Business Practice Manual for

Demand Response

Version 110

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Commented [A1]: Insert date of posting

Approval History

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BPM Owner: Tricia Johnstone

BPM Owner's Title: Director, Operational Readiness

Revision History

Version	PRR No.	Date Posted	Revisions Effective	Description
11	1588	8/23/2024	~~11/1/2024~~	FERC 2222 Updates: Section 2.1, Appendix A, Appendix B
10	1472	9/29/2022	9/29/2022	Correction to language in Section 15 - Outages
9	1465	8/26/2022	11/15/2022	(1)Clarify the requirements for WEIM entity's use of the RDRR model (2) FRP Initiative: change the default election for the bid dispatchable election (3) RDRR Track 2 Initiative: Change the minimum load curtailment amount for discrete RT dispatch option and outline the attestation process for requesting to go above the minimum load curtailment amount, as well as, add Appendix H
8	1438	8/18/2021	7/20/2022	Resource Sufficiency Evaluation Enhancements: Add section 17 and 18 for Non-Participating DR Scheduling in RSE and ALFS for WEIM Entities
7	1342	8/2/2021	5/1/2021	Updates to RDRR Bid Dispatchable Options Added Appendix G for Load Cap Adjustment
6	1283	10/4/2021	10/1/2020	Correction to the Appendix B for PDR-LSR (CON) under "LOAD" measurement type change TEE > 0 to TEE < 0, and add reference to ISO tariff section 11.6.7 to section 5.7 PDR-LSR. Removed notation in Appendix F for PDR electing 60 min bid dispatchable option not considered in RUC.
5	1272	8/26/2020	8/1/2020	Add section 10, Effective Flexible Capacity (EFC) values for Resource Adequacy

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4	1247	10/23/2020	10/1/2020	Clarification on existing process updated Sections: 2.6, and 3. Updates for ESDER 3B Sections: 2, 2.1, 2.2, 4, 5 (removed MGO with 10-in-10, added new PEMs, links to SQMD tutorial, and form), 5.1, 5.2, 5.4-5.6, 7, 8 (in addition to updates for ESDER 3B, changed default value for PDR), 9, 11-15, Appendix A, and Appendix B. Added for ESDER 3B: Appendix C – F.
3	1226	April 1, 2020	April 1, 2020	PRR 1226: Appendix B updates to clarify TMNT measurement type data requirement.
2	1209	January 21, 2020	November 13, 2019	PRR 1209: Demand Response BPM, Emergency PRR, Appendix B table updates to include meter generation output and footnotes to the measurement types, load, and meter before meter after (MBMA)
1	1174	July 30, 2019	November 13, 2019	Original BPM

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Attachments:

List of Exhibits:

1. Introduction

Welcome to the ISO ***BPM for Demand Response.*** In this Introduction you will find the following information:

- The purpose of ISO BPMs
- What you can expect from this ISO BPM
- Other ISO BPMs or documents that provide related or additional information

1.1 Purpose of ISO Business Practice Manuals

The Business Practice Manuals (BPMs) developed by ISO are intended to contain implementation detail, consistent with and supported by the ISO Tariff, including: instructions, rules, procedures, examples, and guidelines for the administration, operation, planning, and accounting requirements of ISO and the markets. Each Business Practice Manual is posted in the BPM Library at: http://bpmcm.ISO.com/Pages/BPMLibrary.aspx

1.2 Purpose of this Business Practice Manual

The *BPM for Demand Response* covers the responsibilities for the CAISO, Scheduling Coordinator (SC), Demand Response Provider (DRP), and processes associated with ISO Tariff provisions related to Demand Response. The BPM is intended for those entities that expect to participate in the ISO Markets.

The provisions of this BPM are intended to be consistent with the ISO Tariff. If the provisions of this BPM nevertheless conflict with the ISO Tariff, the ISO is bound to operate in accordance with the ISO Tariff. Any provision of the ISO Tariff that may have been summarized or repeated in this BPM is only to aid understanding. Even though every effort will be made by the ISO to update the information contained in this BPM and to notify Market Participants of changes, it is the responsibility of each Market Participant to ensure that he or she is using the most recent version of this BPM and to comply with all applicable provisions of the ISO Tariff.

A reference in this BPM to the ISO Tariff, a given agreement, any other BPM or instrument, is intended to refer to the ISO Tariff, that agreement, BPM or instrument as modified, amended, supplemented or restated.

The captions and headings in this BPM are intended solely to facilitate reference and not to have any bearing on the meaning of any of the terms and conditions of this BPM.

1.3 References

The definition of acronyms and words beginning with capitalized letters are given in the *BPM for Definitions & Acronyms*.

Other reference information related to this BPM includes:

- The BPM for Metering
- The BPM for Reliability Requirements
- The BPM for Market Instruments
- The BPM for Market Operations
- The BPM for Direct Telemetry
- The BPM for Settlements and Billing
- ISO Tariff

2. Overview of Demand Response Resources

In this section, you will find the following information:

- An introduction to Proxy Demand Resources (PDR), Reliability Demand Response Resources (RDRR), and Proxy Demand Resource-Load Shift Resources in addition to their descriptions.
- An overview of their associated business processes including:
  - The Demand Response Provider Agreement and its process
  - The Demand Response Registrations System (DRRS) and a description of the resources registration process
- A description of post market Meter Data development, submittal, baseline and performance measurement (Demand Response Energy Measurement)
- A description of the monitoring metrics in place for these resources
- A description of their participation requirements

2.1 Product Overview[1]

CAISO introduced three products that rely on the same technical functionality and infrastructure:

1. Proxy Demand Resource (PDR)
2. Reliability Demand Response Resource (RDRR)
3. Proxy Demand Resource – Load Shift Resource (PDR-LSR)

[1] Section 2.1 contains updates that have not yet been approved (PRR 1465).

The CAISO additionally recognizes a forth demand response resource type as part of a distributed energy resource aggregation (DERA) that relies on the same performance measurement processes established for the above three products:

~~3.~~4. Distributed Curtailment Resource (DCR)

The CAISO developed the Proxy Demand Resource (PDR) product to increase demand response participation in the ISO's wholesale Energy and Ancillary Services markets. Additionally, PDR will help in facilitating the participation of existing retail demand response into these markets.

The CAISO developed the Reliability Demand Response Resource (RDRR) product to further increase demand response participation in the ISO markets by facilitating the integration of existing emergency-triggered retail demand response programs and newly configured demand response resources that have reliability triggers and desire to be dispatched only under certain system conditions. RDRRs can economically bid and be dispatched in the day-ahead market but only be dispatched for reliability in the real-time market. RDRRs cannot offer or self-provide Ancillary Services or submit RUC availability bids. WEIM balancing authority areas may use the RDRR model assuming they have approval from their local regulatory authority and meet the requirements of RDRR participation.

The CAISO developed the Proxy Demand Resource - Load Shift Resource (PDR-LSR) to recognize the ability for demand to consume during oversupply conditions, facilitating its ability to shift and shape load with market signals reflecting grid conditions.

The CAISO defined the Distributed Curtailment Resource (DCR), an underlying resource type for the Distributed Energy Resource Aggregate (DERA), in compliance with FERC order 2222. DERAs can include one or more DCRs with the capability to support both curtailment and injection of Energy from underlying DER and DCR types, as opposed to the existing DERA (which only recognizes Energy injection). To calculate the Demand curtailment provided by the DCR within a DERA, the Scheduling Coordinator must calculate its Demand Response Energy Measurement (DREM)[2].

Similar to Demand Response, the metering performance of DCRs will be reflected as supply (or metering channel 4). DCRs will be required to provide meter data, and baseline monitoring data following the existing timeline for meter data and monitoring data submissions. All existing Performance Evaluation Methodologies are available for the measurement of a DCR. To obtain approval for the DCRs use of any Performance Evaluation Methodology (PEM), the Scheduling Coordinator will follow the steps outlined in Section 5 of this BPM.

Commented [PJ2]: There will be a new section in tariff **4.17.7 Distributed Energy Resource Aggregations with Demand Curtailment** That support the footnote statement. This tariff section will be activated with FO2222 go-live

2 Consistent with the requirements in Tariff Sections 4.13.4 and 11.6

~~In addition, RDRR enables the integration of CPUC-jurisdictional emergency responsive demand response resource programs. RDRRs can economically bid and be dispatched in the day-ahead market but only be dispatched for reliability in the real-time market. RDRRs cannot offer or self-provide Ancillary Services or submit RUC availability bids. WEIM balancing authority areas may use the RDRR model assuming they have approval from their local regulatory authority and meet the requirements of RDRR participation.~~

Proxy Demand Resources using the load-shift methodology (PDR-LSR) must elect to bid and be dispatched in the Real-Time Market using either the five or fifteen minute interval bidding option. PDR-LSR does not have the sixty minute (hourly block) bidding option.

In general, the three (3) products is a combination of Load scheduled by a Load Serving Entity at the Default LAP and a Bid to curtail submitted by the Demand Response Provider (DRP) using a separate proxy generator with a distinct Resource ID. The LSE and the DRP may be the same or different entities.

The PDR-LSR product is modeled as a PDR consisting of registered location(s) that include at least one storage device. Under this model, the resource has the ability to bid and be dispatched for both load curtailment (discharging, generation), and load consumption (charging, negative generation) from the BTM storage.

A PDR, RDRR, and PDR-LSR will be treated in the markets as a proxy generator bid as an aggregate generator, which may be defined at a single node or across multiple nodes within a CAISO defined Sub-LAP. The scheduling, dispatch, and settlement of the PDR, RDRR or PDR-LSR will be as a proxy generator resource as a distinct Resource ID. The LSE base Load will be scheduled and settled at the Default LAP (DLAP). Settlements for energy provided by PDRs and RDRRs shall be based on the Demand Response Energy Measurement which is calculated using an approved Performance Evaluation Methodology (see CAISO Tariff Sections 4.13.4 and section 5 of this BPM. The Demand Response Energy Measurement applicable to use of the Performance Evaluation Methodology is the resulting Energy quantity calculated by comparing the Customer Baseline of a PDR, RDRR or PDR-LSR (Curtailment) against its actual underlying Load for a Demand Response Event. A PDR, RDRR or PDR-LSR with separately measured behind the meter generation, utilize Meter Data consisting of its total gross consumption when using the Customer Load Baseline Methodology. The Demand Response Energy Measurement for a PDR or RDRR using the MGO methodology consisting of registered behind-the-meter generation is the quantity of Energy equal to the difference between (i) the Energy output, and (ii) the Generator Output Baseline for the behind-the-meter generation registered in the PDR or RDRR, which derives from the Energy output of the behind-the-meter generation only, independent of offsetting facility Demand. For a PDR or RDRR using the combination of both methodologies, the Demand Response Energy Measurement will be their independently derived Demand Response Energy Measurements' resulting sum.

The Demand Response Energy Measurement for the PDR, RDRR or PDR-LSR, representing the curtailed or MGO offsetting portion of the resource's Load, is settled directly with the DRP's SC.

The following summarizes the Proxy Demand Resource, Reliability Demand Response Resource or Proxy Demand Resource – Load Shift Resource product design attributes:

- A DRP may participate in the CAISO Markets separately from the LSE;
- The LSE and Utility Distribution Company (UDC) have the opportunity to review location information for a registration requested by a DRP;
- A PDR is eligible to participate in the Day-Ahead Energy market, Real-Time Energy market and Ancillary Services market to provide Spinning and Non-Spinning Reserves;
- A PDR and RDRR may elect the bid dispatchable options of 60, 15, or 5 minutes for the Real-time market;
- A RDRR is eligible to participate in the Day Ahead Energy market and Real-Time Energy market;
- A PDR-LSR participates under the PDR model providing functionalities for the BTM storage to bid and be dispatched for both load curtailment and load consumption. PDR-LSR is eligible to participate in the Day-Ahead and Real-Time Energy markets through the use of two separate Resource IDs for load curtailment (CUR), and load consumption (CON). The PDR-LSR (CUR) Resource ID is designed in the same fashion as the standard PDR product. The PDR-LSR (CON) Resource ID is designed in similar fashion as the existing NGR – Dispatchable Demand Resource (DDR) model. Both Resource IDs must be registered or updated in the MasterFile at the same time, and must bid in the same Market with a bid dispatchable option of either 15 or 5 minutes.
    - Load curtailment (CUR) Resource ID is eligible to provide Resource Adequacy (RA), and may participate in the Ancillary Services (AS) market to provide Spinning and Non-Spinning Reserves. It must bid at or above the Net Benefit (NBT) price threshold, and non-exporting rules apply.
    - Load consumption (CON) Resource ID is ineligible for RA and provision of AS, and must bid from the bid floor up to a value less than $0.
- PDR and RDRR are load curtailment products. Performance for the resource will be measured in aggregate based on individual location load curtailment only and must not include measured export of energy from any of these individual locations;
- The CAISO does not prohibit net-energy metered (NEM) locations from participating in PDRs or RDRRs, however, meter data from NEM locations must only represent load or the resulting load offset when using the MGO methodology;

- Meter data intervals in which there is a net export of energy, at any underlying PDR, RDRR, or PDR-LSR (Curtailment only) location, must be set to zero (0) when using a Customer Load Baseline methodology. This must be performed prior to summing individual location meter data in the development of the aggregated SQMD to the CAISO for that PDR or RDRR resource. Meter Data will consist of Energy output of the behind-the-meter generation up to, but not including, output that represents an export of energy from that location. Additionally, when calculating the Generator Output Baseline using the MGO methodology, meter data must a) be set to zero in any Settlement interval in which the behind-the-meter generation is charging and b) consist of the Energy output of the behind-the-meter generation up to, but not including, output greater than its facility Demand.
- The DRP's SC submits a PDR or RDRR bid to curtail Load, or PDR-LSR bids either to curtail or consume loads, and receive Automated Dispatch System (ADS) instructions as if it were a generator. The PDR or RDRR is bid and settled at a PNode (which could be a specific location or an aggregation of PNodes, and Settlement occurs directly between the CAISO and the DRP's Scheduling Coordinator;
- The LSE continues to forecast and schedule its total Load at the Default LAP;
- PDRs and RDRRs consists of:
    - Residential End Users: DRP may elect to use the ten-in-ten, metering generator methodology, control group methodology, five-in-ten methodology, or weather matching methodology.
    - Non-residential End Users: DRP may elect to use the ten-in-ten, metering generator methodology, control group methodology, or weather matching methodology.
- PDR-LSRs consists of:
    - Residential End Users: DRP may elect to use the ten-in-ten, five-in-ten, combined, or weather matching methodology.
    - Non-residential End Users: DRP may elect to use the ten-in-ten, combined, or weather matching methodology.

The following methodologies may be utilized to calculate Customer Load Baselines and Demand Response Energy Measurements for PDRs and RDRRS:

- Performance of the PDR or RDRR using a **Ten in Ten Methodology** is generally determined through a pre-determined baseline calculation using the last 10 non-event days with a look back window of 45 days and a bidirectional adjustment capped at 20%. PDR or RDRR using behind-the-meter generation to offset Demand may submit for use, in the Ten in Ten Methodology, Meter Data reflecting the total gross consumption, independent of any offsetting Energy produced by separately metered behind-the-meter generation.

- Performance of the PDR or RDRR using a **Five in Ten Methodology** is generally determined through a pre-determined baseline calculation using the last 5 non-event days with a look back window of 45 days and a bidirectional adjustment capped at 1.4 (71% to 140%). PDR or RDRR using behind-the-meter generation to offset Demand may submit for use, in the Five in Ten Methodology, Meter Data reflecting the total gross consumption, independent of any offsetting Energy produced by separately metered behind-the-meter generation.

