PL settlement under MRTU Release 1 below we consider some illustrative examples.

## 6.3. Settlement Example

The example in Figure 4 shows a customer with 20MW of load and an aggregated 10 MW of DR capability. The aggregated load is located in a Custom Load Aggregation Point  $k$  ( $CLAP_k$ ) that is within a Local Capacity Area. The 20 MW of load is scheduled and settled at the CLAP level. For Release 1 of the MRTU, this Customer can participate in the Day Ahead Energy, Day Ahead Non-Spinning Reserve Ancillary Service, and Real-Time Imbalance Energy markets (initially limited to Real-time Energy from awarded Non-spinning Reserve capacity).

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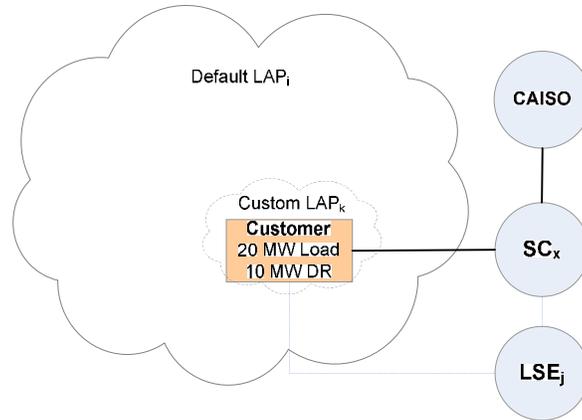


Figure 4 – Sample Scenario – 20MW PL in CLAP<sub>k</sub> represented by SC<sub>x</sub>

### 6.3.1. Example – Day-Ahead Energy

The Customer submits a Participating Load DA Energy bid for Hours Ending 12-22 as shown in Figure 5. According to this bid, the customer has a load of 20 MWs of which 10 MWs is curtailable. The customer is willing to reduce its 20 MW load by 4 MWs if the price is at or above \$50/MWh, and additional 2 MWs at \$60, and \$80 MWh and the remainder 2 MWs if the price is at or above \$100 / MWh. The remaining amount of the load is self scheduled as price taker and may vary during different hours of the day.

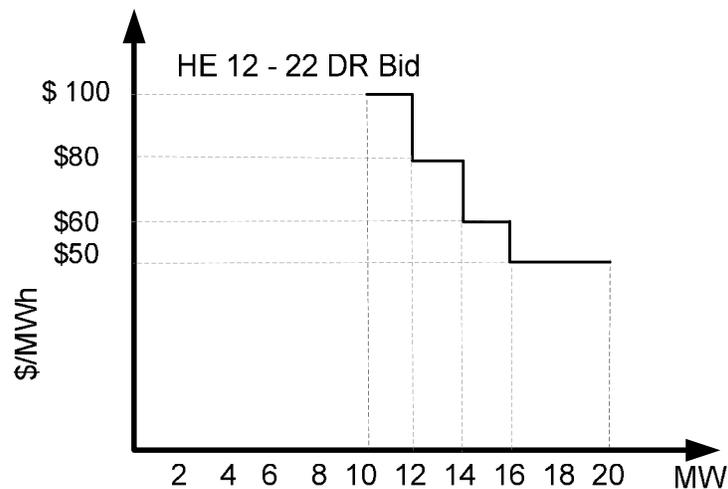
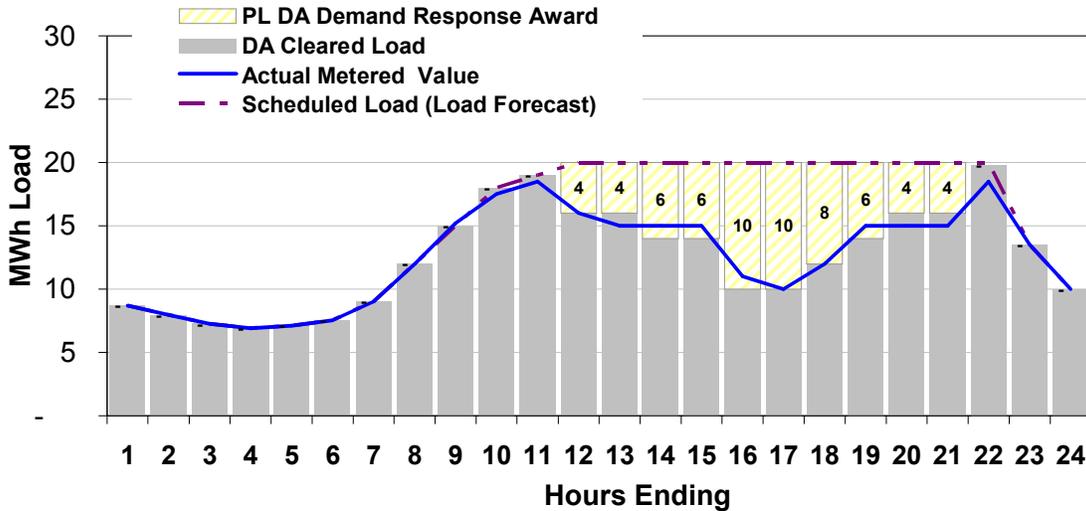


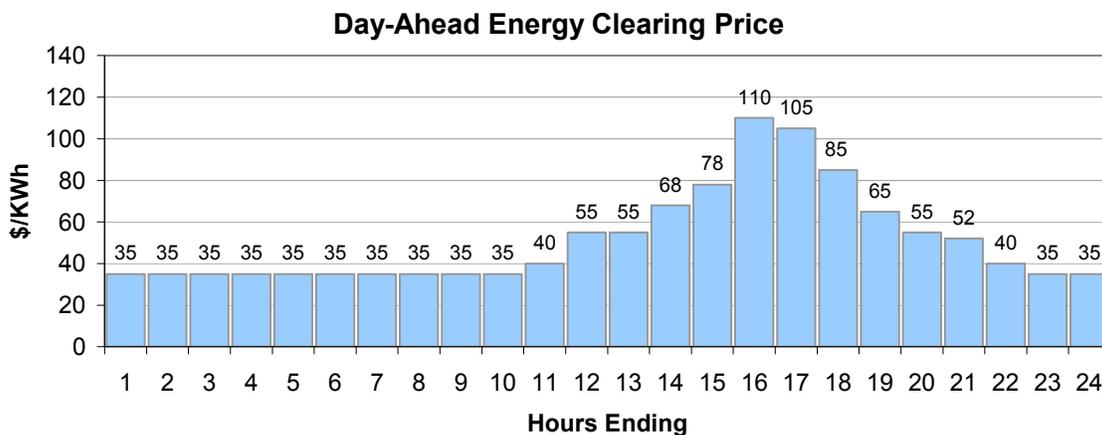
Figure 5 – PL Demand Bid Curve

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The customer schedules its Day-Ahead load at the Custom LAP as shown in Figure 6. The Day-Ahead Energy for the Custom LAP clears at hourly prices shown in Figure 7 resulting in PL Demand Response awards as shown below.



**Figure 6 – Participating Load schedule at a Custom LAP**



**Figure 7 – Custom Lap Clearing Price for Energy**

The customer is charged for the cleared day-ahead energy schedule based on

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the following formulation.

$$PL \text{ DA Energy Settlement Day} = \sum_{T=1,24} CLAP \text{ DA Energy Clearing Price}_T * (\text{Baseline Schedule}_T - \text{Day-Ahead DR Award}_T)$$

In real time the customer load deviates from the day-ahead schedule and the metering value reflecting its load following self curtailment is in Figure 6. Based on this metering value, the customer will receive a real-time energy settlement of:

$$PL \text{ RT Energy Settlement Day} = \sum_{T=1,24} CLAP \text{ RT Energy Clearing Price}_T * (\text{Metered Value}_T - \text{Day Ahead Cleared Schedule}_T)$$

In RUC, the ISO uses the cleared day-ahead PL quantity as the PL forecast.

### 6.3.2. Example – Day-Ahead Ancillary Service

The Customer also submits a non-spinning reserve bid of 2 MWs at \$4/MW/h for HE 19-22. The DA Non-Spin Clearing price at the PL location is \$5/MW/h for hours 19-20 and \$3/MW/h for hours 21-22; accordingly, the 4 MW Non-spin bid clears for hours 19-20.

The Customer receives a settlement of:

$$4 (\$/\text{MW}/\text{h}) * 2 (\text{MW}) * 2 (\text{hrs}) = \$16 \text{ for HE 19-20 non-spinning reserve}$$

### 6.3.3. Example – Real-Time Imbalance Energy

Before the close of the real-time market, for hours ending 19-20, the SC submits a real-time Energy bid for 2 MW of generation from the pseudo-generator associated with the PL to cover the awarded Non-spinning Reserve. The pseudo-generator Energy bid is \$55/MWh for the first MW and \$75/MWh for the second MW.

Assume the real-time CLAP price is \$60/MWh in hours ending 12-19 and \$50/MWh in hours ending 20-22

**Scenario 1:** There is no contingency. Since the PL Non-spin is contingency only, even though during the hours 18-20 the real-time price is above the first MW block of the pseudo generator Energy bid of \$55/MWh, this energy is not

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dispatched.

The real-time settlement is based on the deviation of the real-time meter from the day-ahead schedule. The settlement is simply (meter-DA Schedule)\*RT price. A charge to SC if positive (+); a credit to SC if negative (-).

Consider 3 cases:

- Case 1: meter > DA schedule.  
 For example for hour 19  
 $RT\ Settlement = (meter: 15MWh - Schedule: 14MWh) * \$55/MWh = +\$55$
- Case 2: meter = DA schedule.  
 For example for hour 18 RT Settlement = 0
- Case 3; meter < DA schedule  
 For example for hour 20  
 $RT\ Settlement = (meter: 15MWh - Schedule: 16MWh) * \$55/MWh = -\$55$

Scenario 2: There is a contingency during hours 18-20 and the Energy from Non-spin is released into the real-time imbalance Energy bid stack<sup>10</sup>.

During the hours 18-20 the real-time price is above the first MW block of the pseudo generator Energy bid of \$55/MWh, and this energy is thus dispatched, i.e., the PL is instructed to curtail by 1 MW during the contingency.

Consider the following cases:

- Case 1: The DA schedule is 15 MW (i.e., 5 MW of PL curtailed), and the actual telemetry before Non-spin deployment is 15 MW. Telemetry indicates that the resource reduced consumption by 1 MW as instructed for Energy deployment from Non-spin. The resource keeps its DA Non-spin payment and is paid for real-time Energy based on the difference between actual meter (settlement meter) and DA schedule with no need to distinguish the deviation because of uninstructed over or under consumption or energy deployed from Non-spin.

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<sup>10</sup> The assumption here is that there is a contingency without scarcity. Thus the Non-spinning Reserve Energy bid prices are included in the real-time stack as bid rather than at the bid cap.

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Case 2: The DA schedule is 15 MW (i.e., 5 MW of PL curtailed), and the actual telemetry before Non-spin deployment is 16 MW. Telemetry indicates that the resource reduced consumption by 1 MW (to 15 MW) when instructed for 1 MW of Energy deployment from Non-spin. The resource keeps its DA Non-spin payment and is paid for real-time Energy based on the difference between actual meter (settlement meter) and DA schedule with no need to distinguish the deviation because of uninstructed over or under consumption or energy deployed from Non-spin.

Case 3: The DA schedule is 15 MW (i.e., 5 MW of PL curtailed), and the actual telemetry before Non-spin deployment is 14 MW. Since the resource is already at 14 MW (1 MW below DA schedule), when instructed to produce 1 MW of Energy from Non-spin, it does not move. Thus, telemetry indicates that the resource did not reduce consumption by 1 MW (although it was already under-consuming). The fact that the resource did not move subjects it to No-pay for AS. It is paid for real-time Energy based on the difference between actual meter (settlement meter) and DA schedule with no Energy penalty since it has adequate dispatchable range for 2 MW of Energy.

Case 4: The DA schedule is 12 MW (i.e., 8 MW of PL curtailed and the remaining 2 MW for Non-spin), and the actual telemetry before Non-spin deployment is 11 MW. The resource is instructed to curtail 1 MW due to contingency. Since the resource is already at 11 MW (1 MW below DA schedule), when instructed to produce 1 MW of Energy from Non-spin, it does not move. Thus, telemetry indicates that the resource did not reduce consumption by 1 MW (although it was already under-consuming). The fact that the resource did not move subjects it to No-pay for AS. Moreover, since at 11 MW consumption it had only 1 MW of curtailable load (from 11 to 10), It is subject an additional no Pay for the other MW of Non-spin. Thus the No-pay charge applies to the 2 MWs of AS it sold DAM. It is paid for real-time Energy based on the difference between actual meter (settlement meter) and DA schedule; however, there is an uninstructed Energy no-pay. That is, when the settlement quality meter reads 11 MW, since the resource was supposed to be operating at 12 MW to be able to provide the 2 MW Non-spin it had sold in DAM, the uninstructed reduced consumption from 12 MW to 11 MW is not paid for (as “unavailable energy” penalty).

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## 7. REFERENCES

CAISO MRTU Tariff

Participating Load Agreement

Business Practice Manual (BPM) for Definitions and Acronyms

Business Practice Manual (BPM) for Market Instruments

Business Practice Manual (BPM) for Market Operations

Business Practice Manual (BPM) for Metering

Business Practice Manual (BPM) for Settlements and Billing

Meter Service Agreement for CAISO Metered Entities

Meter Service Agreement for Scheduling Coordinators

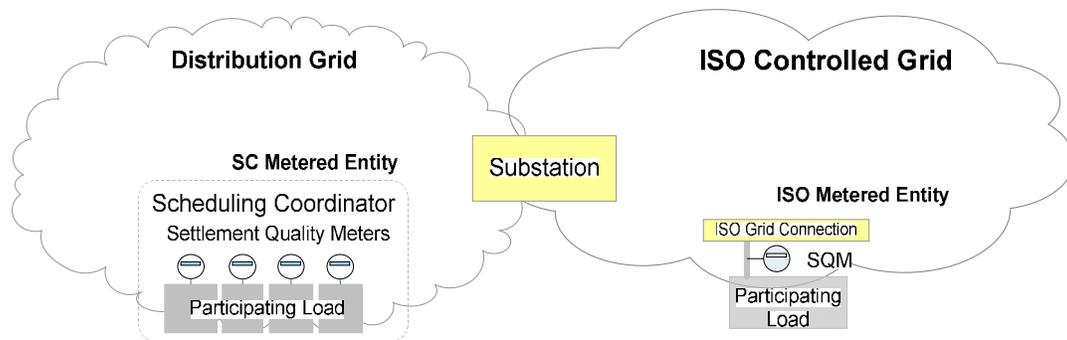
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## 1. APPENDIX I - TECHNICAL SPECIFICATIONS – METERING REQUIREMENTS

Participating Loads can participate in the CAISO markets as either

- (a) A CAISO Metered Entity, or
- (b) A Scheduling Coordinator (SC) Metered Entity.

A Participating Load is a CAISO Metered Entity if it represents a Load that is directly connected to the CAISO Controlled Grid or Load or Loads that are otherwise required to provide Meter Data to the CAISO through the CAISO certified metering directly polled by the CAISO. Given the limited number of such loads, most Participating Load applications will be SC Metered Entities as illustrated in Figure 8.