- PDR or RDRR composed of both residential and nonresidential customers may choose to calculate separate baselines for the different customer classes using a Combined Methodology. Total performance is the sum of the Ten in Ten and Five in Ten performances.

- Performance of the PDR or RDRR using a **Meter Generator Output methodology** consisting of registered behind-the-meter generation is the difference between the measured Energy output of the behind-the-meter generation and its calculated Generator Output Baseline which is generally determined through a pre-established baseline calculation using the last 10 similar non-event hours with a look back window of 45 days.

  PDR or RDRR using Meter Generator Output may separately calculate baselines for gross load not including behind-the-meter generation with approved customer load baseline known as MGO with Customer Load Baseline (CLB) such as either Five in Ten, or Ten in Ten methodologies depending on the customer classes. These two baselines are to be used independently to establish separate performance for the customer load and the behind-the-meter generation. Total performance is the sum of the Meter Generator Output and the customer load baseline performances.

  PDR or RDRR composed of both residential and nonresidential customers may choose to calculate separate baselines for the different customer classes. Total performance is the sum of the Ten in Ten and Five in Ten performances known as the MGO with Day Matching Combined.

  PDR or RDRR may also calculate MGO with CLB using weather matching methodology. The calculation is performed separately, and then added together (MGO plus Weather) to get the total performance.

- Performance of the PDR or RDRR using a **Control Group Methodology** will identify a control group that must consist of 150 distinct End Users (or more), that are registered in the Demand Response System and that do not respond to CAISO dispatch. The control group must have nearly identical demand patterns and be geographically similar such that they experience the same weather patterns and grid conditions as the PDR and RDRRs that respond to the dispatch

(Treatment Group). The control group's aggregate Demand during the same Trade Date and Trade Hour as the Demand Response Event, divided by the relevant number of End Users in the "Treatment" group will define the baseline.

- Performance of the PDR or RDRR using a **Weather Matching Methodology** is generally determined by development of a baseline using the four (4) days, from a pool of non-event days, with the closest daily maximum temperature to the day in which the event occurred. Begin by collecting meter data for ninety (90) calendar days prior to the event day, working sequentially backwards from the Trading Day under examination, including only business days if the Trading Day is a business day, including only non-business days if the Trading Day is a non-business day, and excluding calendar days on which the Proxy Demand Resource was subject to an Outage or previously provided Demand Response Services (other than capacity awarded for AS or RUC) or the Reliability Demand Response Resource was subject to an Outage as described in Section 12.10 of this BPM, or previously provided Demand Response Services. The weather matching methodology has a bidirectional adjustment capped at 1.4 (71% to 140%).

- Performance of the PDR or RDRR using an **Electric Vehicle Supply Equipment (EVSE) Methodology** is an extension of the use of a sub-meter from the MGO. The EVSE methodology recognizes the sub-meter of behind-the-meter electric vehicles in determining their contribution to the facility's overall load curtailment with its own distinct performance measurement.

- Performance of the PDR using a **Proxy Demand Response-Load Shift Resource (PDR-LSR) Methodology** recognizes distinct performances from PDR-LSR curtailment, and PDR-LSR consumption utilizing performance methodologies for each. These provides the ability for a PDR-LSR to calculate the load curtailment of the facility, load curtailment of the sub-metered storage device, combined facility/sub-metered storage device load curtailment, and the load consumption from the sub-metered storage device.

- The CAISO tariff provision to statistically derive meter data was included to accommodate participation of an aggregated PDR/RDRR comprising several locations, some of which are interval metered and have revenue quality meter data available, and with the condition that the balance of locations would mimic the metered random sample. Once the randomly sampled fraction of revenue quality meter data is converted to settlement quality meter data (SQMD), the sum is then scaled to derive and submit the SQMD sized for the PDR or RDRR. This scaled SQMD value is called the "virtual" SQMD. The calculation detail for this virtual SQMD can be found in the Demand Response User Guide.

  Virtual SQMD derived based on statistically sampled physical metering rather than physical metering data for all locations, is treated identical to any other SQMD. Virtual SQMD can only be used for a PDR or RDRR selecting the Customer Load Baseline Performance Methodology. Market participants providing statistically sampled SQMD may be requested to comply with ISO information requests to audit their meter data collection and "virtual" meter data scaling process.

A Demand Response Provider representing a PDR or RDRR may submit a written application to the CAISO for approval of a methodology to statistically derive meter data for the PDR or RDRR that consists of a statistical sampling of Energy usage data. (CAISO Tariff Section 10.1.7). The CAISO will accept, as pre-approved, any application requesting use of the methodology detailed in the Demand Response User Guide for the following cases:

- For day-ahead energy participation only, when hourly interval metering is not installed at all underlying resource locations. Not applicable for ancillary service participation.
- For day-ahead energy participation only, when hourly interval metering is installed at all underlying resource locations but RQMD is not derived using the hourly interval meter data for settlement purposes, but is developed using load profiles. Not applicable for ancillary service participation.
- For real-time and ancillary services participation when interval metering installed at all underlying resource locations is not recorded

To request to submit statistically derived data to the CAISO, the DRP can access the template on the CAISO website and submit the completed template to PDR@caiso.com. Upon receipt of the request, the CAISO has 10 business days to review the template for completeness, make additional inquiries and initiate the document for digital signature.

- The CAISO will adjust the Settlement of the PDR/RDRR associated Load Serving Entity LSE based on the measured performance of the PDR or RDRR only when the Real Time Market Clearing Price is below the threshold Market Clearing Price set forth in Section 30.6.3.1.

The *BPM for Demand Response* addresses several of these design attributes; however, additional BPMs have changed to reflect PDR and RDRR design attributes. The following BPMs should be reviewed for further information not provided within this section of the *BPM for Demand Response*.

Ref#	BPM
1	Metering
2	Compliance Monitoring
3	Definitions & Acronyms

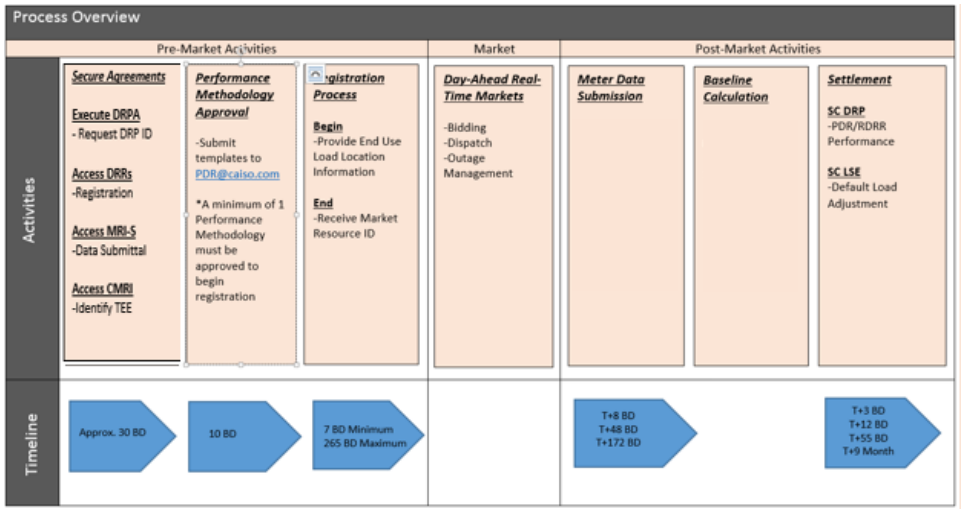
4	Direct Telemetry
5	Managing Full Network Model
6	Market Instruments
7	Market Operations
8	Outage Management
9	Scheduling Coordinator Certification & Termination
10	Settlements & Billing
11	Reliability Requirements

A supplement document to the *BPM for Demand Response* document is the Demand Response System User Guide which provides in-depth information on the application, and automated systems that are in place to enable participation of Proxy Demand and Reliability Demand Resources. This document is located on the CAISO website at caiso.com. It is referenced throughout this section to highlight subject matter for which greater detail is available.

2.2 Process Overview

The following diagram is provided to illustrate the process and estimated timing[3] of processes from registration through participation in the CAISO Markets into the CAISO's post market processing, including metering, Settlements and compliance monitoring for PDR, RDRR, and PDR-LSR. The following sections describe process steps and application impacts specific to PDR, RDRR, and PDR-LSR market participation.

3 Timeline is an estimation only and is subject to change upon completion of scheduled process enhancements designed to gain efficiencies and reduce timelines associated with the registration resource management process.



Creating and Registering Locations and Resource process flow

2.3 Market Participation Demand Response Registration Checklist

Information Request Sheet	Submitted	☐
Executing a Demand Response Provider Agreement (DRPA)	Received for review Executed – Signed/Returned	☐ ☐
Demand Response Provider (DRP ID) assigned by ISO	Received	☐
Scheduling Coordinator Assignment	Obtained	☐
Demand Response System Access (DRRS) – Production and Map Stage (Market Simulation) environments	AIM request submitted (DRRS) DRRS certificate received DRRS access verified	☐ ☐ ☐ ☐ ☐ ☐
DRRS/PDR/PDR-LSR/RDRR Training	User guide reviewed Request training (DRRS) Training completed (DRRS)	☐ ☐ ☐

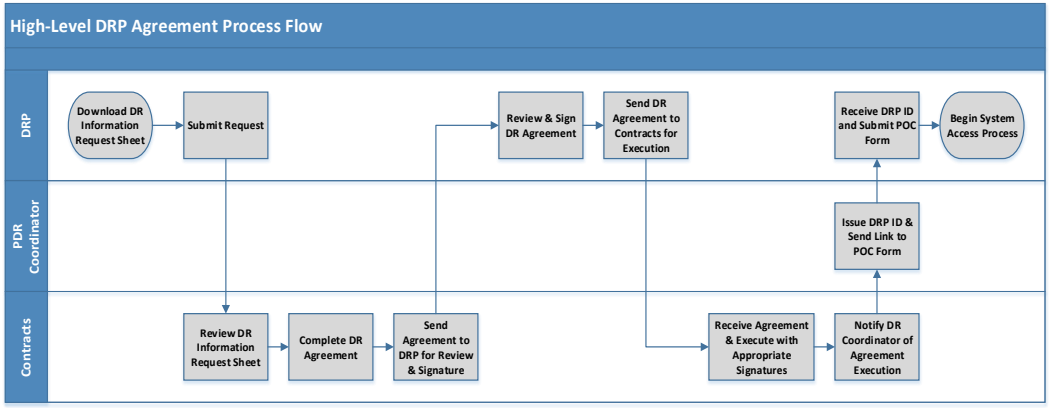
DRRS Automated Email Notification	Submitted Contacts to be added to the database	☐
Market Results Interface - Settlements (MRI-S)	AIM request submitted (MRI-S)	☐
Customer Interface for Resource Adequacy (CIRA)	Applicable to resources with resource adequacy (RA).	☐
Performance Evaluation Methodology (PEM)/Baseline Methodology Form and SQMD Plan if applicable	Submitted	☐
Master File (MF)	Submitted access request. Applicable to SC. Note: Master File database contains static data that reflects the operational	

	characteristics of resources that participate in the CAISO markets. SC for the resource may need to make changes to specific operating parameters.	☐
Customer Market Results Interface (CMRI)	Submitted access request. Applicable to SC.	☐

2.4 Executing a Demand Response Provider Agreement (DRPA)

To initiate a Demand Response Provider Agreement (DRPA), an information request sheet must be filled out completely and returned to Regulatory Contracts at regulatorycontracts@caiso.com. Once the information request sheet has been reviewed for completeness, it will be processed by contracts and a Demand Response Provider Agreement will be originated. The information request sheet for the DRPA can be obtained at www.caiso.com.

The pro forma Demand Response Provider Agreement is incorporated in Appendix B of the CAISO Tariff. This agreement must be signed by a DRP and the CAISO and provided prior to requesting a PDR or RDRR Resource ID. As with other CAISO agreements, the Demand Response Provider Agreement will bind the DRP to the CAISO Tariff. This agreement requires that the DRP use a certified Scheduling Coordinator (note, the SC must be certified to submit Settlement Quality Meter Data and have a Meter Service Agreement for Scheduling Coordinators with the CAISO) for all required tariff activities with the CAISO. The Demand Response Provider Agreement requires that the DRP have sufficient contractual relationships with the end use customers, LSE, and UDC and meet any Local Regulatory Authorities' requirements prior to participating in the CAISO Markets. This agreement process will have a ten (10) Business Day turn-around timeframe. After the DRPA has been executed, the DRP shall submit a DRP ID request form to the CAISO at PDR@caiso.com. The DRP ID request form can be found on the CAISO webpage at: http://www.caiso.com/participate/Pages/Load/Default.aspx. If the request is approved, the CAISO will assign a new DRP ID.



2.5 Obtaining a Demand Response Provider (DRP) ID

Once the Demand Response Provider Agreement (DRPA) has been executed, the following shall occur:

1. DRP shall submit a DRP ID request form to CAISO at pdr@caiso.com. The DRP ID request form can be found at http://www.caiso.com/participate/Pages/Load/Default.aspx.

2. After the DRP ID request form has been reviewed and approved, CAISO shall assign a new DRP ID. If the request is denied, CAISO will contact the requester to request for further information.

2.6 Use of a Certified Scheduling Coordinator

The CAISO requires the use of a certified Scheduling Coordinator to be eligible to transact business directly with the CAISO. A DRP could endeavor to become a certified Scheduling Coordinator or use an existing certified Scheduling Coordinator. It is important to note that the certification process for a new Scheduling Coordinator could take up to 120 days. A list of certified Scheduling Coordinators is maintained on the CAISO Website, under the reference tab of the operations

center page. The DRP must enter into the appropriate contractual relationship with a certified Scheduling Coordinator, and notify the CAISO of the Scheduling Coordinator it will be using. By using a certified Scheduling Coordinator, all requirements, as outlined in the BPM for Scheduling Coordinator Certification and Termination, will be maintained by the Scheduling Coordinator and the DRP would not have to satisfy these requirements (for example: system requirements, credit requirements, demonstration of market proficiency, emergency procedures, and establishing qualifications to submit Settlement Quality Meter Data) independently.

3. Load Serving Entities (LSE) and Utility Distribution Companies (UDC)

End use customer load served by an LSE and provided distribution services by a UDC may be represented in the wholesale market by a third party DRP. Therefore, the CAISO systematically facilitates a registration process during which these entities are informed of a DRP's identification of their end-use customers, referenced by a unique service account number, and intent to use their load response capabilities as a PDR or RDRR. The LSE and UDC are identified when the locations are created by DRPs during the registration process, therefore, an LSE ID and UDC ID must be available. In addition, for the LSE and UDC to exercise their review capability, they must obtain a unique ID.

It is important for DRPs to work with the LSEs and UDCs for all the end-use customers they represent to ensure they have obtained their IDs from the CAISO prior to commencing with the PDR/RDRR registration process. End-use customers (Service Accounts) can be aggregated across multiple LSEs in a registration, but they must be in the same sub-LAP.

3.1 Obtaining a Load Serving Entity (LSE) ID or Utility Distribution Company (UDC) ID

The CAISO maintains a list of DRP, LSE, and UDC IDs that have been issued. This list is located at: http://www.caiso.com/Documents/ListofDemandResponseParticipants.pdf. California companies must be listed on either the CEC website as an Electric Load

Serving Entity (LSE) or the CPUC website as an Electric Service Provider (ESP). Non-California companies must be designated by their local regulatory authorities as LSE/ESP equivalents.