**Figure 8 – Conceptual Illustration of a CAISO Metered Entity and a SC Metered Entity**

The MRTU Business Practice Manual for Metering in reference to CAISO Tariff Section 10.2.9.2 states that subject to any exemption granted by CAISO, CAISO Metered Entities and Scheduling Coordinator Metered Entities must record Meter Data in Standard Time as follows:

- At five minute intervals for Loads and Generating Units providing Ancillary Services and/or Imbalance Energy
- At one hour intervals for other Meter Data

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For the MRTU Release 1, the 5 minute interval reading needed for ancillary services may be constructed by dividing a 15-minute interval reading into three equal values.

### **1.1. CAISO Metered Entity**

Participating Loads that are CAISO Metered Entities are required to obtain, install, and have inspected CAISO Certified Meters as outlined in the CAISO Metering Protocol. CAISO Certified Meters are listed on the CAISO Home Page. The CAISO may allow a temporary exemption for existing revenue quality interval meters that meet the requirements of the ANSI C12.20-1997 meter standards, and can generate all required Operational Data and communicate with the CAISO's Operational Meter Analysis & Reporting system (OMAR) through the ECN or through OMAR Online.

Each CAISO Metered Entity must provide Meter Data to RMDAPS by direct interface between RMDAPS and its revenue quality meter or compatible Meter Data Server. CAISO Metered Entities will use ECN to interface directly with RMDAPS.

Meter Data will be collected regularly by RMDAPS in accordance with the frequency for collection determined by the CAISO. The ISO may also collect Meter Data on demand.

ISO Metered Entities or SCs representing ISO Metered Entities must ensure that the Meter Data provided to RMDAPS from a Compatible Meter Data Server identifies the relevant ISO Metered Entity and is raw, unedited and unaggregated Meter Data in kWh and kVarh values. The ISO will be responsible for the validation, editing and estimation of that Meter Data in order to produce Settlement Quality Meter Data.

### **1.2. SC Metered Entity**

Scheduling Coordinators shall be responsible for a) the collection of Meter Data for the Scheduling Coordinator Metered Entities it represents; b) the provision of Settlement Quality Meter Data (SQMD) to the CAISO; and c) ensuring that the SQMD supplied to the CAISO meets the requirements of Section 10 of the MRTU Tariff.

The SC is responsible for submitting SQMD for the Loads of Participating Loads that it represents. The SC must submit the required meter data with respect to the meters for all the SC Metered Entities it represents as either individual loads and/or as aggregated loads as are PL resources are represented to the CAISO in Schedule

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1 of the Participating Load Agreement. The SC shall provide the CAISO with the SQMD no later than the day specified in Section 10.3.6 of MRTU Metering Tariff.

SQMD for Scheduling Coordinator Metered Entities shall be either:

- 1) an accurate measure of the actual consumption of Energy by each Scheduling Coordinator Metered Entity in each Settlement Period;
- 2) for Scheduling Coordinator Metered Entities connected to a UDC Distribution System and meeting that Distribution System's requirement for load profiling eligibility, a profile of that consumption derived directly from an accurate cumulative measure of the actual consumption of Energy over a known period of time and an allocation of that consumption to Settlement Periods using the applicable Approved Load Profile; or
- 3) an accurate calculation by the Scheduling Coordinator representing entities operating pursuant to Existing Contracts.

Participating Loads from SC Metered Entities may use any revenue quality interval meter that meets the standards of and is approved by the CPUC or a Local Regulatory Authority, and that meets all other applicable CAISO requirements including:

- Interval meter must record at no less than 15-minute intervals if the Participating Load is providing ancillary services and/or real-time imbalance energy
- SCs must submit their (SQMD) on a 10 or 60-minute interval basis.
- SCs will be responsible for providing the CAISO with SQMD for all Loads that they represent at the same granularity as scheduled.
- Individual contributor Load data that comprises aggregated SQMD must be readily available to the CAISO for audit and review.
- Aggregated Loads will be treated like any other SC Metered Entity for purposes of financial settlements.
- SCs must ensure that validation, editing, and estimation are completed, and SQMD is provided to the CAISO within the required schedule. SCs must also use the established mechanisms for data exchange, and must comply with all other applicable requirements in the CAISO Tariff and CAISO Metering Protocol.

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### **1.3. Access to Meter Data**

#### **1.3.1. Participating Loads as CAISO Metered Entities**

For CAISO metered entities, the CAISO, in accordance with the CAISO Tariff and CAISO Metering Protocol, will have complete access to the Meter Data of CAISO Metered Entities recorded by the CAISO Certified Meter.

Individual Loads of Participating Loads must comply with the security requirements as presented in CAISO Metering Protocol Section 9.

#### **1.3.2. Participating Loads as SC Metered Entities**

Scheduling Coordinators must submit Settlement Quality Meter Data to the CAISO for those Scheduling Coordinator Metered Entities that they represent. Each Scheduling Coordinator must provide the CAISO with connectivity to the Scheduling Coordinator's systems with which the CAISO will interface to obtain or prove Settlement Quality Meter Data.

The Participating Load and the SC shall ensure that the CAISO will have access to the entire metering facilities of the individual SC Metered Entity as well as the meter data aggregation and meter data management facilities that it represents in order to inspect, test, or otherwise audit those metering facilities.

The SC, upon request by the CAISO, must provide CAISO the meter reads for the individual SC Metered Entities represented and any substitution routines used in the aggregated Meter Data produced by the SC.

The SC shall apply the security and validation procedures prescribed by the California Public Utilities Commission (CPUC) or other relevant Local Regulatory Authority to the meter data of the SC Metered Entities that it represents. If the relevant Local Regulatory Authority has not prescribed any such procedures, the SC shall promptly notify the CAISO and shall establish security and validation

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procedures satisfactory to the CAISO.<sup>11</sup>

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<sup>11</sup> See procedures set forth in the CAISO Metering Protocol found at:  
<http://www.caiso.com/docs/2005/10/01/200510011606575762.html>

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## **2. APPENDIX II - TECHNICAL SPECIFICATIONS – TELEMETRY REQUIREMENTS**

### **2.1. Telemetry Requirements**

Participating Loads that provide Ancillary Services must provide CAISO EMS real-time Telemetry. For this purpose, Participating Loads shall use a CAISO approved energy Data Acquisition and Concentration (eDAC) device or system.

Participating Loads may employ a Data Aggregation system to collect data from distributed Participating Load components for transmission to the CAISO EMS by eDAC. The data can be collected by the Data Aggregation system through a direct and persistent connection like a leased line (not a dial-up). The CAISO EMS Telemetry requirements for the Aggregated Load must be met, in the same manner as for individual Loads, through the entire data transfer process, from the Load to eDAC to the to the CAISO Energy Management System.

### **2.2. Data Communications Protocol**

eDAC shall communicate data with the CAISO EMS using DNP 3.0 protocol.

For the DNP 3.0 communications with the CAISO EMS, eDAC can use the CAISO Energy Communications Network (ECN), or a secure link over Internet (i.e. uses PKI/SSL security), as shown in Figure 3.

Participating Loads' systems must comply with CAISO Security Standards as referred to in Appendix III.

Participating Loads are responsible for dedicated remote site connectivity to the Internet via their ISP using T-1, 56k BRI, ISDN, HDSL, DSL, ADSL, Frame Relay (DSU/CSU) or other standard connections provided by Internet Service Providers.