1. The LSE or UDC shall submit a request form to CAISO at pdr@caiso.com. These request form(s) can be found at: http://www.caiso.com/participate/Pages/Load/Default.aspx.

2. After the request form has been reviewed and approved, the CAISO shall assign a new LSE ID or UDC ID. If the request is denied, the CAISO will contact the requester to request for further information.

4. Demand Response Registration System (DRRS)

The DRRS is accessed by the DRP to complete location, registration, and resource management processes in order to establish a PDR/RDRR/PDR-LSR resource ID for market participation. It is also accessed by the Load Serving Entity (LSE) and Utility Distribution Company (UDC) to manage their review process of locations submitted by the DRP.

The DRRS provides interfaces, both Application Program Interface (API) and User Interfaces (UI) to allow the DRP to create, modify, and remove location and to allow the LSE and UDC to review and provide comments on registered locations. The APIs allow for streamlined and automated

Proxy Demand Response (PDR), Reliability Demand Response Resources (RDRR), and Proxy Demand Response-Load Shift Resource location registration processing.

An additional functionality of the DRRS is to maintain a duplication check of locations being created by the DRP. The system performs this check to prevent duplicated overlapping effective dated locations from being created.

Please refer to the DR User Guide for more information about the DRRS UI, and the Technical Specifications for more information about the API.

5. Performance Evaluation Methodology Approval Process

DRPs must obtain approval for the use of any Performance Evaluation Methodology (PEM) before the DRRS will allow it to be a selectable option in the Registration Process. PEM requests will be received, reviewed, and approved by the CAISO. DRP can download the PEM templates and cover page from the CAISO website. Once approved, the CAISO will initiate the necessary DRRS updates so that it becomes an available registration option for that DRP ID. The approval is for the DRP's use of that PEM for registration going forward. It is not a resource specific approval. PEM form request can be sent to PDR@caiso.com. DRPs will submit a completed template request to PDR@caiso.com. Upon receipt of request, the CAISO has 10 business days to review the PEM template. If the CAISO approves, it will make the necessary changes to the DRRS. As part of that process, the CAISO will initiate an approved PEM template for digital signature. The signed PEM template will not only serve as the CAISO's acknowledgement of approval, but also will satisfy as a Settlement Quality Meter Data Plan, as outlined in Tariff Section 10.3.7.1. An email will be sent to the Scheduling Coordinator and DRP notifying them that the approved PEM is available for them to select in the DRRS. At this time, the DRP can begin the registration process. DRP/SC may update its Baseline Methodology only once every 30 days for a resource that has been used in a registration. For the approved baseline method that is utilized in a registration, the SC for the resource must submit data for settlements and monitoring purposes into MRI-S. The details about the data requirements are outlined in the Appendix B of this BPM.

Pursuant to Section 4.13.4 of the tariff, the following PEMs will be available for request:

- Weather Matching
- Control Group
- Day Matching 10-in-10
- Day Matching 5-in-10 (residential only)
- Day Matching Combined
- Meter Generator Output
- Meter Generation Output with Day Matching 5-in-10
- Meter Generation Output with Day Matching 10-in-10

- Meter Generation Output with Day Matching Combined
- Meter Generation Output with Weather Matching
- Electric Vehicle Supply Equipment (EVSE) non-residential
- Electric Vehicle Supply Equipment (EVSE) non-residential with Day Matching 10-in-10
- Electric Vehicle Supply Equipment (EVSE) non-residential with Day Matching Combined
- Electric Vehicle Supply Equipment (EVSE) non-residential with Weather Matching
- Electric Vehicle Supply Equipment (EVSE) residential
- Electric Vehicle Supply Equipment (EVSE) residential with Day Matching 5-in-10
- Electric Vehicle Supply Equipment (EVSE) residential with Day Matching 10-in-10
- Electric Vehicle Supply Equipment (EVSE) residential with Day Matching Combined
- Electric Vehicle Supply Equipment (EVSE) residential with Weather Matching
- PDR-LSR
- PDR-LSR with Day Matching 5-in-10
- PDR-LSR with Day Matching 10-in-10
- PDR-LSR with Day Matching Combined
- PDR-LSR with Weather Matching

The following Performance Evaluation Methodologies may be utilized to calculate the Customer Load Baselines and Demand Response Energy Measurements for PDR, RDRRs, and PDR-LSRs.

- Residential End Users may elect to use the ten-in-ten, metering generator output, control group, five-in-ten, weather matching, PDR-LSR or EVSE methodology.
- Non-residential End Users may elect to use the ten-in-ten, metering generator output, control group, weather matching, PDR-LSR or EVSE methodology.

The following performance methodologies listed below requires additional submittal of a SQMD form for approval of metering device(s) used:

- Meter Generation Output
- Meter Generation Output with Day Matching 5-in-10
- Meter Generation Output with Day Matching 10-in-10
- Meter Generation Output with Day Matching Combined
- Meter Generation Output with Weather Matching
- Electric Vehicle Supply Equipment (EVSE) non-residential
- Electric Vehicle Supply Equipment (EVSE) non-residential with Day Matching 10-in-10
- Electric Vehicle Supply Equipment (EVSE) non-residential with Day Matching Combined
- Electric Vehicle Supply Equipment (EVSE) non-residential with Weather Matching
- Electric Vehicle Supply Equipment (EVSE) residential
- Electric Vehicle Supply Equipment (EVSE) residential with Day Matching 5-in-10

- Electric Vehicle Supply Equipment (EVSE) residential with Day Matching 10-in-10
- Electric Vehicle Supply Equipment (EVSE) residential with Day Matching Combined
- Electric Vehicle Supply Equipment (EVSE) residential with Weather Matching
- PDR-LSR
- PDR-LSR with Day Matching 5-in-10
- PDR-LSR with Day Matching 10-in-10
- PDR-LSR with Day Matching Combined
- PDR-LSR with Weather Matching

The SQMD Plan Template must be submitted in parallel with the PEM form for ISO approval. SQMD Plan template must be submitted To: NRI@caiso.com; PDR@caiso.com. The approval process may take up to 40 calendar days.

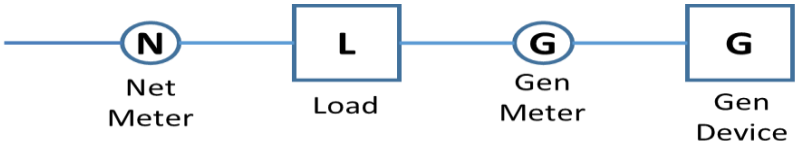
- The SQMD Plan Template Tutorial is located at: http://www.caiso.com/Documents/SQMDResourceTemplateTutorial.pdf
- The SQMD Plan template is located at: http://www.caiso.com/Documents/SQMDPlanTemplate.docx

Additional documentation may be requested by the ISO. Please refer to the BPM for Metering for more information about SQMD.

5.1 Metering Generator Output

The Metering Generator Output (MGO) Methodology is a performance evaluation methodology in which the demand reduction value is based on the output of generator located behind the revenue meter for the demand resource. It requires a second meter, or "sub-meter" to isolate the output from any behind-the-meter generation. Under this metering configuration, the MGO methodology provides for the use of this meter to calculate a Demand Response Energy Measurement based upon the load curtailment provided by that behind-the-meter generator(s) only. The MGO Methodology utilizes a Generator Output Baseline calculation to determine load curtailment provided by the behind-the-meter generator during market participation that is in excess of what it generally provides to curtail facility load, namely, its generating baseline.

The following illustration reflects the metering configuration that includes a generation meter enabling the overall demand response at the location to be separated into a pure load (facility) response and a behind-the-meter generation device's response or contribution.



MGO is calculated by the DRP and not the CAISO. The SC for the DRP is responsible for ensuring that SQMD submitted to the MRI-S represents an accurate generation quantity for the resource which represents the Demand Response Energy Measurement calculated in compliance with the MGO Methodology per tariff sections 4.13.4.2 and 11.6.2.

This option would apply in instances where only the behind-the-meter device is registered in the PDR/RDRR (not the facility load as in the option available under the customer load baseline methodology). The demand response performance, referred to as $\mathbf{DR_{SUPPLY}(t)}$, is the demand reduction resulting from the output of the behind-the-meter generation device for dispatch interval **t**. The demand response performance $\mathbf{DR_{SUPPLY}(t)}$ would be evaluated based on the physical meter generator output G for dispatch interval **t** or **G(t)**, adjusted by a quantity $\mathbf{G_{LM}}$ which represents an estimate of the typical energy output used for retail load modifying purposes and benefits. The calculated value, $\mathbf{G_{LM}}$[4], would appropriately remove an estimated quantity of energy delivered by the device to the facility for

4 $G_{Load\ Modifying}$ or G_{LM} is an ISO term used to represent an estimated value of the typical retail load modifying behavior of the behind the meter generating device.

its retail load modifying purposes, i.e. energy not produced in response to an ISO PDR/RDRR dispatch. The performance evaluation introduces an adjusted MGO value calculated by taking the difference between **G(t)** and $\mathbf{G_{LM}}$, where the demand response performance attributed to a PDR/RDRR supply dispatch would be calculated as:

$$\mathbf{DR_{SUPPLY}(t) = -[G(t) - G_{LM}]}$$

The adjustment for typical retail load modifying behavior, or $\mathbf{G_{LM}}$, is established using a 10-in-10 non-event hour selection method on similar day types, i.e., comparing weekday events to weekday non-events, and weekend and holiday[5] events to weekend and holiday[4] non-events. An "event" is any ISO dispatch of a PDR/RDRR that occurs during an ISO Hour Ending interval, be it the full hour or a 5-minute interval in that hour. G_{LM} is calculated by looking back as far as 45 calendar days and calculating the simple average energy delivered during the 10 most recent non-event hours for the same day type and for the same event hour when the PDR/RDRR dispatch event occurred.

G_{LM} Calculation rules

Following are the rules to calculate $\mathbf{G_{LM}}$:

- A 10-in-10 non-event hour selection method is used
    - The selection of non-event hours is performed by iterating backward up to 45 calendar days to find the target number of non-event hours for the same event hour and same day type beginning with the most recent days and calculating the simple average energy delivered by the device.

5 Holidays = FERC holiday minus Presidents' Day, Veterans Day and Columbus Day

- The selection of Customer Baseline data will include a number of the most recent days, excluding different day-types and previous events hours within those days (definitions below)

- Two different day-types will be supported:
    - Weekday (Monday through Friday)[6]
    - Weekend (Saturday, Sunday)
- An event hour is any hour when there was an ISO market award or dispatch at or above the demand response net benefits test price threshold[7] or outage recorded for the PDR or RDRR.

Market Participation	Status	Event Hour
DA award or RT dispatch ≥ NBT	yes	yes
AS Capacity Award only *(PDR, PDR-LSRcur only)*	yes	no
AS Energy Dispatch *(PDR, PDR-LSRcur only)*	yes	yes
RUC Capacity Award only	yes	no
Outage	yes	yes

    - Periods when the generating device meter is recording a load (charging) is not categorized as an event.

6 Excluding Federal Holidays and the day after Thanksgiving

7 In compliance with the direction provided in FERC Order No. 745, the ISO posts the price thresholds and supply curves that would have been in effect for the previous 12 months, as well as the threshold price and supply curve for the next trade month by the 15th day of the current month.

- Target & minimums are defined as:

	Weekday	Weekend/Holiday
Target	10 Hours	4 Hours
Minimum	5 Hours	4 Hours

- Once the target number of hours is reached, selection ends and a simple average is calculated to determine GLM.
- If the target number of hours is not reached, but the minimum number of hours is reached, G_{LM} is calculated on the selected hours.
    - Example: If only 8 non-event hours for a week day for the applicable event-hour can be found across a 45-day look back, then those set of 8 non-event hours will be averaged.
- If the minimum number of hours is not reached, then GLM is set to zero.

Once the value for GLM is determined, the demand response performance, $\mathbf{DR_{SUPPLY}(t)}$, representing the demand response energy measurement would be calculated as:

$$\mathbf{DR_{SUPPLY}(t) = -[G(t) - G_{LM}]}$$

Charging and Export Treatment

For hours when a behind-the-meter storage device is charging the scheduling coordinator metered entity should record a "zero" for those hours or intervals in that hour. For calculating G_{LM}, the ISO is only interested in the average energy output (not input) across the target or minimum number of hours required for that day type.

For intervals when a behind-the-meter generation results in the export of generation from the location, net meter N< 0 (see behind-the-meter generation meter configuration illustration above for reference), then the MWh amount settled in that interval is the MWh delivered up to N = 0. This net export check is done at each location level, not at the PDR/RDRR aggregate level. The ISO retains the authority to audit both the N and G meter data values submitted by the scheduling coordinator metered entity to ensure compliance with this net export rule.

5.2 Metering Generator Output with Customer Load Baseline

In cases where both the load and the behind-the-meter generation at a location respond to a market award or dispatch, the load curtailment provided would be the combined demand response performance attributed to both reduced load consumption by traditional load reduction methods and the behind-the-meter generation.[8] The Demand Response Energy Measurement would combine calculated results using the Customer Load Baseline Methodology, using gross load meter data,[9] and the MGO Methodology.

Calculations for MGO with Customer Load Baseline may include the following CLB:

- Day Matching 5-in-10 (residential only)
- Day Matching 10-in-10
- Day Matching Combined
- Weather Matching

The SC will be responsible for calculating the CLB and MGO, and ensuring that submitted to the MRI-S represents an accurate generation quantity for the resource which represents the combined Demand Response Energy Measurement calculated in compliance with both the CLB and MGO Methodologies per tariff section 4.13.4 and 11.6.3.

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8 Generally referred to as the combined CLB and MGO Methodology.

9 The gross load meter data reflects the load consumption at that location independent of any offsetting Energy produced by behind-the-meter generation.

This option would apply in instances where both the load and the behind-the-meter device together are registered as the PDR/RDRR resource. Under this option, the demand response performance would be the combined demand response performance attributed to $DR_{LOAD}(t)$ and $DR_{SUPPLY}(t)$, as previously detailed under Customer Load Baseline and Metering Generator Output respectively, resulting in a total demand response reduction calculated as:

$$DR_{TOTAL}(t) = DR_{LOAD}(t) + DR_{SUPPLY}(t)$$

Or, $$DR_{TOTAL}(t) = B_{N-G}(t) - N(t) + G_{LM}(t)$$

Consider the following example where $N(t) = 15$, $G(t) = -7$, $B_{N-G}(t) = 25$ and $G_{LM}(t) = -3$. In this example, the total performance evaluation would be:

$$DR_{LOAD}(t) = B_{N-G}(t) - [N(t) - G(t)] = 3 \textbf{ and } DR_{SUPPLY}(t) = -[G(t) - G_{LM}(t)] = 4$$

Or, $$DR_{TOTAL}(t) = 7$$

The net export rule must be applied to $DR_{SUPPLY}(t)$ consistent with MGO. If $N < 0$, then the MWh amount settled in that interval is the MWh delivered up to $N = 0$. The ISO retains the authority to audit both the N and G meter data values submitted by the scheduling coordinator acting as the scheduling coordinator metered entity to ensure compliance against this net export rule.

5.3 Control Group

Pursuant to Section 4.13.4.3 of the tariff, control groups (CG) must consists of at least 150 distinct End Users that are geographically similar such that they experience the same patterns and grid conditions as the PDRs and RDRRs representing the **Treatment** group (TG). The Control group cannot combine/co-mingle Residential and Non-Residential to meet the requirement of 150 distinct End Users. The Service accounts (locations) representing the **Control** group and **Treatment** group will be identified in the DRRS. The **Control** group Locations will go through the normal LSE and UDC approval process. The difference between the **Control** group and the **Treatment** group is that during event days, the **Treatment** group experienced event dispatch while the **Control** group did not.

When **creating Registration** with the **Control Group** as the baseline method:

- The Control Group Locations must have a minimum of 150 sample sizes, and can span across multiple subLAPs. The subLAP should be specified in the API request and cannot be "null".
- The user is allowed to choose locations in multiple DLAP within in the same subLAP
- In the XSD", identify the valid values of "CG" (Control group location) and "TG" (Treatment group location) in the optional element "locationGroupType". For the UI, the CG and TG must be identified.
- A subLAP of all locations flagged as a TG must be the same. TG Locations subLAPs must also be the same as the registration.
- The Registration must have a at least one TG location.
- A TG location is not allowed to participate in a different registration with overlapping timeframe.
- CG locations can participate in different CG baseline registration with overlapping timeframe if it is marked as a Control group location in the other registration as well.

The Control Group baseline methodology utilizes load data from two (2) distinct groups -- Control Group (CBL) load data and Treatment (TMNT) load data to develop Demand Response Energy Measurement (DREM).

- Control Group Load Data and Treatment Load Data
  - Where DREM = {(hourly avg of **control group load data**) – (hourly avg of **treatment group load data**)} x (#locations in **treatment group**) = {(total load of control group/# locations in control group) – (total load of treatment group/#locations in treatment group)} x #locations in treatment group

CBL and TMNT measurement types are used for monitoring and auditing purposes. The baseline load data should be submitted only if there is an event; the SC shall submit 90 days of historical data prior to the event day. This can be submitted on a daily basis or a full set once dispatch occurs.

Scheduling Coordinators are responsible for validating that the control group accurately represents the PDR/RDRR.

- For PDRs or RDRRs whose number of End Users have not changed for more than 10% in the prior month, the control group must be validated every other month.

- For PDRs and RDRRs whose number of End User have changed for more than 10% in the prior month, the control group must be validated monthly.
- A validation of the Meter Data for the PDR and RDRRs within the control group must be done by evaluating the previous 75 days, excluding the days where the resource performed. More specific criteria for this validation will be described within the Demand Response User Guide.

5.4 Day Matching (5-in-10 Residential Only, 10-in-10, and Combined)

ISO Tariff sections 4.13.4.1 and 4.13.4.4

Scheduling Coordinators will be responsible for calculating the Baseline for PDRs, RDRRs and PDR-LSRs using 5-in-10, 10-in-10, and combined. These Baselines can be utilized with Meter Generation Output, Electric Vehicle Supply Equipment non-residential, Electric Vehicle Supply Equipment residential (5-in-10 only), and Proxy Demand Response – Load Shift Resources (curtailment only) to calculate Demand Response Energy Measurements.

The day matching baselines estimate what electricity use would have been in the absence of a Demand Response dispatch, using electricity use data on non-event, but similar days. The load patterns during a subset of non-event days are used to estimate the baseline for the event day. A total of 13 day matching baselines were evaluated to determine the most accurate and precise of the 13.There are differences between Residential and Non-Residential Day Matching. Non-Residential reflects current 10 in 10. Additionally, weekends are treated differently and reflected in both eligible days to consider then target days and minimums days required if targets cannot be met. Five-in-ten has a maximum adjustment factor of 1.4, the adjusted percentage can have a maximum value of one hundred-forty (140) percent to a minimum of seventy-one (71) percent. Ten-in-ten uses an adjusted percentage of a maximum value of one hundred-twenty (120) percent and a minimum value of eighty (80) percent.

In the case for Proxy Demand Response resources that combine residential and non-residential customers, the aggregate baselines for the two customer groups should be calculated separately using the appropriate baseline and then added together to represent the full resource. This is not necessary if the baseline method for both residential and non-residential customers is the same, as is the case for the current recommended weather matching baselines.

Also, eligible/targets/minimums should be used for day matching 5/10 and 10/10. Note: non-residential can may elect to use the 10-in-10 day matching. Residential can use either day-matching. Event is equivalent to Total Expected Energy (TEE) > 0.

Performance of the PDR or RDRR Residential or Non-Residential for 10 in 10 weekday event day treatment: ISO Tariff section 4.13.4.1

1. Begin by collecting 45 days of historical data leading to the day of the event.
2. Identify eligible days that occurred prior to the event, where TEE > 0 using the last ten (10) non-event weekdays, excluding Holidays with a 45 day lookback.
3. If the minimum number of days cannot be met, a minimum of five (5) calendar days will be used. If the target these targets cannot be met, please see refer to ISO Tariff section 4.13.4.1.a.
4. Generate unadjusted baseline:
    - Unweighted: Simply averaged to generate the baseline
5. Apply Adjustment percentage of a maximum value of one hundred-twenty (120) percent and a minimum value of eighty (80) percent.
    - For adjustment hours, please refer to ISO Tariff section 4.13.4.1c.
6. Calculate the DREM by taking the difference between the baseline and the observed load, the data should have already been decomposed to the 5-minute increment level, and the load reductions relative the baseline are positive. The 5-minute interval should be set to 0 for settlements if baseline is less than the observed load.

Performance of the PDR or RDRR Residential or Non-Residential for 10 in 10 weekend event day treatment: ISO Tariff section 4.13.4.1

1. Begin by collecting 45 days of historical data leading to the day of the event.
2. Use the last four (4) calendar days including Holidays
3. Keep the last four (4) eligible calendar days.
4. If the target cannot be met, please see refer to ISO Tariff section 4.13.4.1.a.
5. Generate unadjusted baseline:
    - Unweighted: Simply averaged to generate the baseline
6. Apply Adjustment an adjusted percentage of a maximum value of one hundred-twenty (120) percent and a minimum value of eighty (80) percent.

- For adjustment hours, please refer to ISO Tariff section 4.13.4.1c.

7. Calculate the DREM by taking the difference between the baseline and the observed load, the data should have already been decomposed to the 5-minute increment level, and the load reductions relative the baseline are positive. The 5-minute interval should be set to 0 for settlements if baseline is less than the observed load.

Performance of the PDR or RDRR Residential Only for 5 in 10 weekday event day treatment: ISO Tariff section 4.13.4.4

1. Begin by collecting 45 days of historical data leading to the day of the event.
2. Remove the ineligible days (weekends and Holidays)
    - Average the hourly load for the eligible event hours for each day.
        - Example, if there was an event on 9/10/2015 at hour ending 17 to hour ending 19, then you would average hour ending 17 to hour ending 19 for each day.
3. Sort by the average event load in decreasing order and select the highest 5 weekdays with the highest totalized load during the hours when the Demand Response Services were provided will be used.
4. Generate unadjusted baseline:
    - Unweighted: Simply averaged to generate the baseline
5. Calculate same-day adjustment.
    - Define the adjustment window periods. Adjustment hours are two hours immediately prior to the event period with a two hours buffer before and two hours after the event with a two hours buffer.
    - Average across those four (4) hours for both the baseline and the date the event was observed.
6. Apply an adjustment percentage: adjustment percentage can have a maximum value of one hundred-forty (140) percent to a minimum of seventy-one (71) percent.

7. Calculate the DREM by taking the difference between the baseline and the observed load, the data should have already been decomposed to the 5-minute increment level, and the load reductions relative the baseline are positive. The 5-minute interval should be set to 0 for settlements if baseline is less than the observed load.

Performance of the PDR or RDRR Residential Only for 5 in 10 weekend event day treatment: ISO Tariff section 4.13.4.4

1. Begin by collecting 45 days of historical data leading to the day of the event.
2. Remove the ineligible days; keeping only the eligible days: weekends, and holidays, and days immediately prior to the event.
3. Keep the last 5 eligible days. Sort by the average event load in decreasing order, and select the highest 3 eligible days with the highest totalized load during the hours when the Demand Response Services were provided will be used.
4. Application of weights to baseline days
    - Weighted average. The closest day to the event day receives a weight of 50%, the next closest receives a weight of 30% and the furthest receives a weight of 20%.

      Note: The closest in this case refers to days closest to the event day, not by the average event load sorting. The weighting is applied by multiplying the % for each day to the hourly load profiles, then summing. This is a weighted average.
5. Calculate same-day adjustment.
    - Define the adjustment window periods. Adjustment hours are two hours immediately prior to the event period with a two hours buffer before and two hours after the event with a two hours buffer.
    - Average across those four (4) hours for both the baseline and the date the event was observed.
6. Apply an adjustment percentage: adjustment percentage can have a maximum value of one hundred-forty (140) percent to a minimum of seventy-one (71) percent.
7. Calculate the DREM by taking the difference between the baseline and the observed load, the data should have already been decomposed to the 5-minute increment level, and the load reductions relative the baseline are positive. The 5-minute interval should be set to 0 for settlements if baseline is less than the observed load.

Day Matching Combined allows the use of 5-in-10 to develop DREM for residential locations and 10-in-10 for non-residential locations (service accounts) when combined in the same resource.

Note: There may be requests to see DREM developed for each customer class if warranted.

The example below shows the combined residential and non-residential Day Matching.

Baseline Type Simplified Example of Day Matching

Example: PDR Event HE12 Intervals 1 – 6 (TEE>0)

- Resource Registration includes both residential and non-residential locations
- **Day Matching** Baseline Type selected

Baseline values assume adjustment has been applied:

HE12	Interval 1	Interval 2	Interval 3	Interval 4	Interval 5	Interval 6
10/10 non-residential	1.5 MW	1.75 MW	1.75 MW	2.0 MW	2.0 MW	2.0 MW
5/10 residential	.25 MW	.50 MW	.50 MW	.50 MW	.65 MW	.75 MW
BASELINEadj Data Submitted	**1.75 MW**	**2.25 MW**	**2.25 MW**	**2.50 MW**	**2.65 MW**	**2.75 MW**

Actual load values for resource during dispatch:

HE12	Interval 1	Interval 2	Interval 3	Interval 4	Interval 5	Interval 6
10/10 non-residential Load	1.25 MW	1.25 MW	1.00 MW	1.00 MW	1.00 MW	2.00 MW
5/10 residential Load	.10 MW	.10 MW	.25 MW	.50 MW	.75 MW	1.00 MW
LOAD Data Submitted	**1.35 MW**	**1.35 MW**	**1.25 MW**	**1.50 MW**	**1.75 MW**	**3.00 MW**

Demand Response Energy Measurement (DREM) = Baseline - Actual:

HE12	Interval 1	Interval 2	Interval 3	Interval 4	Interval 5	Interval 6
10/10 non-residential Load	.25 MW	.50 MW	.75 MW	1.00 MW	1.00 MW	0 MW
5/10 residential Load	.15 MW	.40 MW	.25 MW	0 MW	0 MW [1]	0 MW [1]
DREM Data Submitted = BASELINEadj – Actual Load	**.40 MW**	**.90 MW**	**1.00 MW**	**1.00 MW**	**1.00 MW**	**0 MW** [1]

[1] Note, DREM = max (0, BASELINEadj – Actual Load)

5.5 Weather Matching

ISO Tariff section 4.13.4.5

Pursuant to Section 4.13.4.5 of the tariff, Scheduling Coordinators will be responsible for calculating the Baseline for PDRs, RDRRs and PDR-LSRs using Weather Matching. The Baseline can be utilized with Meter Generation Output, Electric Vehicle Supply Equipment residential/non-residential, and Proxy Demand Response – Load Shift Resources (curtailment only) to calculate Demand Response Energy Measurements.

The weather matching baselines estimate what electricity use would have been in the absence of Demand Response dispatch during non-event days with similar weather conditions. The load patterns with the most similar weather conditions during a subset of non-event days are used to estimate the baseline for the event day. Weather matching baselines do not include information from an external control group. A total of seven weather-matching baselines were evaluated to determine the most accurate and precise of the seven.

Performance of DR using a Weather Matching Methodology is determined by:

- Using four days from a pool of non-event days, with the closest daily maximum temperature of event that occurred.
- Collecting 90 days of historical data leading to the day of the event. For weekdays, excluding the event days and Holidays. For weekends and Holidays, exclude event days.
- Adjustment hours are two hours immediately prior to the event period with a two hours buffer before and two hours after the event with a two hours buffer.

Should the size of the population increase or decrease over time, the sample fraction must be re-evaluated and the sample size adjusted accordingly.

Virtual SQMD derived based on statistical sampled physical metering rather than physical metering data for all locations, is treated identical to any other SQMD submitted in the MRI-S. Virtual SQMD can only be used for a PDR or RDRR selecting the Customer Load Baseline Performance Methodology. Market participants providing statistically sampled SQMD may be requested to comply with ISO information requests to audit their meter data collection and "virtual" meter data scaling process.

5.6 Electric Vehicle Supply Equipment (EVSE)

ISO Tariff Section 4.13.4.6

The performance measurement of EVSE is tailored for Electric Vehicle market participation and enables the direct measurement of the actual Electric Vehicle load curtailment when distinctly measured from an EVSE sub-meter, aggregation of EVSE sub-meters or aggregation of individual meters embedded in the EVSEs.

The EVSE performance methodology differentiates between residential and non-residential service locations. An EVSE residential service location will use the 5-in-10 load baseline while an EVSE non-residential service location will use the 10-in-10 load baseline.

The EVSE performance may be independently measured or combined with load curtailment from the EVSE host:

EVSE residential – performance of EVSE only

- EVSE res
    - EVSE residential can be combined with the following CLB listed below:
        - Day Matching 5-in-10
        - Day Matching 10-in-10
        - Day Matching Combined
        - Weather Matching

EVSE non-residential – performance of EVSE only

- EVSE non res
    - EVSE non-residential plus the following CLB listed below:
        - Day Matching 10-in-10

- Day Matching Combined
- Weather Matching

Use of the EVSE performance methodologies requires at least one service account identified with having a behind-the-meter EVSE to be included in the registration. Each locations EVSE aggregated load curtailment must be calculated separately and then combined with the host load curtailment calculated using a separate customer load baseline to represent the total performance of the resource. Additionally, EVSE load curtailment used in combination with the "Day Matching Combined" baseline for calculating the host load curtailment, allows the mixing of residential and non-residential customer service accounts in a registration. It requires calculation of performance of the residential and non-residential customer load curtailment separately using the appropriate baseline for each customer class.