### **2.3. Scan Rates**

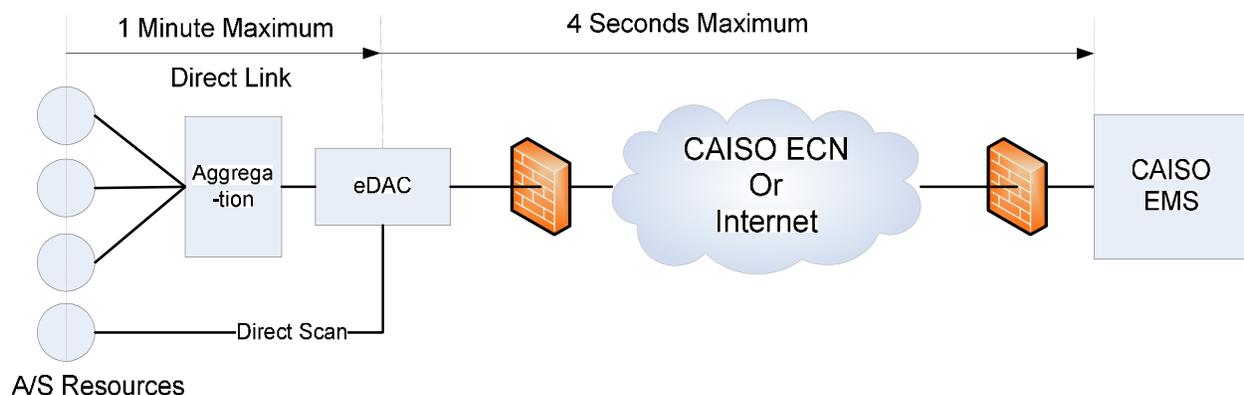
For Ancillary Services, CAISO EMS Telemetry must be available on a four-second Scan Rate from the eDAC to the CAISO EMS.

If a Data Aggregation function is utilized, each meter behind the server must be polled no less frequently than once per minute. This is illustrated in Figure 9.

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The aggregated Demand shall be updated after each individual meter is polled.

Subject to prior CAISO approval, the CAISO EMS Telemetry requirement can also be met using a device other than the revenue meter, in which case the revenue meter would not have to be capable of providing instantaneous data. All Load resources must have the capability to provide required data simultaneously to the CAISO Control Center facilities located in Folsom and Alhambra.



**Figure 9 - Telemetry timing requirements for Participating Load – Ancillary Services market**

### 2.3.1. Load Visibility

Participating Loads bidding Non-Spinning Reserve must provide active CAISO EMS Telemetry on a continuous basis. Non-Spinning Reserve bids may be deemed invalid should loss of CAISO EMS Telemetry occur during the time that a Load is called upon to participate in the CAISO’s Non-Spinning Reserve market. Participating Loads will not be allowed to bid into the CAISO’s Non-Spinning Reserve markets during the time the CAISO EMS Telemetry is out of service, even if meter data is accurate. The Scheduling Coordinator must notify the CAISO through the SLIC (Scheduling Logging for the ISO of California) system should loss of CAISO EMS Telemetry occur.

### 2.4. Telemetry Data Points List

This section describes the minimum requirements for real-time telemetry for Participating Loads for participation in the CAISO ancillary service market. They are

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the minimum standards that will allow the CAISO to manage effectively the reliability of the electrical system. At any time, the CAISO may require additional values to be telemetered to meet real-time requirements.

The CAISO may allow some exemptions to these standards for Participating Loads with relatively small Loads where the CAISO deems this is acceptable. Such exemptions will be handled on a case-by-case basis.

Table 4 provides telemetry point list requirements for loads participating in the ancillary service market.

**Table 4 Telemetry Point List Summary**

SC Metered Entity		ISO Metered Entity			
Data Point	Units	Load ≤ 10MW		Load > 10 MW	
		Data Point	Units	Data Point	Units
Aggregated Power	MW	POD Real Power	MW	POD Real Power	MW
		POD Reactive Power	Mvar	POD Reactive Power	Mvar
Voltage Level	kV	Bus Voltage	kV	Bus Voltage	kV
Connectivity Status		Connectivity Status		Connectivity Status	
eDAC Status		eDAC Status		eDAC Status	
				Gross Real Power	MW
				Gross Reactive Power	Mvar
				Switchyard Line Real Power	MW
				Switchyard Line Reactive Power	Mvar
				Switchyard Bus Voltage	Kv
				Switchyard Transformer Real Power	MW
				Switchyard Transformer Reactive Power	Mvar
				Switchyard Load Breaker Status	Open/ Close
				Switchyard Line Breaker Status	Open/ Close
				Switchyard Transformer Breaker Status	Open/ Close

The telemetry requirements for Participating Loads are established based on the type of service bid into the CAISO's markets, the size of the Loads of the Participating Load, and the manner in which those Loads connect to the grid in the CAISO Control Area. The requirements here apply to individual and Aggregated Loads participating in the CAISO Non-Spinning Reserve markets.

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### 2.4.1. Telemetry Requirements for a SC Metered Entity

For distributed Aggregated Loads, Aggregated Loads at a single site, and individual Loads represented as a SC Metered Entity, the Participating Load is required to provide telemetry for:

- **Aggregated Power** - This telemetry provides the current value of the Participating Loads power consumption in MWs. It is assumed that the Participating Load has provided CAISO with hourly upper and lower limits of it load available for participation in the Ancillary Service market.
- **Voltage at the load connection to the distribution grid;**
- **Load Control Connectivity Status** - Load Control Connectivity Status will provide status indication of the load management or control system responsible for adjusting the load in response to the CAISO ancillary service dispatch signal.
- **eDAC Status** – eDAC heartbeat status signal will provide the indication that eDAC device/system is in a sound operating condition and is scanning and exchanging data as required.

### 2.4.2. Telemetry Requirements for a CAISO Metered Entities

For distributed Aggregated Loads, Aggregated Loads at a single site, and individual Loads represented as a CAISO Metered Entity, and where the individual or Aggregated Load has a total Demand of less than <10 MW, the Participating Load is required to provide :

- **Point of Delivery MW;**
- **Point of Delivery Mvar;**
- **Bus Voltage;**
- **Connectivity Status;** and
- **eDAC Status.**

The CAISO may exercise its reasonable discretion with regard to Mvar and kV telemetry requirements where the data is not needed to support CAISO network modeling or other CAISO Controlled Grid operational requirements.

For individual and Aggregated Loads at a single site (e.g., pumping plant, large industrial complex, etc.) and for distributed Aggregated Loads, where the individual or aggregated load has a demand >10 MWs, the Participating Load is required to provide:

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- **Point of Delivery MW;**
- **Point of Delivery Mvar;**
- **Bus Voltage;**
- **Gross MW;**
- **Gross Mvar;**
- **Bus Voltage;**
- **Connectivity Status** data for each individual Load or individual component of the aggregated Load to the CAISO by means of CAISO EMS Telemetry, as those data points are described below.
- **eDAC Status.**

The CAISO may exercise its reasonable discretion with regard to these telemetry requirements for the individual Loads within an aggregate where the data granularity is not needed to support CAISO network modeling requirements.

For individual and Aggregated Loads at a single site (e.g., pumping plant, large industrial complex, etc.) connected to the high voltage transmission system (60 kV or above) where the Participating Load owns the associated transmission switchyard facilities, the Participating Load is required to provide the transmission switchyard line and transformer MW and Mvar data, the switchyard bus voltage, and the status of all switchyard switching devices, as those data points are described below, in addition to the data points specified above. The CAISO may exercise its reasonable discretion with regard to these telemetry requirements for the individual telemetry points where the data granularity is not needed to support CAISO network modeling requirements.

- **Line Real Power – Per Line**
- **Line Reactive Power – Per Line**
- **Bus Voltage - Per Connected Bus**
- **Transformer Real Power - Per Connected Transformer**
- **Transformer Reactive Power- Per Connected Transformer**
- **Load Breaker Status**
- **Line Breaker Status**
- **Transformer Breaker Status**

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- **Other breaker status may be required (bus, transformer, bank, etc.).**

### **2.4.3. Point List Descriptions**

#### **2.4.3.1. Participating Load Analog Values**

##### **Point of Delivery Real Power (POD MW)**

**Definition:** This quantity is defined as the total Load (i.e. pump, motor, process Load, etc.) MW consumption at the point of delivery with the CAISO Controlled Grid.