The following table illustrates the calculation logic when using an EVSE with Day Matching Combined performance measurement:

Baseline Methodology	**EVSE residential + Day Matching Combined**	**EVSE non-residential + Day Matching Combined**
Locations	Location 1: non-residential: non-residential + no charging station Location 2: residential: residential + charging station	Location 1: non-residential + no charging station Location 2: residential + charging station Location 3: non-residential + charging station
Performance Calculation	Location 1 + Location 2 Non-residential (10/10) + EVSE residential (5/10)	Location 1 + Location 2 + Location 3 [Non-residential (10/10) + residential (5/10)] + EVSE non-residential (10/10)

5.7 Proxy Demand Resource-Load Shift Resource (PDR-LSR)

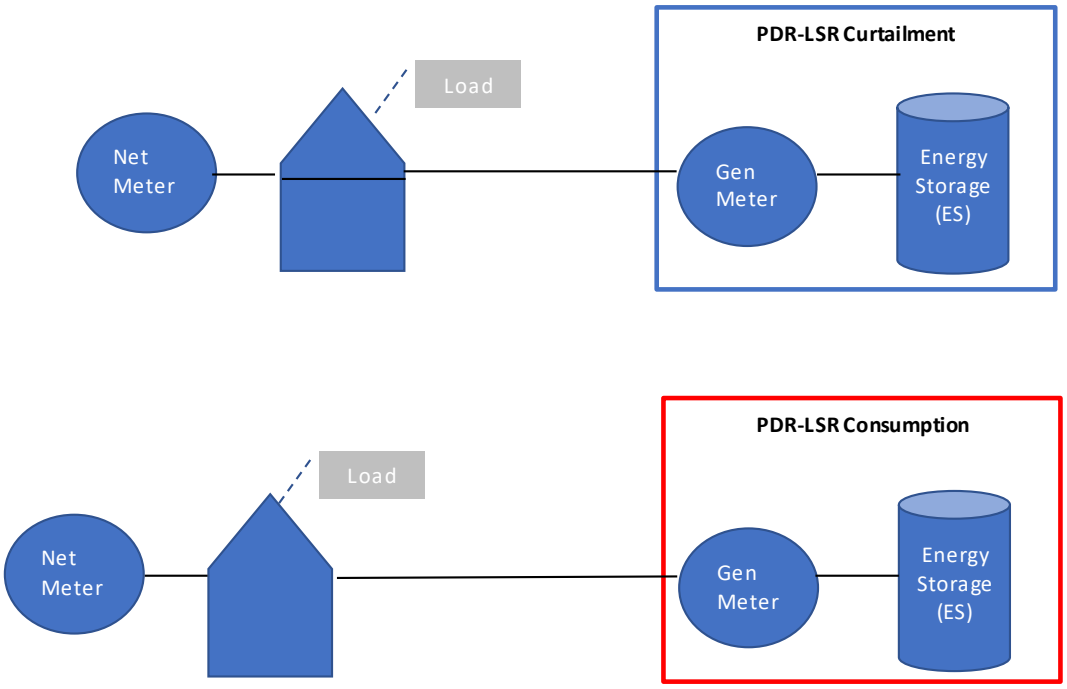
ISO Tariff Section 4.13.4.7 and 11.6.7

With the PDR-LSR performance methodology, the SC may calculate the load curtailment of facility, load curtailment of the behind-the-meter storage, and the load consumption of the behind-the-meter storage.

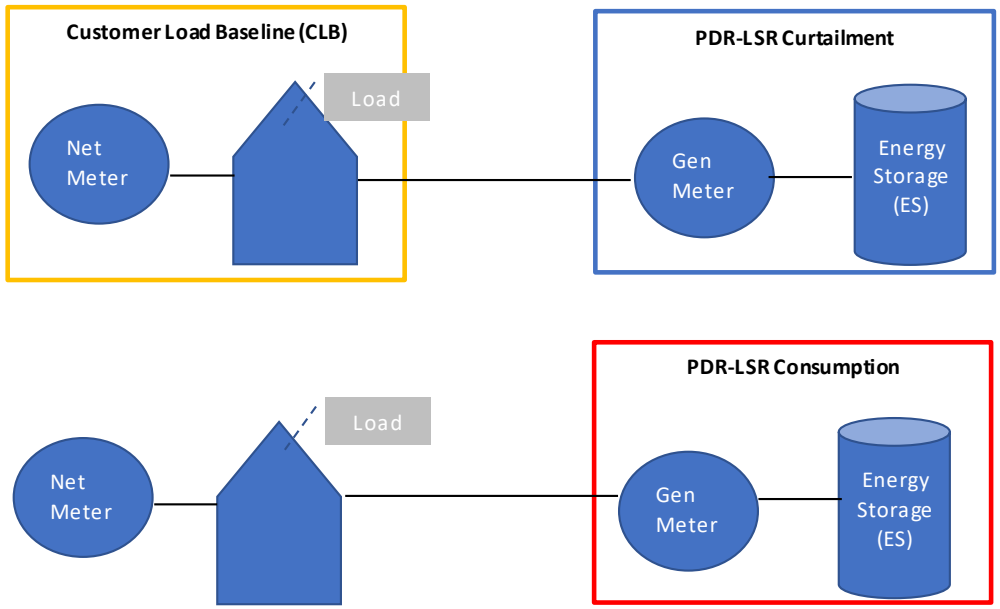
PDR-LSR may utilize the following configurations for calculating performance methodologies:

1. Only the behind-the-meter energy storage device provides load curtailment and consumption.

Customer Load Baseline (CLB)



2. The PDR-LSR with Baseline is used when the facility load is offering load curtailment, and the behind-the-meter storage provides both load curtailment and load consumption. The facility load nets out the energy storage device and utilizes the customer load baseline to calculate load curtailment. The behind-the-meter storage will utilize the PDR-LSR curtailment calculation to combine the facility load CLB derived value. The PDR-LSR consumption will only apply to the behind-the-meter storage.



6. Approved Statistical Sampling Methodology

Pursuant to Section 10.1.7 of the tariff, a Demand Response Provider representing a PDR or RDRR must obtain CAISO approval of any methodology used to statistically derive meter data for the PDR or RDRR that consists of a statistical sampling of Energy usage data. The CAISO will accept, as pre-approved,[10] any request for use of the methodology detailed in this section for the following cases:

- For day-ahead energy participation only, when hourly interval metering is not installed at all underlying resource locations. Not applicable for ancillary service participation.
- For day-ahead energy participation only, when hourly interval metering is installed at all underlying resource locations but RQMD is not derived using the hourly interval meter data for settlement purposes, but is developed using load profiles. Not applicable for ancillary service participation.
- For real-time and ancillary services participation when interval metering installed at all underlying resource locations is not recorded in 5- or 15-minute intervals.

The ISO tariff provision to statistically derive meter data was included to accommodate participation of an aggregated PDR/RDRR comprising several locations, some of which are interval metered and have revenue quality meter data available, and with the condition that the balance of locations would mimic the metered random sample. Once the randomly sampled fraction of revenue quality meter data is converted to settlement quality meter data (SQMD), the sum is then scaled to derive the SQMD sized for the PDR/RDRR.

10 Attachment A provides DRPs with a template that can be submitted to the CAISO to request use of the approved Statistical Sampling Methodology. The CAISO requires 10 business days to process requests submitted with completed template provided.

6.1.1.1 Virtual SQMD Calculation

This scaled SQMD value is called the **Virtual SQMD** and is calculated as:

$$m_{VIRTUAL} = \frac{N}{n} \cdot \sum_{i=1}^{n} m_i$$

where: $N = Total\ Number\ of\ Locations\ Participating$

$n = Number\ of\ Metered\ Locations$

$m_i = SQMD\ for\ Location\ i$

$n \in N\ (Metered\ Locations\ are\ a\ subset\ of\ Locations\ Participating)$

It is critical that the members of the sample (n) be selected at random from within the population (N). This means that sample members must be selected without bias to any factor such as size, location, or customer type. The participant may be required to demonstrate that each PDR/RDRR sample was selected at random.

6.1.1.2 Sample Size Determination

Determining the minimum number of metered locations providing RQMD is based on statistical sampling principles. For an infinite population, the required sample size is given as:

$$n' = \left(\frac{z}{e_{REL}}\right)^2 \cdot \left(\frac{1-p}{p}\right)$$

Where: $e_{REL} = Relative\ Precision\ Level$

$z = Value\ based\ on\ Level\ Of\ Confidence$

$p = True\ Population\ Proportion$

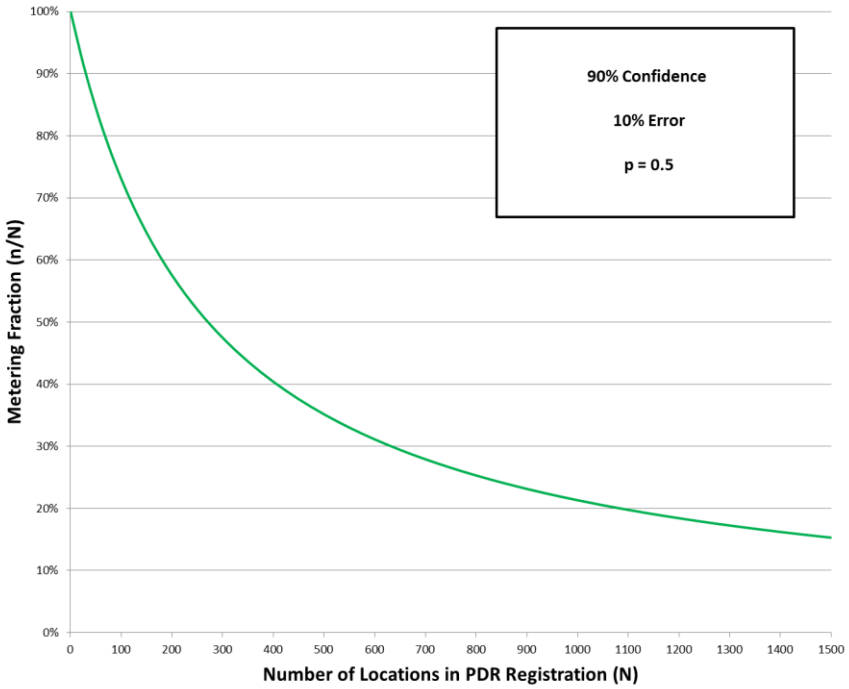
For a finite population, the sample fraction can be calculated as:

$$\frac{n}{N} = \frac{n'}{N + n'}$$

This yields several different Metering Fraction curves as a function of the two variables to be fixed, in addition to the population size (N) and the True Population Proportion (p).

The following figure shows the resulting curve based on the ISO's approved decision to set the Relative Precision Level to 10% and the Level of Confidence to 90%, which results in a z of 1.645 11. Since the True Population Proportion is difficult to calculate, a value of p = 0.5 is chosen, similar to other ISOs and RTOs. The sample size for an infinite population with these requirements is therefore: $\mathbf{n}' = \mathbf{271}$.

11 The value of z is derived from a distribution of samples with 10% of the high samples and 10% of the low samples in the two respective tails of a Gaussian distribution.


90% Confidence
10% Error
p = 0.5
Metering Fraction (n/N)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
Number of Locations in PDR Registration (N)

6.1.1.3 Minimum Sample Fractions

The ISO requires that every resource employing the approved statistical sampling methodology have a sample fraction:

$$f = \frac{n}{N} = \frac{n'}{N + n'} = \frac{271}{N + 271}$$

The following table shows a number values for the fraction based on the number of locations:

PDR Locations	Minimum Sample Fraction
10	96%
25	92%
50	84%
75	78%
100	73%
125	68%
150	64%
175	61%
200	58%
250	52%
300	47%
350	44%
400	40%
500	35%
750	27%
1000	21%
1500	15%
2000	12%

7. Resource Registration

PDR, RDRR, and PDR-LSR Resource ID

The PDR, RDRR, and PDR-LSR Resource ID is a CAISO assigned Resource ID that represents a Proxy Demand Resource, Reliability Demand Response Resource or Proxy Demand Response-Load Shift Resource in the CAISO Markets. The DRP shall maintain its Registration to ensure that the information represented is accurate such as SC for the Resource ID. The DRP will make the appropriate changes to the registration, and notify the CAISO of changes that impacts Master File. The Resource ID will be used to bid, schedule, receive an award, receive Automated Dispatches System (ADS) instructions and be settled in the CAISO Markets. There are certain steps that must be accomplished by the DRP, LSE, UDC, and CAISO before the CAISO can assign a PDR, RDRR or PDR-LSR Resource ID.

There are three different types of Resource IDs that can be assigned to a PDR, RDRR or PDR-LSR;

- Pre-defined – A pre-defined resource is one that has been pre-modeled within a SubLAP by the CAISO using pre-identified nodes and pre-established distribution factors.

- Custom - A custom resource is one that is, upon request of the DRP, specifically for resource that is not in the existing CAISO modeled within a SubLAP using customized DRP identified Pricing Node(s) within a SubLAP and customized distribution factors based on actual load curtailment across the Nodes.

- PDR-LSR – A Proxy Demand Resource Load Shift Resource is registered in the demand response system and modeled in the full network model as a single pre-defined resource with two distinct Resource IDs registered in the Master File. This allows the resource to bid and be dispatched for both load curtailment and load consumption. The PDR-LSR will register in DRRS under the *Curtailment ID,* and Master File under two resource IDs -- *Curtailment ID,* and the *Consumption ID*.

The naming convention to identify the PDR-LSR *Curtailment and Consumption Resource* will be as follow:

  - PDR-LSR Curtailment subLAP_voltagecode_PDRPCURxxx >> example ABCD_1_PDRPCUR001

  - PDR-LSR Consumption subLAP_voltagecode_PDRPCURxxx >> example ABCD_1_PDRPCON001

The two resource IDs must be submitted in one file (GRDT) when registering for Master File. Both resource IDs must have the same BID_DISP_OPT, SC_ID, and effective dates. See section 8 for Generator Data Template (GRDT) submission and processing for more information.

Electric Vehicle Supply Equipment (EVSE) is modeled as a PDR, therefore registration will follow the same process as the standard PDR resource for DRRS and MasterFile. However, when utilizing the EVSE baseline methodology, service account/location must have at least one (1) behind-the-meter or energy storage device.

In DRRS, registrations for resources with the behind-the-meter storage device, and EVSE utilizing the following Baseline Methodologies will be validated against the Baseline Method, and the Location's device type:

- Meter Generator Output
- Meter Generation Output with Day Matching 5-in-10
- Meter Generation Output with Day Matching 10-in-10
- Meter Generation Output with Day Matching Combined
- Meter Generation Output with Weather Matching
- Electric Vehicle Supply Equipment (EVSE) non-residential
- Electric Vehicle Supply Equipment (EVSE) non-residential with Day Matching 10-in-10
- Electric Vehicle Supply Equipment (EVSE) non-residential with Day Matching Combined
- Electric Vehicle Supply Equipment (EVSE) non-residential with Weather Matching
- Electric Vehicle Supply Equipment (EVSE) residential
- Electric Vehicle Supply Equipment (EVSE) residential with Day Matching 5-in-10
- Electric Vehicle Supply Equipment (EVSE) residential with Day Matching 10-in-10

- Electric Vehicle Supply Equipment (EVSE) residential with Day Matching Combined
- Electric Vehicle Supply Equipment (EVSE) residential with Weather Matching
- PDR-LSR
- PDR-LSR with Day Matching 5-in-10
- PDR-LSR with Day Matching 10-in-10
- PDR-LSR with Day Matching Combined
- PDR-LSR with Weather Matching

Please see Appendix E – Location Type – Baseline Method Reference Matrix, and the Demand Response Registration User Guide for more information on creating registration.

Registration versus Resource ID Relationship

Both pre-defined and custom Resource IDs will have a 1:1 relationship with a current registration.

PDR-LSR will have a 1:1 relationship in DRRS, but 1:2 relationship in Master File.

8. Generation Data Template (GRDT) Submission and Processing[12]

Resource management requires interfacing with the Masterfile and Resource Modeling processes.[13] Resource modeling sets up and maintains resource characteristics and scheduling coordinator assignments used in the market and systems to reliably operate the grid. Once the Registration is in the **confirmed** status, the DRP must follow this process and timelines associated with it to establish a PDR/RDRR/PDR-LSR in the Masterfile or to make updates to an existing PDR/RDRR/PDR-LSR attributes. The Masterfile maintains all resource attributes used in the markets and is the system of record for resource participation.

The **Generator Resource Data Template (GRDT)** is used to submit requests to add or change specific operating parameters that reside in the Master File**. All GRDTs shall be sent to the RDT@caiso.com.** Please see Business Practice Manual (BPM) for Market Instruments, Appendix B for Master File update procedures, and data elements in the GRDT. In addition to the BPM for Market Instruments, the GRDT and IRDT Definitions provides definitions of the data elements, business rules, and tips for making changes. The GRDT and IRDT Definitions is located on CAISO website at: www.caiso.com > Market & Operations > Network and Resource Modeling

Custom Resource ID

After the SC has successfully create a registration in DRRS for the "Custom" Resource type, the SC shall submit the GRDT to RDT@caiso.com. The SC must provide the Registration ID in the "**Comment**" column, the **Resource ID** (blank) and the SC/DRP can determine any name for the **Resource Name** (RES_NAME). If Resource ID = Resource Name, leave the **Resource Name** blank.

The CAISO will notify the SC with the Resource ID and the effective date in Master File.

12 Section 8 contains updates that have not yet been approved (PRR 1465)

13 Detailed information on the CAISO Resource Modeling process can be found at http://www.caiso.com/market/Pages/NetworkandResourceModeling/Default.aspx

Registration Levels

The CAISO will provide the ability to allow changes to the underlying end use Load customers without having to issue a new Resource ID to the DRP. Registration levels were created to allow flexibility for the DRP to revise its end use customers associated with a PDR, RDRR or PDR-LSR, without having to request a new Resource ID. The registration level will also allow easier application of the baseline, as will be explained below. The key aspect of the registration level is that the meter data for both the baseline and the event day will need to be submitted to the CAISO at the registration level of the Resource ID.

The Demand Response Registration System allows the DRP to create registrations. These registrations must maintain the same standards as the overarching PDR, RDRR or PDR-LSR with underlying Load represented by the same LSE and located in the same Sub-LAP. Each registration must represent participation in the same market(s), and for a RDRR the registration must have the same real-time dispatch option (marginal or discrete) and seasonal term designation.

Since Registrations can be effective dated, changes to underlying locations can be staged to maintain sequential confirmed Registrations for a given Resource ID minimizing risk of participation gaps for the PDR/RDRR. This allows for ongoing changes to occur at the registration level with limited impact to the effective date of the PDR, RDRR or PDR-LSR in the Master File when Registrations are changing based on underlying Location effective date changes. It is the DRPs/SCs responsibility to monitor the Registrations in DRRS and ensure that changes are made to the Master File to accurately represent their PDR/RDRR/PDR-LSR market participation capabilities including the resources PMax, BID_DISP_OPT, and effective dates.

The CAISO will take automated measures to identify and correct cases where there is an effective PDR/RDRR Resource ID in the Masterfile without a valid corresponding effective Registration in the DRRS. This correction may include:

- End-dating of the identified Resource ID

Any Master File update may take 5 to 11 business days to implement, depending on the complexity of the changes, and is subject to the Master File Data Freeze.

The Masterfile maintains the discrete dispatch selection for RDRR resources. The discrete dispatch status may be selected once during a Reliability Demand Response Services season (winter/summer). A season is a 6 month period (summer and winter). Once selected, the status shall be maintained throughout the season. The discrete dispatch flag may be selected once within a season such that after the initial season selection, selection updates can be made ONCE in subsequent seasons.

- Summer season runs from June through September
- Winter season runs from October through May

For RDRR Masterfile set up, the following requirements apply:

- Each RDRR must have a minimum of 500 kW of load reduction.
- Each RDRR may choose a Discrete Real-Time Dispatch Option once each season. Non-selection defaults RDRR to the Marginal Real-Time Dispatch Option which must remain until the end of the season.
- Each RDRR must reach its maximum load curtailment within forty (40) minutes after it receives a Dispatch Instruction, and must be capable of providing Demand Response Services for at least four (4) consecutive hours per Demand Response Event.
- Each RDRR must have a minimum run time of no more than one (1) hour.
- Bid Dispatchable Options are 60-minutes, 15-minutes, and 5-minutes.
- Master File stores a Demand Response (DR) Type attribute, "DR_TYPE[1410] = 'RDRR'. Data is viewable only. This field in Master File is set up based on the valid registration in the Demand Response Registration System.

- The maximum load curtailment for a resource that selects the Discrete Real-Time Dispatch Option shall be no larger than 100 MW. There is no maximum for RDRR selecting the Marginal Real-Time Dispatch Option.

The CAISO will consider exceptions to the discrete dispatch cap if there are valid reasons for the resource to exceed 100 MW. The Demand Response Provider must submit a request for approval *via a CIDI ticket with the Subject Line "Demand Response Attestation".* The Demand Response Provider must attach the attestation to the CIDI ticket. The Attestation can be found under Appendix H of this Business Process Manual. In the attestation, The Demand Response Provider must attest that the Reliability Demand Response Resource is (1) located at a single site; (2) cannot safely or operationally be split into multiple loads; and (3) does not have the ability to operate under the Marginal Real-Time Dispatch Option.

The CAISO will review the attestation and must be able to determine that the above the cap size of the RDRR and its use of the Discrete Real-Time Dispatch Option does not cause significant reliability issues. Once the CAISO approves the attestation, the appropriate settings will be made within the Masterfile and the CIDI ticket will be closed. Please allow 10 business days for review and approval.

This request can be summited at any time. However, if the resource is approved for over 100 MW and later increases by 50MW or greater, or otherwise makes changes that would affect the answers in its original attestation, a new attestation must be submitted.

For any increment or decrease to the resource's Pmax value, it is the responsibility of the Scheduling Coordinator to update the Generator Resource Data Template (GRDT).

For Masterfile set up, the following requirements apply:

- For PDR and RDRR, the SC may elect to use the sixty (60) minute, fifteen (15) minute or five (5) minute bid dispatchable options. PDR and RDRRs with no election will default to the 60-minute bid dispatchable option, and may request to update the option to a 15 or 5 minute intervals option with a basis for the change. Additional information may be requested by the CAISO to confirm that physical characteristics of the resource conform to the bid and dispatch option elected.

- Master File will store a Demand Response (DR) Type attribute, "DR_TYPE[14] = 'PDR'. This field will be set in the Master File based on the valid registration in the Demand Response Registration System. SCs will be able to view this attribute on the GRDT, but not modify.

Additionally, for PDR-LSR Masterfile set up, the following requirements apply:

- Two (2) Resource IDs must be represented on the same GRDT file.

  1) One represents the load ***Curtailment***.

  - *Curtailment ID* will be identified as FUEL_TYPE = 'GEN', same as the standard PDR resources.
  - MIN_GEN = 0
  - MAX_GEN > 0
  - Eligible for Spin and Non-Spin

  2) The other represents load ***Consumption***.

  - The *Consumption ID* will be identified as FUEL_TYPE = 'DDR'
  - MIN_GEN < 0
  - MAX_GEN = 0
  - Not Eligible for Spin or Non-Spin

- DR_TYPE = 'PDR_LSR' for load shifting resource.

14 GRDT definition and business rules for DR_TYPE: PDR is Proxy Demand Response, RDRR – Reliability Demand Response Resource, and all others are Null.

- BID_DISP_OPT can either be 5 or 15. Both *Curtailment ID* and *Consumption ID* must elect the same BID_DISP_OPT.

    1) The PDR _LSR must elect to bid and be dispatched in either a five (5) or fifteen (15) minute intervals

    2) Additional information may be requested by the CAISO to confirm that physical characteristics of the resource conform to the bid and dispatch option elected.

- Validations rule will apply to both *Curtailment and Consumption IDs* to ensure that the PMin to PMax ramp rates is achievable for the 5 minute or 15 minute BID_DISP_OPT:

    (PMAX – PMIN)/BID_DISP_OPT

- The effective start and end date must be the same for the related PDR_LSR resource IDs.

9. Net Qualifying Capacity (NQC) values for Resource Adequacy (RA)

PDR, RDRR, and PDR-LSR (Curtailment only) Resources with RA capacity must establish net qualifying capacity values (NQC) prior to submitting a Resource Adequacy (RA) Plan or a Supply Plan. To do so, the SC must submit an NQC request form through the CIRA application. The NQC request form is available on the CAISO website at: http://www.caiso.com/planning/Pages/ReliabilityRequirements/Default.aspx.

Please see the BPM for Reliability Requirements for more details on NQC and RA eligibility, as well as the timeline the SC must follow for NQC, RA Plan and Supply Plan submission.

10. Effective Flexible Capacity (EFC) values for Resource Adequacy

Through the RA program, LSEs can procure generic and flexible capacity RA. The generic RA capacity a resource can provide is established by NQC value, and flexible capacity RA is established by EFC value using the formula as described in the ISO Tariff subsection 40.10.4.1(a). In order to be eligible for flexible capacity RA, Proxy

Demand Resource must elect the five (5) minute bid dispatchable option. PDRs providing flexible capacity must also meet its must offer obligation (MOO) as described in the BPM for Reliability Requirements.

11. Telemetry

Telemetry is a requirement of market participation for a PDR with a rated capacity (Pmax) greater than or equal to 10 MW. It is also required for a PDR that requests certification to provide non-spinning and spinning reserve at any rated capacity (Pmax). Please refer to the BPM for Direct Telemetry for details on the ISO direct telemetry process, diagram, and validation process of telemetry data flow.

DR seeking Telemetry may follow the flowchart, and checklist posted on the CAISO website under the "Demand response and load" section at: http://www.caiso.com/participate/Pages/Load/Default.aspx

Telemetry request shall follow the Full Network Model schedule.

12. Using the Appropriate Systems for Meter Data Management, and Performance Data Submittal

Scheduling Coordinators must submit Demand Response Energy Measurement (DREM), and monitoring data (as applicable) into the Market Results Interface-Settlements system (MRI-S). DREM submissions will be considered Settlement Quality Meter Data (SQMD). DREM represents performance of the resources in response to a schedule or dispatch and will be used for the market settlement calculation. Additionally, Proxy Demand Response Resources providing Ancillary Services must submit Load Meter Data into the MRI-S for the interval preceding, during, and following the Trading Interval(s) in which they were awarded Ancillary Services. The data requirements for submittal into MRI-S for each Baseline/Performance Evaluation Methodology are listed in Appendix B, and Appendix C.

For more information regarding Meter Data management and timelines, please refer to the Business Practice Manual (BPM) for Metering section 12.7.

13. Using Customer Market Results Interface (CMRI)

For PDR selecting the 60-Minute, and 15-Minute bid dispatchable options, utilize CMRI to obtain dispatch instruction, until the ADS Replacement Project is implemented. Scheduling coordinator may also obtain the report in CMRI to view Event or Total Expected Energy (TEE).

The three (3) reports are listed below:

- Expected Energy report to view whether there is an Event or TEE.[15]
- Real-Time Unit Commitment (RTUC) Advisory Schedules (60-Minute)
    - The report is published as Advisory, but should be considered binding for PDRs selecting the hourly bid option.
- Fifteen-Minute Market (FMM) Schedules (15-Minute)

For more information on how to pull the reports, see the Demand Response Registration User Guide available at www.caiso.com.

14. DRRS Monitoring Process

The CAISO will monitor through the demand response applications and business processes the performance of the PDR or RDRR. In general, the CAISO will look at certain metrics across all PDR, RDRR, and PDR-LSR, and will flag those which fall outside typical ranges. However, based on monitoring results, the CAISO will take action pursuant to CAISO Tariff Section 30.6.3.

15. Outages

A PDR, RDRR or PDR-LSR is allowed to have outages, but will be limited to updates to its ramp rates or to modifying its capacity to 0. PDR, RDRR and PDR-LSR are all-or-nothing resources, which limits how much such resources can be derated. PDR, RDRR, and PDR-LSR are also prevented from submitting a rerate of their PMin. OMS has been updated to enforce these business rules.

[15] Expected Energy report is used by all PDRs, irrespective of selecting the 60 minute or 15 minute bid dispatchable options.

OMS has been updated to permit a PDR, RDRR or PDR-LSR to submit only PMax derates or Ramp Rate derates. Any other data entered in OMS through either the UI or API for a PDR, RDRR, or PDR-LSR Resource ID shall return an error message. OMS also has validation to restrict PMax derates entries for PDR and RDRR Resource IDs to be only 0 MW. A PMax derate is used to indicate a day should not be used in the baseline calculation. Since a day is either valid or invalid, the only PMAX derate permitted for PDR and PDR-LSR is derate to 0 MW's (i.e., a PDR is either 100% available or 0% available, there are no partial derates for PDRs and PDR-LSRs).

Cause codes are no longer required when submitting outages.

In order to keep a Resource ID active and reduce the need to make updates to the CAISO Master File, the DRP using its scheduling coordinator can submit extended outages to derate its resource to 0 MW when it does not wish to participate in the market. Please see Operating Procedure 3220 for more information.

16. Net Benefits Test (NBT)

ISO Tariff section 30.6.3

The Net Benefits Test will establish a Market Clearing Price for PDRs, RDRRs, and PDR-LSRs. PDR, RDRR, PDR-LSR (Curtailment only) bids for energy must be at or above the Market Clearing Price in the CAISO market. PDR-LSR load consumption may bid from the bid floor up to a value less than $0.

The CAISO will post on the CAISO website the Net benefits Test's Market Clearing Prices that in effect in the previous 12 months, and any update to the supply curve analysis. The monthly future gas prices are used in the calculation of Demand Response NBT threshold prices, please see Appendix C of BPM for Market Instruments.

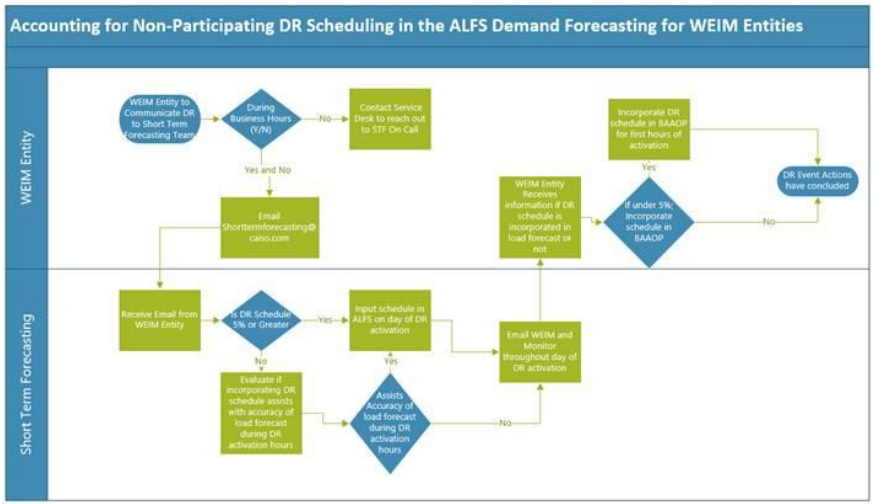
The process for determining the Market Clearing Price is set forth in Section 30.6.3.1 of the CAISO tariff.

17. Accounting for Non-Participating DR Scheduling in the Resource Sufficiency Evaluation (RSE) for WEIM Entities

A non-participating DR (*e.g.*, Demand Response that are not represented by PDR or RDRR models) may be accounted for as reductions to the Load Forecast utilized in the Balancing, Feasibility, Capacity and Flexible Ramping RSE tests. This functionality is based upon a MasterFile inclusion flag, where upon each WEIM entity's attestation that only a non-participating DR will be submitted, such hourly values may be provided that represent the DR expected in each WEIM entity load forecast zone. DR adjustments are submitted via the BAAOP UI by WEIM operators during events when such DR is called upon. For further details on this function and process, refer to the *Energy Imbalance Market BPM, Section 11.3.2 Resource Sufficiency Evaluation and Appendix C*.