**Purpose:** Point of Delivery MW is used to determine the CAISO Control Area's non-conforming Load component and may be used as the "equivalent Load" take-out real power measurement value in the network model.

**Methods of providing this value:** This value can be provided from the revenue meter if equipped to provide instantaneous measurement values, or from instrument devices at the site using accurate transducers. It must be a "real time" instantaneous value and not "averaged" over time.

##### **Point of Delivery Reactive Power (POD Mvar)**

**Definition:** This quantity is defined as the total Load (i.e. pump, motor, process Load, etc.) Mvar consumption at the point of delivery with the CAISO Controlled Grid.

**Purpose:** Point of Delivery Mvars is used to determine the Control Area's non-conforming Load power factor and may be used as the "equivalent Load" take-out reactive power measurement in the network model.

**Methods of providing this value:** This value can be provided from the revenue meter if equipped to provide instantaneous measurement values, or from instrument devices at the site using accurate transducers. It must be a "real time" instantaneous value and not "averaged" over time.

##### **Gross Real Power (Gross MW)**

**Definition:** This quantity is defined as the Load (i.e. pump, motor, process Load, etc.) MW consumption as measured at the terminals of the Load device.

**Purpose:** Gross MW is used to identify the discrete Load device's real power consumption and is used as a measurement in the network model. This value is used in conjunction with the connectivity value to confirm connection of the Load device to the grid.

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Methods of providing this value: This value can be provided from a revenue meter connected at the terminals of the Load device if equipped to provide instantaneous measurement values, or from instrument devices at the site using accurate transducers. It must be a "real time" instantaneous value and not "averaged" over time.

### **Gross Reactive Power (Gross Mvar)**

Definition: This quantity is defined as the Load (i.e. pump, motor, process Load, etc.) Mvar consumption as measured at the terminals of the Load device.

Purpose: Gross Mvar is used to identify the discrete Load device's reactive power consumption or production and to establish the Load device's power factor. It is used as a measurement in the network model.

Methods of providing this value: This value can be provided from a revenue meter connected at the terminals of the Load device if equipped to provide instantaneous measurement values, or from instrument devices at the site using accurate transducers. It must be a "real time" instantaneous value and not "averaged" over time.

### **Bus Voltage (kV)**

Definition: This quantity is defined as the operating voltage associated with the Participating Load. For Loads at a single site which are only required to be telemetered as an aggregate quantity, the bus voltage shall be the voltage as measured at the point of delivery with the CAISO Controlled Grid. For Loads at a single site which are required to provide telemetered values for the individual Load components, the bus voltage shall be the voltage as measured at the terminals of the Load device. It must be a "real time" instantaneous value presented as a phase-to-phase voltage quantity.

Purpose: The CAISO uses bus voltage to determine each Participating Load's impact on system voltage as well as an indication of an individual Load component's connectivity. Bus voltage is critical as a measurement in the network model. This value is also useful in identifying voltage control issues, Mvar circulation problems, overall system voltage profiles, etc.

Methods of providing this value: This value can be provided from a revenue meter connected at the appropriate point if equipped to provide instantaneous measurement values, or from instrument devices at the appropriate point using accurate transducers.

#### **2.4.3.2. Participating Load Digital Values**

### **Connectivity Status (UCON)**

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**Definition:** The connectivity status represents the connection status to the grid of the Loads of the Participating Load (i.e. pump, motor, process Load, etc.).

**Purpose:** The UCON value establishes the Participating Load’s compliance with dispatch instructions and it provides a measurement in the network model to identify connection of the Load to the system.

**Methods of providing this value:** This value is calculated from the actual breaker status points of each Load of a Participating Load plus Load MWs or voltage greater than 1% (or other threshold determined by the CAISO engineer). For aggregated Loads, this value is calculated from the breaker status and Load MWs for the individual Load components comprising the aggregate Load.

### **2.4.3.3. Switchyard Values**

#### **Switchyard Line and Transformer MW and Mvar**

**Definition:** The MW and Mvar flow quantities for the transmission lines and transformers in or connected to the switchyard.

**Purpose:** These values allow for proper network model measurements and assessment of network topology and assist in troubleshooting data quality problems (i.e. sum of flows into and out of a bus). The MW and Mvar values are essential for modeling system restoration scenarios.

**Methods of providing this value:** These values are obtained through typical transducer outputs from the line or transformer CT and PT devices or other such instrument devices connected to the line or transformer.

#### **Switchyard Bus Voltage**

**Definition:** This value is the high side voltage at the Participating Load’s switchyard bus.

**Purpose:** The switchyard bus voltage is used as a measurement in the network model. It identifies voltage concerns and/or system-imposed limitations on reactive support. The CAISO also uses it in identifying data quality issues such as “bad” PT readings.

**Methods of providing this value:** This value is provided from transducers or other instrument devices connected to the bus PT devices.

#### **Switchyard Status**

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Definition:	The breaker and/or Motor Operated Disconnect (MOD) status for each Load, line, bus, and transformer breaker in the Participating Load's switchyard.
Purpose:	These values are used in determining network topology in the network model. They are needed for system restoration and outage information. In some arrangements, they may be the basis for forming unit connectivity.
Methods of providing this value:	These values are direct measurements from switchyard devices and may be obtained through existing RTUs owned by the IOU and located in the switchyard. The breaker status for each Load of the Participating Load must be communicated to the CAISO through an CAISO approved eDAC. If the Participating Load owns other switchyard devices and existing IOU telemetry to the CAISO is available for these devices (i.e. through an RTU), then this is an acceptable means of obtaining these values. However, the CAISO Data Acquisition Engineer must agree with the specific methods. The Participating Load is ultimately responsible to ensure these values are provided at all times.

#### **2.4.4. Telemetry Data Availability & Maintenance**

While the CAISO will provide and maintain the CAISO Energy Management System, the Participating Loads, the Load Aggregators, and/or their Scheduling Coordinators (SCs) will be fully responsible for all other telemetering equipment, communications circuits, systems, and hardware required to provide Operational Data to the CAISO Energy Management System.

In terms of performance, the SC will be responsible for assuring 1) the functionality of its entire telemetering system and 2) the integrity and accuracy of data telemetered to the CAISO. To enforce this requirement, SCs must comply with CAISO auditing requirements, and the CAISO will have auditing rights similar to those applicable to SC metering systems.

##### **2.4.4.1. Reliability Requirements**

The Participating Load shall be responsible for maintaining the availability of the telemetry device, eDAC, and all participating load interface systems. The Participating Load shall also be responsible for maintaining telemetry device communications access to the ECN and/or the Internet.

The telemetry device (including all parts thereof) is and will at all times remain the property of the Participating Load. Risk of loss, theft or damage of the

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telemetry device will be the responsibility of the Participating Load.

A Participating Load will be solely responsible for the cost to prepare and maintain the site at which a telemetry device will be installed. The Participating Load will also be solely responsible for the cost of engineering, installation, operation, and maintenance of that telemetry device and all other activities associated with the installation, operation, and maintenance of that telemetry device. The CAISO will provide support as described herein to ensure that the telemetry device properly interfaces with the CAISO EMS.

The local communications access circuit generally represents the highest risk to participating load interface availability. The CAISO's minimum circuit requirement is a single dedicated Private Line, Frame Relay or ISDN ECN access circuit or a single Private Line, Frame Relay, DSL, or ISDN Internet access circuit. Communications provider service level agreements establish an availability target of 99.0 percent for a single ECN access circuit. Implementation of a second ECN access circuit (optional) increases the availability target to 99.9 percent.

It is the Participating Load's responsibility to procure Internet services through a reliable provider. The CAISO recommends that Participating Loads procure services through a Tier 1 Internet Service Provider (ISP).