18. Accounting for Non-Participating DR Scheduling in the ALFS Forecasting for WEIM Entities

A non-participating DR (*e.g.*, Demand Response that are not represented by PDR or RDRR models) may be accounted for as additions or reductions to the Load Forecast utilized in the formation of the CAISO forecast of EIM Demand if determined by the Short Term Forecasting team to enhance the accuracy of CAISO forecast of EIM Demand. This functionality can be utilized if the WEIM Entities follow the communication process outlined in the diagram, below.


Accounting for Non-Participating DR Scheduling in the ALFS Demand Forecasting for WEIM Entities
WEIM Entity
Short Term Forecasting
WEIM Entity to Communicate DR to Short Term Forecasting Team
During Business Hours (Y/N)
No
Contact Service Desk to reach out to STF On Call
Yes and No
Email Shorttermforecasting@caiso.com
Incorporate DR schedule in BAAOP for first hours of activation
Yes
DR Event Actions have concluded
WEIM Entity Receives information if DR schedule is incorporated in load forecast or not
If under 5%; Incorporate schedule in BAAOP
No
Receive Email from WEIM Entity
Is DR Schedule 5% or Greater
Yes
Input schedule in ALFS on day of DR activation
Email WEIM and Monitor throughout day of DR activation
No
Yes
Evaluate if incorporating DR schedule assists with accuracy of load forecast during DR activation hours
Assists Accuracy of load forecast during DR activation hours
No

Appendix A: Definitions

The following defined terms and acronyms are used throughout this document:

Terms	Definition
ADS	Automated Dispatch System
AIM	Access Identity Management (AIM) application. The application provides registered UAAs with the ability to view application-level access for all of their organization's users as well as any users from other organizations who have access to their resources (endorsed users).
AIMS	Access and Identity Management System – application used to provision access to users of the DRRS
API	Application User Interface. Allows users to upload bulk location data to accommodate the input of the volume of locations participating in the Demand Response Program.
CLB	Customer Load Baseline
CMRI	Customer Market Results Interface
Custom Resource ID	A unique resource ID requested by the DRP, modeled with their specified nodal location and associated generation distribution factors (GDF)
Customer	The name of the customer that the user assigned during the registration process
DCR	Distributed Curtailment Resource – A Distributed Energy Resource providing Demand curtailment as part of a Distributed Energy Resource Aggregation.

DERA	Distributed Energy Resource Aggregation
Demand Response Energy Measurement	The quantity of Energy equal to the difference between (i) the Customer Baseline for the Proxy Demand Resource or Reliability Demand Response Resource and (ii) either the actual underlying Load or the quantity of Energy calculated pursuant to Section 10.1.7 for the Proxy Demand Resource or Reliability Demand Response Resource for a Demand Response Event.
DRP	Demand Response Provider
DRP SC	Demand Response Provider Scheduling Coordinator who are responsible for submitting bids into the market and meter data to the MRI-S.
DRPA	Demand Response Provider Agreement previously called Proxy Demand Resource Agreement (PDRA).
DRRS	Demand Response Registration System. Allows users to create large volumes of locations and aggregate locations for participation in the ISO's demand response program.
DRRS UI	Demand Response Registration System User Interface
Energy Storage (ES)	The term Energy Storage (ES) and Behind-The-Meter (BTM) is used interchangeably.
EVSE	Electric Vehicle Supply Equipment
Event	Total Expected Energy (TEE) > 0

FMM	Fifteen-Minute Market
HASP	Hour-Ahead Scheduling Process
Load Reduction	The total Load Reduction capacity per location
Location name	Identifies the location/site for the user
Locations	Physical location of the demand response entity. This includes the customer data such as the service account number, physical service location, and curtailable load amounts.
LSE	Load Serving Entity
MF	Master file database contains the physical characteristics and data used by the CAISO for
MSA	Meter Service Agreement
NBT	Net Benefit Test
New Custom PDR	CAISO will develop a new resource ID for this registration (custom).
PDR	Proxy Demand Resource
PDR-LSR	Proxy Demand Resource – Load Shift Resource. A resource participation model facilitating participation of the curtailment and consumption of load.
PEM	Performance Evaluation Methodology or also known as Baseline Methodology. A baseline is an estimate of the expected consumption had there not been a demand response event.
Pnode	Pricing Node - A single network Node or subset of network Nodes where a physical injection or withdrawal is modeled and for which a Locational Marginal Price is calculated and used for financial settlements.
Pre-Defined Resource ID	A pre-established resource ID pre-modeled in each SubLAP based on CAISO specifications and available in the MasterFile for DRP to request assignment to a registration.
RDRR	Reliability Demand Response Resource

Registration	Comprised of a single location or an aggregation of many locations. Submitted by the DRP to the LSE and UDC for review and CAISO for approval. Meter data is also submitted at the registration level for the baseline calculation prior to the market participation.
Resource ID	A unique ID used for participation in the ISO wholesale markets (scheduling/bidding and settlements). Assigned by the CAISO during the registration process in the Demand Response Registration System. Resource specific information for the ID resides in the ISO Master File.
RUC	Residential Unit Commitment
SQMD	Settlement Quality Meter Data
SubLAP	Sub-Load Aggregation Point, which represents an aggregation of PNodes within a Default Load Aggregation Point (DLAP). There are 23 SubLAP locations in CAISO. The SubLAP is the location in which all the locations within the registration reside.
UAA	User Access Administrator
UDC	Utility Distribution Company. The UDC is the entity that operates an electric distribution system. It is also where the Locations in the Registration reside and is an entity that is a part of the approval process.

Appendix B: Baseline/Performance Evaluation Methodology MRI-S Data Submittal Requirements for Demand Response

Baseline Methods and Measurement Type mapping:

Measurement Type	Data Granularity	Baseline Method	Comments
LOAD	5 minute	• Control Group • Day Matching 5/10 (Residential Only) • Day Matching 10/10 • Day Matching Combined • Weather Matching • Meter Generation Output[16] • Meter Generation Output with Customer Load Baseline[17] • PDR-LSR (CUR only)	**AS Resource only** This is the actual load for intervals the resource receives an Ancillary Service award. Both LOAD and MBMA data sets are required for no pay calculations, even though the LOAD data includes the same values submitted in the MBMA data set.[21]

16 "MGO" is a performance evaluation methodology that can be used by a generation device located behind the revenue meter, to represent the load reduction attributed only to the output of that generation device excluding its typical use. Referred to as "generation offset only".

17 "MGO with Customer Load Baseline" formerly known as "Meter Generation Output with 10-in-10" under this performance methodology option, the demand response performance is a result of combining the demand response energy measurement (DREM) from pure load reduction calculated utilizing a customer load baseline of Day Matching 10 in 10, Day Matching 5 in 10 (residential customers only), Day Matching Combined, weather matching combined with the DREM from load reduction attributed to generation offset (MGO). Referred to as "load and generation"

21 For a Proxy Demand Resource or Reliability Demand Response Resource using behind-the-meter generation to offset demand utilizing one of the MGO performance methodology options, meter data submitted for LOAD and MBMA represents metered load for the service account (customer) not of the sub-metered behind-the-meter generator.

		• PDR-LSR (CUR) with Customer Load Baseline[18] • EVSE-Residential • EVSE-Residential with Customer Load Baseline[19] • EVSE Non-Residential • EVSE Non-Residential with Customer Load Baseline[20]	For PDR-LSR, and PDR with Customer Load Baseline, data is submitted for the PDR-LSR curtailment (CUR) ID only. For EVSE it would be the load at the EVSE. For EVSE with CLB submit load at the facility level.
LOAD	5 minute	• PDR-LSR(CON)	PDR-LSR Consumptions (CON) ID submit "LOAD" only. This represents the energy consumption or reduction when dispatched. Data required for intervals where TEE<0.
GEN	5 minute	• Control Group • Day Matching 5/10 (Residential Only) • Day Matching 10/10 • Day Matching Combined • Weather Matching • Meter Generation Output	Demand Response Energy Measurement (DREM) or performance data of the resource in response to an award or dispatch. Data required for intervals where TEE>0.

18 PDR-LSR with Customer Load Baseline (CLB) includes Day Matching 5-in-10, Day Matching 10-in-10, Weather Matching, and Day Matching combined.

19 EVSE residential with Customer Load Baseline (CLB) includes Day Matching 5-in-10, Day Matching 10-in-10, Weather Matching, and Day Matching combined

20 EVSE non-residential with Customer Load Baseline (CLB) includes Day Matching 10-in-10, Weather Matching, and Day Matching Combined.

		• Meter Generation Output with Customer Load Baseline[17~~13~~] • PDR-LSR (CUR) • PDR-LSR (CUR) with Customer Load Baseline[18~~14~~] • EVSE-Residential • EVSE-Residential with Customer Load Baseline[19~~15~~] • EVSE-Non-Residential • EVSE-Non-Residential with Customer Load Baseline[20~~16~~]	
MBMA	5 minute	• Control Group • Day Matching 5/10 (Residential Only) • Day Matching 10/10 • Day Matching Combined • Weather Matching • Meter Generation Output • Meter Generation Output with Customer Load Baseline[17~~13~~] • PDR-LSR (CUR only) • PDR-LSR (CUR) with Customer Load Baseline[18~~14~~] • EVSE-Residential	**AS Resource Only** This is the actual load data for the interval preceding, during, and following the trading intervals for which they were awarded ancillary services.[22] For PDR-LSR and PDR-LSR with Customer Load Baseline, data is submitted for the PDR-LSR curtailment ID only. For EVSE it would be the load at the EVSE. For EVSE with CLB submit load at the facility level.

22 California Independent System Operator Corporation Tariff Section 4.13.

		• EVSE-Residential with Customer Load Baseline[19~~15~~] • EVSE-Non-Residential • EVSE-Non-Residential with Customer Load Baseline[20~~16~~]	
CBL	Hourly	• Control Group • Day Matching 5/10 (Residential Only) • Day Matching 10/10 • Day Matching Combined • Weather Matching • Meter Generation Output with Customer Load Baseline[17~~13~~] • PDR-LSR (CUR) with Customer Load Baseline[18~~14~~] • EVSE-Residential with Customer Load Baseline[19~~15~~] • EVSE-Non-Residential with Customer Load Baseline[20~~16~~]	For **monitoring** only. Underlying load data used in the customer load baseline calculation for all baseline methods. 90 days of historical data prior to the day of the event is required. PDR-LSR with CLB Curtailment ID only This is applicable for the "MGO with CLB, EVSE residential with CLB, and EVSE non-residential with CLB"[23] only. It represents the net load data used to develop the customer load baseline of the facility only. 90 days of historic data prior to the day of the event is required.

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23 "MGO with CLB" provides for the use of Day Matching 10 in 10, Day Matching 5 in 10 (residential customers only), Day Matching Combined and Weather Matching performance evaluation methods in the calculation of the DREM portion attributed to customer load response only.

			PDR-LSR with CLB submit resource IDs PDR-LSR curtailment. Distributed Curtailment Resources (DCR) within the HDERA resource model are required to submit the CBL data when using one of the listed Baseline Methodologies.
TMNT	Hourly	• Control Group • Meter Generation Output • Meter Generation Output with Customer Load Baseline[17~~13~~] • PDR-LSR (CUR and CON) • PDR-LSR (CUR) with Customer Load Baseline[18~~14~~] • EVSE-Residential • EVSE-Residential with Customer Load Baseline[19~~15~~] • EVSE-Non-Residential • EVSE-Non-Residential with Customer Load Baseline[20~~16~~]	For **monitoring** Only Submit for trade date where TEE > 0. 90 days of historic data prior to the day of the event is required. For the Control Group baseline method, data represents the actual load data for those locations in the treatment group. For the MGO and MGO with CLB baseline methods, TMNT data represents the generation device metered values. For PDR-LSR submit both resource IDs, the consumption and curtailment IDs.

			For PDR-LSR with CLB, submit only the curtailment only ID. For all EVSEs, this represents the load at the EVSE. Distributed Curtailment Resources (DCR) within the HDERA resource model are required to submit the TMNT data when using one of the listed Baseline Methodologies.
BASE	Hourly	• Control Group • Day Matching 5/10 (Residential Only) • Day Matching 10/10 • Day Matching Combined • Weather Matching • Meter Generation Output with Customer Load Baseline[17][~~13~~] • PDR-LSR (CUR) with Customer Load Baseline[18][~~14~~] • EVSE-Residential with Customer Load Baseline[19][~~15~~] • EVSE-Non-Residential with Customer Load Baseline[20][~~16~~]	For **monitoring** Only Calculated customer load baseline (CLB) values used to derive DREM. For the "MGO with CLB, EVSE residential with CLB, EVSE non-Res with CLB, and PDR-LSR (CUR) with CLB": BASE data represents the customer load baseline used to calculate the DREM attributed to the pure load reduction only. BASE data is submitted for trade dates when the resource/registration is being actively bid into the market for the hours in which it is bid. Distributed Curtailment Resources (DCR) within the HDERA resource model are required to submit the BASE data when

			using one of the listed Baseline Methodologies.

- GEN: This represents the resources DREM
- CBL: This represents the Load data during the event
- TMNT: For Control Group, this represents the actual underlying consumption or energy of the Loads participating in the resource. For Metered Generation Output (MGO), and Metered Generation Output (MGO) with CLB, this represents the generation device metered.
- MBMA: This represents Load data for PDR resources providing Ancillary Services. The Scheduling Coordinator must submit Meter Data for the interval preceding, during and following the Trading Interval(s) in which they were awarded.
- BASE: This represents the customer load baseline (CLB) used to calculate the DREM attributed to the pure load reduction only.

"BASE" measurement type must be submitted in hourly interval granularity for the trade dates when the resource is actively bid into the market for the hours in which it bid. The SC shall calculate and submit adjusted baselines for the hour that the resources is bid into the market, and received an award, in this case, the hourly interval Total Expected Energy (TEE) is greater than 0. If the resource is bid into the market, and received an award, the SC shall calculate and submit adjusted baselines, and submit unadjusted baselines for other hours.

Example of "BASE" measurement type and when to apply and not to apply adjustment baseline.

Resource A is bidding in the day-ahead market for hour ending 14 through 21, and in the real-time market for hour ending 17 through 22. The resource received an award for hour ending 18 and 19. The SC will need to submit adjusted baseline for hour ending 18 and 19, and unadjusted baseline for the other hours ending 14-17, and 20-22.

Example: When to apply and not apply baseline adjustment

Resource A, Market day 4/30/2019:																							
Hour Ending	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Bid in day-ahead														Y	Y	Y	Y	Y	Y	Y	Y			
Bid in real-time																	Y	Y	Y	Y	Y	Y		
TEE > 0																		Y	Y					
BASE submission required														Y	Y	Y	Y	Y	Y	Y	Y	Y		
Adjusted (A) or Unadjusted (U)														U	U	U	U	A	A	U	U	U		

Adjusted baseline data for hours when TEE >0

To ensure accuracy and compliance with the CAISO tariff, the CAISO will have the right to audit Meter Data submitted by SCs to establish performance evaluation methodologies or Demand Response Energy Measurements.