#### **2.4.4.2. Availability Requirements**

A Participating Load will be solely responsible for all costs and other consequences associated with the unavailability of the telemetry device and/or the inability of the telemetry device to communicate with the CAISO, including any financial consequences pursuant to the terms of the CAISO Tariff.

If any operational function of the telemetry device is unavailable for any reason other than a failure of (i) equipment indicated by the Operations and Maintenance Boundaries diagram as falling under the Operational and Maintenance responsibility of the CAISO or the communications provider in the case where the Participating Load has selected the ECN for connectivity to the CAISO, or (ii) equipment indicated by the Operations and Maintenance Boundaries diagram as falling under the Operational and Maintenance responsibility of the CAISO in the case where the Participating Load has selected the Internet for connectivity to the CAISO, the Participating Load will not be permitted to participate in the CAISO market affected by the telemetry device outage.

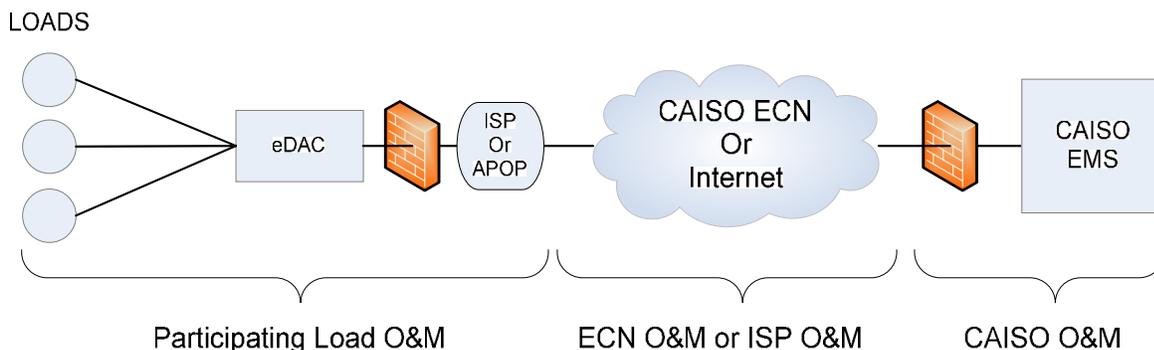
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### 2.4.4.3. Operation and Maintenance

The Participating Load is responsible for all activities associated with the operation and maintenance of the telemetry capabilities. The purpose of this section is to describe the notification and interface requirements for the following activities.

- Software and Firmware Upgrades
- Data Base Revisions
- Routine Testing/Maintenance

Figure 10 illustrates the boundaries of responsibility for maintenance of the system from the CAISO to the Participating Load. Sections of the system are illustrated with responsibility assigned to either the CAISO or the Participating Load. The CAISO is responsible for the maintenance of the CAISO systems such as the EMS and the SDA equipment interfacing to the ECN or the Internet. The communications provider has responsibility for maintaining the ECN through contract to the CAISO. The CAISO as the organization securing the services of the communications provider to provide the ECN has accountability for the maintenance of the ECN. If the Internet is chosen as the method of connectivity then the Internet Service Provider (ISP) has the responsibility for operating and maintaining the ISP network. The Participating Load as the organization securing the services of the ISP has accountability for the ISP service as well. Finally, the Participating Load has the responsibility of operating and maintaining the meters, Data Aggregation, and the eDAC Telemetry Field Device.



**Figure 10 - Operation and Maintenance Boundaries**

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### 3. APPENDIX III - CAISO SECURITY POLICY

Security requirements will apply to the transfer of data to the CAISO Energy Management System. Security requires support for X.509v3 Digital Certificates and SSL for authentication and encryption between the CAISO Energy Management System and the eDAC Device. The CAISO maintains its own certificate authority and will provide digital certificates. The CAISO recommends that Participating Loads provide firewalls between their web providers and application servers.

The following subsections provide security requirements for the Participating Load telemetry option.

#### 3.1. Internet Connection (Telemetry and/or Control)

Assumptions:

- Using the world wide web, internet
- Internet is untrusted

Requirements:

- Must use an CAISO approved eDAC device

Considerations:

- Internet connectivity is cheap and easily available
- Secure field devices have a higher cost
- No guaranteed SLA

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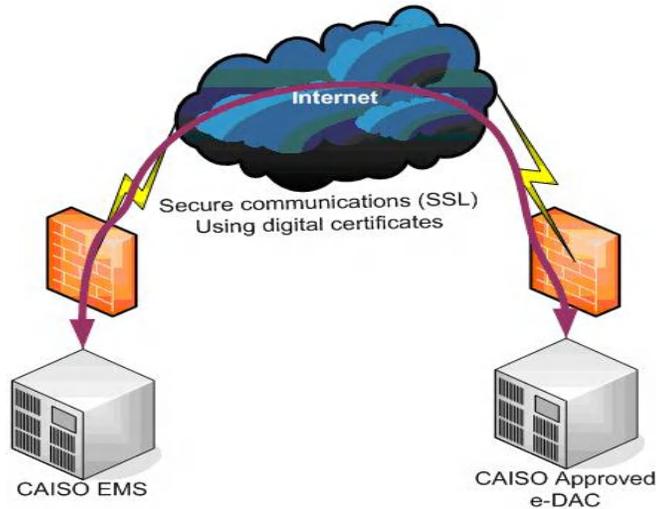


Figure 11 - Internet Connection (Telemetry and/or Control)

### 3.2. ECN Connection (Telemetry Only)

#### Assumptions

- Only collecting telemetry information

#### Requirements

- Must use CAISO approved device (secure or unsecure)

#### Considerations

- ECN connectivity is between \$250-400 a month and a 45 day provisioning window
- Secure field devices have a higher cost
- Guaranteed 99.9 SLA

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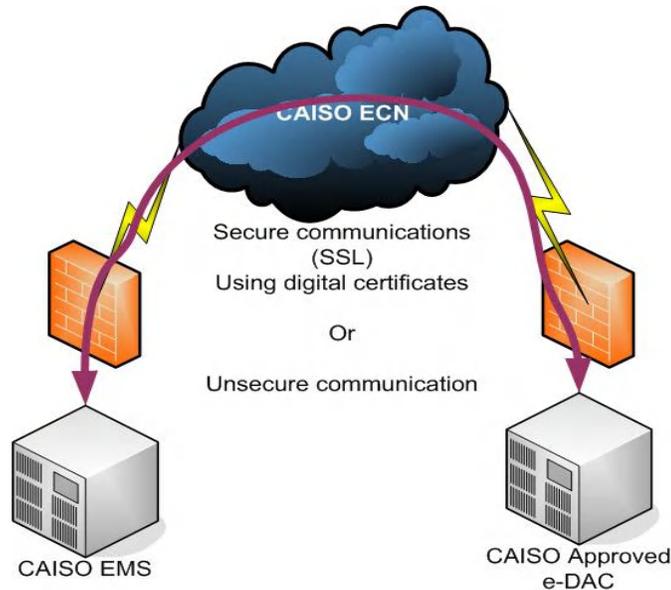


Figure 12 - ECN Connection (Telemetry Only)

### 3.3. ECN Connection (Telemetry and Control)

#### Assumptions

- Collecting telemetry information and sending control instructions

#### Requirements

- Must use an CAISO approved e-DAC device

#### Considerations

- ECN connectivity is between \$250-400 a month and a 45 day provisioning window
- Secure field devices have a higher cost
- Guaranteed 99.9 SLA

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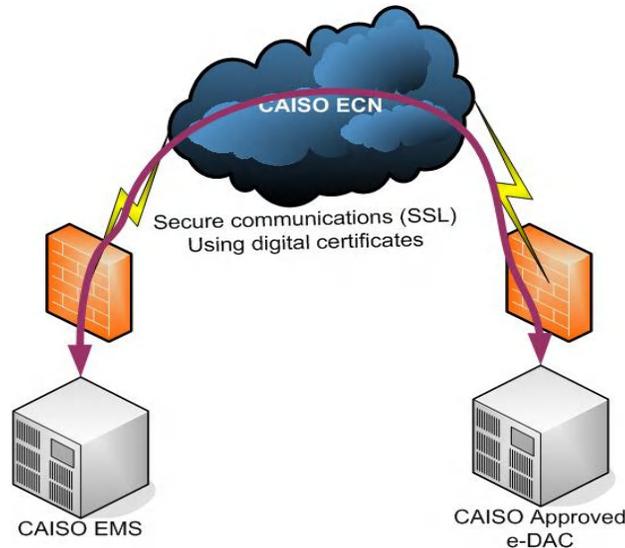


Figure 13 - ECN Connection (Telemetry and Control)

### 3.4. Participating Load Reference Security Documents

CAISO has information security documents relevant to each project. This Participating Load Users Manual is inclusive of the following security documents (please select link to access the applicable documents):

1. CAISO Information Security Requirements for the Energy Communication Network (ECN):

<http://www.caiso.com/docs/2003/10/13/200310131141511969.pdf>

2. Energy Communication Network Connectivity Security Requirements & Agreement for Data Processing Gateway Devices

<http://www.caiso.com/docs/2002/03/07/2002030708491816784.pdf>

3. Public Key Infrastructure Integration Requirements and Specifications for Data Processing Gateways

<http://www.caiso.com/docs/2003/02/18/200302181600117192.html>

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## 4. APPENDIX IV – PARTICIPATING LOAD ACCEPTANCE TEST (PLAT)



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## 5. APPENDIX V – PARTICIPATING LOAD IMPLEMENTATION PLAN

The Participating Load Implementation Plan shall be submitted and approved by the CAISO prior to participation as a Participating Load in the CAISO’s markets. The implementation plan must identify and include the following:

- The plan shall describe roles and responsibilities of end-use customers, the Load Aggregator, UDC and SC, as appropriate, including detailed contact information for the different parties involved.
- The plan shall indicate if the PL resource will be counted as a Resource Adequacy Resource and which LSE will be counting this resource, including the RA capacity quantity to be counted.
- The plan shall summarize details of the demand resource being developed, including the total peak load of the single or aggregate PL resource, the peak-load reduction capability of the PL resource, the end-use types to be curtailed, the PL resources geographic location, the UDC service territory, the PL resources operating characteristics and limitations, availability, and sensitivities, such as weather, day-types, etc.
- The plan shall describe metering data and metering data interfaces and the process for submitting Settlement Quality Meter Data (SQMD) to the CAISO.
- For Participating Loads providing Ancillary Services, the plan shall detail how the eDAC device or system will satisfy the CAISO’s telemetry requirements so that the CAISO has visibility to the Participating Load when providing ancillary services.
- The plan shall indicate how the resource will respond to a CAISO initiated ADS dispatch signal, i.e. the manual and/or automated steps required to curtail the Demand. Describe the automated DR function, technology and capability that are employed to effectuate the dispatch.
- The plan shall include, as appropriate, data acquisition, data aggregation and control data flow diagrams to demonstrate systems and key touchpoints with PL metering and demand response capabilities.

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Settlement Quality Meter Data:

For proper Settlement the ISO must receive accurate, correct, and timely meter data. The implementation plan must provide the following information:

- The name of the Scheduling Coordinator; and
- The method to be used to collect, process, and verify the SQMD, including the interfaces (Meter Data Management Agent (MDMA), Electric Service Provider (ESP), UDC) that the data must flow through from the meter to the ISO.

**Optional Information**

The implementation plan should include any other information specific to the particular circumstances that may affect participation by customers in the PLP.

The implementation plan for the PLP must be submitted electronically to Mike Boas, at [mboas@caiso.com](mailto:mboas@caiso.com), or as early as necessary to allow completion of the CAISO approval process. CAISO approval of the implementation plan is required prior to the PL resources' participation in the CAISO's markets.

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## 6. APPENDIX VI – PARTICIPATING LOAD AGREEMENT (To be Included)

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CALIFORNIA INDEPENDENT SYSTEM  
OPERATOR

AND

[PARTICIPATING LOAD]

PARTICIPATING LOAD AGREEMENT

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## 7. APPENDIX VII - SETTLEMENT CHARGE TYPES

* MRTU Charge Code Number	MRTU Charge Code Name	Group	Status	Billable Quantity	Dispatchable-Participating LOAD (Pseudo Gen)	Non-Dispatchable / Non-Participating LOAD	Predecessor Charge Codes	Successor Charge Codes
525	FERC Fee Over / Under Recovery	FERC	New - MRTU	Measured Demand	X	X	Measured Demand Over Control Area Pre-calculation	n/a
550	FERC Fee Settlement due Monthly	FERC	Continue	Measured Demand	X	X	CG PC Measured Demand Over Control Area	n/a
551	FERC Fee Settlement due Annually	FERC	New - MRTU	Measured Demand	X	X	CG PC Measured Demand Over Control Area	n/a
591	Emissions Cost Recovery	Other	Continue	Metered Load within the CAISO Control Area and real time gross exports to other in-state control areas	X	X	591, 691	591
721	Intermittent Resources Net Deviation Allocation	PIRP	Continue	Net Negative Uninstructed Deviations	X		Real Time Energy Quantity Pre-calc, CC 6475, CC 6486, CC 711	None
1303	Supplemental Reactive Energy Allocation	AS	Continue	Prorata Measured Demand	X	X	Supplemental Reactive Energy Allocation, 3303	n/a
1353	Black Start Energy Allocation	AS	Continue	TBD	X	X	1001	n/a
1487	Emergency Energy Exchange Program Neutrality Adjustment	IIE	Continue	Net negative uninstructed Energy	X		None	None
2999	Default Invoice Interest Payment	Interest	Continue	SC's share of total unpaid creditors for the Bill Period	X	X	n/a	n/a
3999	Default Invoice Interest Charge	Interest	Continue	Default Invoice Interest	X	X	n/a	n/a
4501	Core Reliability Services - CRS Peak Demand	GMC	Continue	Peak Demand	X	X	None	None
4502	Core Reliability Services - CRS Off-Peak Demand	GMC	Continue	Off-Peak Demand	X	X	None	None
4505	Energy Transmission Services - Net Energy	GMC	Continue	Net energy Load and Exports	X	X	CC 4503	None
4506	Energy Transmission Services - Net Uninstructed Deviations	GMC	Continue	Absolute value of Net Uninstructed Deviations	X	X	Imbalance Energy Quantity Precalc	None
4511	Forward Scheduling - Non Inter-SC trade Schedules	GMC	Replaced	All final hour schedules of load, export, Gen, Import, Awarded AS, and Awarded RUC	X	X	None	None
4534	Market Usage - Awarded AS	GMC	Replaced	Absolute value of SC's purchases and sales of AS in all markets (IFM, HASP, RTM)	X	X	None	None
4535	Market Usage - Instructed Energy	GMC	Continue	Absolute value of SC's Instructed energy in RTM by resource + deviations against instructions	X	X	None	None
4536	Market Usage - Uninstructed Energy	GMC	Continue	Absolute value of SC's uninstructed deviations being netted by settlement interval	X	X	CC 4506	None
4537	Market Usage - Forward Energy	GMC	New - MRTU	Absolute value of SC's Day Ahead and HASP energy purchases and sales	X	X	CC 4506	None
4575	SMCR -Settlements, Metering, and Client Relations	GMC	Continue	Assessed if there is any settlement charge activity within the month	X	X	All CAISO charge codes (excluding Interest or Rounding)	None
5999	FERC Mandated Interest on Re-Runs	Interest	New - MRTU		X	X	n/a	n/a
6011	Day Ahead Energy, Congestion, Loss Settlement	IIE	New - MRTU	IFM Award	X	X	Y	
6090	Ancillary Service Upward Neutrality Allocation	AS	New - MRTU	Prorata Positive Net Upward AS Obligation	X	X	AS Precalc, 6100, 6150, 6170, 6124, 6194, 6200, 6250, 6270, 6224, 6294, 6500, 6570, 6524, 6594	n/a
6100	Day Ahead Spinning Reserve Capacity Settlement	AS	Replaced	DA Spin Capacity Awarded	X			6124, 6194, 6196, 6090, 6636
6124	No Pay Spinning Reserve Settlement	AS	Replaced	Amt of unfulfilled capacity	X		AS Precalc, 6100, 6150, 6170	6194, 6620
6170	Real Time Spinning Reserve Capacity Settlement	AS	New - MRTU	RT Awarded Spin Capacity	X			6124, 6194, 6196, 6090, 6678
6194	Spinning Reserve Obligation Settlement	AS	Replaced	Spin Oblig MW - Effective Qualified Self-Provision	X	X	AS Precalc, 6100, 6150, 6170, 6124, 6500, 6570, 6524	6090, 6196

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* MRTU Charge Code Number	MRTU Charge Code Name	Group	Status	Billable Quantity	Dispatchable-Participating LOAD (Pseudo Gen)	Non-Dispatchable / Non-Participating LOAD	Predecessor Charge Codes	Successor Charge Codes
6194	Spinning Reserve Obligation Settlement	AS	Replaced	Spin Oblig MW - Effective Qualified Self-Provision	X	X	AS Precalc, 6100, 6150, 6170, 6124, 6500, 6570, 6524	6090, 6196
6196	Spinning Reserve Neutrality Allocation	AS	New - MRTU	Prorata Postive Spinning Obligation	X	X	AS Precalc, 6194	n/a
6200	Day Ahead Non-Spinning Reserve Capacity Settlement	AS	Replaced	DA Non Spin Capacity Awarded	X			6224, 6294, 6296, 6090, 6636
6224	No Pay Non-Spinning Reserve Settlement	AS	Replaced	Amt of unfulfilled capacity	X		AS Precalc, 6200, 6250, 6270	6294, 6620
6270	Real Time Non-Spinning Reserve Capacity Settlement	AS	New - MRTU	RT Awarded Non-Spin Capacity	X			6224, 6294, 6296, 6090, 6678
6294	Non-Spinning Reserve Obligation Settlement	AS	Replaced	Non-Spin Oblig MW - Effective Qualified Self-Provision	X	X	AS Precalc, 6100, 6150, 6170, 6124, 6200, 6250, 6270, 6224, 6500, 6570, 6524	6090, 6296
6296	Non-Spinning Reserve Neutrality Allocation	AS	New - MRTU	Prorata Postive Non-Spinning Obligation	X	X	AS Precalc, 6294	n/a
6474	Real Time Unaccounted for Energy Settlement	UFE	Replaced	UDC_UFE * BAUDCSettlementIntervalMeasuredDemandControlAreaQty/ UDCTotalSettlementIntervalMeasuredDemandControlAreaQty	X	X	Pre-Calc Real Time Price, Measured Demand, System Resource Deemed Delivered Energy Quantity, System Resource Dynamic Deemed Delivered Energy Quantity	CC 6477, CC 6774
6475	Real Time Uninstructed Imbalance Energy Settlement	UIE	Replaced	Stimt Int RT UIE1 + RT UIE2	X	X	Real Time Energy Quantity Pre-calc, Real Time Price Pre-calc, CC 6470	CC 6477, CC 6774
6477	Real Time Imbalance Energy Offset	IIE	Replaced	BA SettlementInterval MeasuredDemandControlArea Qty	X	X	CC 6470, CC 6475, CC 6474, CC 6051, CC 6788, CC 6774, Measured Demand	N/A
6480	Excess Cost Neutrality Allocation	IIE	Replaced	BA SettlementInterval MeasuredDemandControlAreaQty	X	X	CC 6482, CC 6486, CC 4470, CC 4480, Measured Demand	None
6482	Real Time Excess Cost for Instructed Energy Settlement	IIE	Replaced	ExceptionalDispatchEligibleQuantity	X		Real-Time Price Pre-calc	CC 6486, CC 6480
6486	Real Time Excess Cost for Instructed Energy Allocation	IIE	Replaced	Min (0, UnitRealTimeUIE + AvailableUndispatchedBidQuantity)	X		Real-Time Energy Quantity Pre-Calc, Real-Time Price Pre-Calc, CC 6482	CC 6480, CC 721
6488	Exceptional Dispatch Uplift Settlement	IIE	New - MRTU	Exceptional Dispatch IIE Eligible Quantity both Inc and Dec	X		Real-Time Price Pre-Calc	CC 6489
6594	Regulation Up Obligation Settlement	AS	Replaced	Reg Up Oblig MW - Effective Qualified Self-Provision	X	X	AS Precalc, 6500, 6570, 6524	6090, 6596
6596	Regulation Up Neutrality Allocation	AS	New - MRTU	Prorata Postive Reg Up Obligation	X	X	AS Precalc, 6594	n/a
6620	Bid Cost Recovery Settlement	BCR	New - MRTU	Max(0, Sum of IFM net Amt + Sum of RUC net Amt + Sum of RTM net Amt)	X		Pre-Calc IFM, RUC, and RTM net amount	Pre-Calc BCR Sequential Netting
6636	IFM Bid Cost Recovery Tier 1 Allocation	BCR	New - MRTU	Proportional IFM Load Uplift Obligation	X		Pre-Calc BCR Sequential Netting	CC 6637, CC 6678
6637	IFM Bid Cost Recovery Tier 2 Allocation	BCR	New - MRTU	Proportion to the BA's Measured Demand	X		CC 6636, Pre-Calc Measured Demand	CC 6678
6678	Real Time Bid Cost Recovery Allocation	BCR	New - MRTU	Proportional to BA's Measured Demand	X	X	Pre-Calc BCR Sequential Netting, CC 6620, CC 6636, CC 6637, CC 6806, CC 6807, CC 6800, CC 6824	None
6694	Regulation Down Obligation Settlement	AS	Replaced	Reg Down Oblig MW - Effective Qualified Self-Provision	X	X	AS Precalc, 6600, 6670, 6624	6090, 6696
6696	Regulation Down Neutrality Allocation	AS	New - MRTU	Prorata Postive Reg Down Obligation	X	X	AS Precalc, 6694	n/a
6774	Real Time Congestion Offset	Cong	New - MRTU	Measured Demand excluding ETC or TOR Self-Schedules for which Real-Time Congestion Credit was provided		X	Y	
6806	Day Ahead Residual Unit Commitment (RUC) Tier 1 Allocation	RUC	New - MRTU	Net Negative Demand Deviations	X	X	Pre-calculation Bid Cost Recovery Sequential Netting, 6800, 6824	6807, 6678
6807	Day Ahead Residual Unit Commitment (RUC) Tier 2 Allocation	RUC	New - MRTU	Metered Demand	X	X	Pre-calculation Measured Demand Over Control Area, 6806	6678
6947	IFM Marginal Losses Surplus Credit Allocation	IIE	New - MRTU	Pro-rata TO SC's Measured Demand in the CAISO Control Area		X	Y	
6977	Allocation of Transmission Loss Obligation Charge for Real Time Schedules Under Control Agreements	LOSSES	New - MRTU	SC's percentage of Control Area Measured Demand (excluding losses)	X	X	Pre-calculation Measured Demand Over Control Area Excluding Transmission Loss Adjustment, 6976	n/a