Appendix C: MRI-S Data Submittal Requirements for Demand Response Resources Matrix

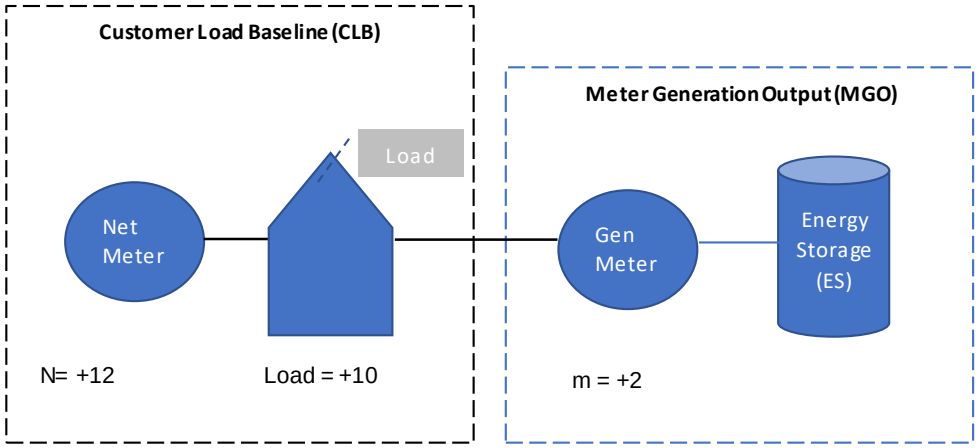
Matrix: Performance Evaluation Methodologies Data Submittal Requirement by Measurement Types

Baseline Method	AS Resource Only						
	LOAD	MBMA	LOAD	GEN	CBL	TMNT	BASE
Control Group	X	X		X	X	X	X
Day Matching 5/10	X	X		X	X		X
Day Matching 10/10	X	X		X	X		X
Day Matching Combined	X	X		X	X		X
Weather Matching	X	X		X	X		X
MGO	X	X		X		X	
MGO with Day Matching 5/10	X	X		X	X	X	X
MGO with Day Matching 10/10	X	X		X	X	X	X
MGO with Day Matching Combined	X	X		X	X	X	X
MGO with Weather Matching	X	X		X	X	X	X
PDR-LSR (Curtailment)	X	X		X		X	
PDR-LSR (Consumption)			X			X	
PDR-LSR (Curtailment only) with Day Matching 5/10	X	X		X	X	X	X
PDR-LSR (Curtailment only) with Day Matching 10/10	X	X		X	X	X	X
PDR-LSR (Curtailment only) with Day Matching Combined	X	X		X	X	X	X
PDR-LSR (Curtailment only) with Weather Matching	X	X		X	X	X	X
EVSE res	X	X		X			
EVSE res with Day Matching 5/10	X	X		X	X	X	X
EVSE res with Day Matching 10/10	X	X		X	X	X	X

EVSE res with Day Matching Combined	x	x		x	x	x	x
EVSE res with Weather Matching	x	x		x	x	x	x
EVSE non-res	x	x		x			
EVSE non-res with Day Matching 10/10	x	x		x	x	x	x
EVSE non-res with Day Matching Combined	x	x		x	x	x	x
EVSE non-res with Weather Matching	x	x		x	x	x	x

Appendix D: Simplified Examples of Performance Evaluation Methodologies

Performance Evaluation Methodology: MGO with Day Matching 10-in-10 Baseline Methodology



CLB and MGO must be calculated separately and then added together. The example below has been simplified to show the calculation. The baseline calculation should include all twenty four (24) hours in the day. The selection of non-event hours is performed by working backward up to 45 calendar days to find the target number of non-event hours for the same event hour and same day type beginning with the most recent days and calculating the simple average energy delivered by the device to get the unadjusted baseline.

The selection of Customer Load Baseline data includes a number of the most recent days, excluding different day-types and previous events hours within those days.

Unadjusted Baseline

$DR_{TOTAL}(t) = DR_{LOAD}(t) + DR_{Energystorage\ (ES)}(t)$

- $DR_{Load}(t) = B_L(t) - [N(t) - m(t)]$

Table 1: 10 in 10 baseline methodology (Similar day and non-event day)

	5/1	5/2	5/3	5/4	5/5	5/8	5/9	5/10	5/11	5/12	5/15	5/16	5/17	5/18	5/19	5/22	5/23	5/24	5/25	5/26	5/29
Facility load[1]	E	E	11	E	E	E	12	E	13	10	10	E	10	E	E	E	11	10	E	12	11

Facility provided 1 MW of load curtailment

- $DR_{ES}(t) = – [B_{ES}(t) – m(t)]$

	5/1	5/2	5/3	5/4	5/5	5/8	5/9	5/10	5/11	5/12	5/15	5/16	5/17	5/18	5/19	5/22	5/23	5/24	5/25	5/26	5/29
Facility load[2]	E	3	E	E	2	5	1	1	E	2	E	3	E	5	E	E	E	4	5	E	3

$DR_{ES}(t) = – [2.9 – 2] = 0.9$ MW **Energy Storage provided 0.9 MW of load curtailment**

$DR_{TOTAL}(t) = 1 + 0.9 = 1.9$ MW Facility and Energy Storage

Adjusted Baseline:

Date	Type	Average Adjustment Window Usage
	Unadjusted Baseline	1.42
29-May-2020	Observed	1.71

Apply an Adjustment Cap of 1.20x:

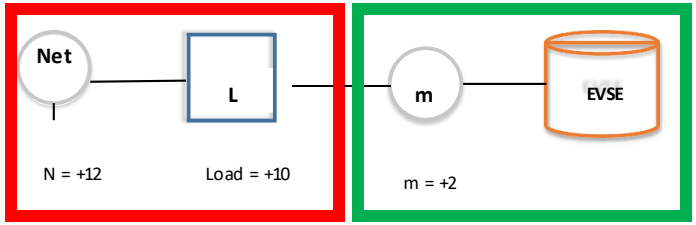
Date	Type	Ratio (1.71/1.42)	Capped Ratio
	Adjusted Baseline	1.21	1.20
29-May-2020	Observed		
	Impact		

Apply same day adjustment:

1.20 (Cap Ratio) x hourly unadjusted baseline

Settlement Energy Measurement or Demand Response Energy Measurement = Adjusted Baseline for each event hour minus (-) Observed or the actual energy used for each event hour.

Performance Evaluation Methodology: Facility Load Curtailment + EVSE Curtailment



$DR_{total}(t) = DR_{Load}(t) + DR_{EVSE}(t)$

$DR_{Load}(t) = \{(t) - (N(t) - m(t))], 0\}$

Table 2: 5 in 10 baseline methodology (Similar day and non-event day)

	5/1	5/2	5/3	5/4	5/5	5/8	5/9	5/10	5/11	5/12	5/15	5/16	5/17	5/18	5/19	5/22	5/23	5/24	5/25	5/26	5/29
Facility load[1]	E	E	11	E	E	E	12	E	13	10	10	E	10	E	E	E	11	10	E	12	11

$$B_L(t) = \frac{13 + 12 + 12 + 11 + 11}{5}$$

$(t) = 11.8$

$DR_{Load}(t) = \{[11.8 - (12 - 2)], 0\}$

$DR_{Load}\ (t) = \{1.8, 0\}$

$DR_{Load}\ (t) = 1.8MW$

Facility provided 1.8 MW of load curtailment

---

[1] Facility load is expressed as positive quantity.

$$DR_{EVSE}\ (t) = [(B_{EVSE} - \mathrm{m}(t)), 0]$$

Table 3: 5 in 10 baseline methodology (Similar day and non-event hour)

	5/1	5/2	5/3	5/4	5/5	5/8	5/9	5/10	5/11	5/12	5/15	5/16	5/17	5/18	5/19	5/22	5/23	5/24	5/25	5/26	5/29
Facility load[2]	E	3	E	E	2	5	1	1	E	2	E	3	E	5	E	E	E	4	5	E	3

$$B_{EVSE}\ (t) = \frac{5 + 5 + 4 + 3 + 3}{5}$$

$$B_{EVSE}\ (t) = 4$$

$$DR_{EVSE}\ (t) = \{[4 - 2], 0\}$$

$$DR_{EVSE}\ (t) = \{2, 0\}$$

$$DR_{EVSE}\ (t) = 2\ MW$$

EVSE provided 2 MW of load curtailment

$$DR_{Total} = DR_{LOAD} + DR_{EVSE}$$

$$DR_{Total} = 1.8 + 2$$

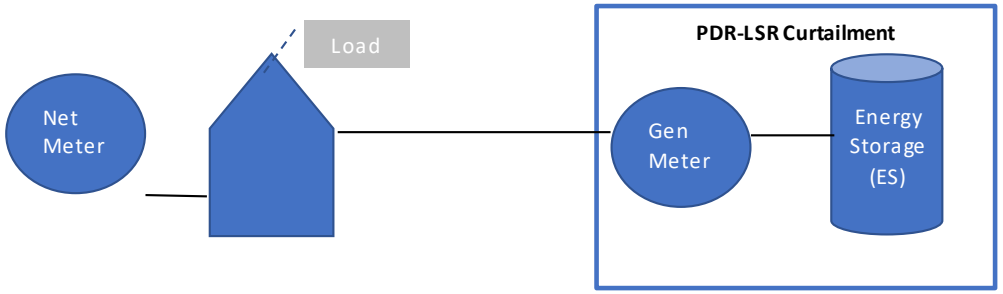
$$DR_{Total} = 3.8\ MW$$

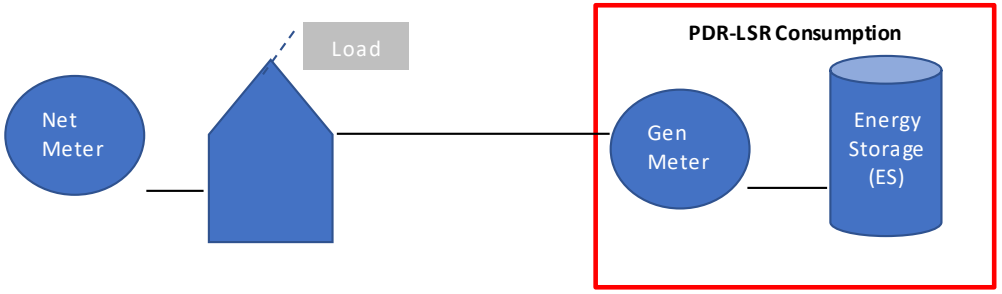
Facility and EVSE provided a total of 3.8 MWs of load curtailment

[2] EVSE load is expressed as positive quantity

Performance Evaluation Methodology: PDR-LSR Example

PDR-LSR Baseline Methodology: The load does not participate in load curtailment only the behind-the-meter storage device provides load curtailment and consumption.





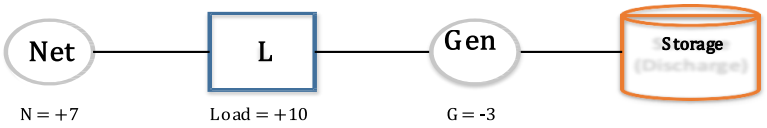
Net Export Rule[1]**:** Deriving the generation value of storage device (t)

$$G(t)^{nx} = \sum_{i=1}^{n} G(i,t) - \min\{0, N(i,t)\}$$

Where,

- $i = 1,2, \ldots n$ – location
- $G(i,t)$ – storage device generation metered output at location i during the dispatch interval t
- $N(i,t)$ – net meter quantity at location i during dispatch interval t

Assume[2]***:***



- $N(i,t)$ =+7
- Load at facility = +10

- BTM storage device Gen = -3

Then apply the net export rule:

$G(t)^{nx} = (-3) - \min(0,7)$

$G(t)^{nx} = -3$

Discharge value after applying the net export rule is 3 MW

---

[1] Applicable when determining performance for PDR-LSR curtailment only.

[2] A specific sign convention was used in developing the application of the net export rule. Load served by the storage device is expressed as a positive quantity and its output in a discharging mode is a negative quantity. This is used in the application of the net export rule only.

1. **Typical Use Calculation: Curtailment**

Pmax = 3 MW

G(t)^{nx}= - 3 MW

Dispatched for 3 MW (HE 17 on Tuesday, May 30)

Table 4: Examination of 10 similar days, non-event hours[3]

	5/1	5/2	5/3	5/4	5/5	5/8	5/9	5/10	5/11	5/12	5/15	5/16	5/17	5/18	5/19	5/22	5/23	5/24	5/25	5/26	5/29
Curtailment[4]	E	E	0	0	0	E	2	0	0	2	4	E	0	E	0	E	0	2	1	1	E
Consumption[5]	0	0	-4	E	E	0	0	-2	-2	0	0	0	-2	0	E	0	-2	0	0	0	0

*E represents an event**

Typical use formula:

$$G_{LM} = Max\{(G_{LMcurt} + G_{LMcons}),\ 0\}$$

- G_{LM} – Typical use value
- G_{LMcurt} – Typical curtailment value (simple average of 10 non-event hours)
- G_{LMcons} – Typical consumption value (simple average of 10 non-event hours)

[3] Event hour is one in which the PDR-LSR was subject to an Outage or previously provided Demand Response Services (other than capacity awarded for AS or RUC).

[4] Curtailment sign convention is expressed as positive quantity representing energy storage output in a discharging mode. This convention used for both the typical use and performance evaluation calculations.

[5] Consumption sign convention is expressed as negative quantity representing energy storage input in a charging mode. This convention used for both the typical use and performance evaluation calculations.

Determine and add the simple hourly average for both the curtailment and consumption values:

$$GLM = Max\{[(\frac{1+1+2+0+0+4+2+0+0+2}{10}) + (\frac{0+0+0+(-2)+(-2)+0+0+(-2)+(-2)+0}{10})], 0\}$$

Then identify the value at or above 0:

$$G_{LM} = Max\{[1.2 + (-.8)], 0\}$$

Load curtailment typical value is evaluated as .4 MW:

$$G_{LM} = .4$$

2. Performance Evaluation Methodology: PDR-LSR (Curtailment)

$\mathbf{Pmax} = 3\,\mathrm{MW}$

$\mathbf{G}(\boldsymbol{t})^{nx} = -3\ \mathrm{MW}$

$\boldsymbol{G_{LM}} = .4\ \mathrm{MW}$

Performance Evaluation (LSR-Curtailment) formula:

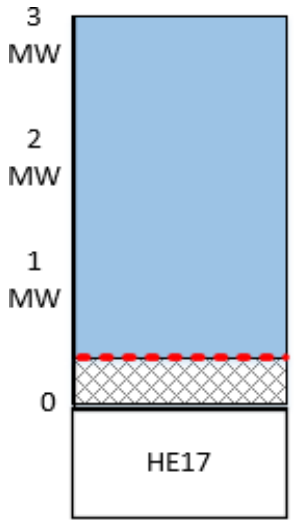
$LSR_{curt} = [|G(t)^{nx}| - G_{LM}]$

- $|\mathrm{G}(t)^{nx}|$ – Generation value of the energy storage device (net export rule applied)
- LSR_{curt} – Curtailment performance of PDR-LSR
- G_{LM} – Typical use value

Calculate the difference between the generation and typical use value:

$LSR_{curt} = [3 - .4]$

Resource provided 2.6 MW of load curtailment:



$LSR_{curt} = 2.6\ MW$

3. Typical Use Calculation: Consumption

Maximum Consumption = -4 MW

$G(t) =$ -4 MW

Dispatched for -4 MW (HE 14 on Tuesday, May 30)

Table 6: Examination of 10 similar days, non-event hours[7]

	5/1	5/2	5/3	5/4	5/5	5/8	5/9	5/10	5/11	5/12	5/15	5/16	5/17	5/18	5/19	5/22	5/23	5/24	5/25	5/26	5/29
Curtailment[8]	E	E	0	0	0	E	2	0	0	2	4	0	0	E	0	E	0	2	0	1	0
Consumption[9]	0	0	-4	E	E	0	0	E	-2	0	0	E	-2	0	E	0	-2	0	E	0	-3

*E represents an event**

Typical use formula:

$$G_{LM} = Min\{(G_{LMcurt} + G_{LMcons}), 0\}$$

- G_{LM} – Typical use value
- G_{LMcurt} – Typical curtailment value (simple average of 10 non-event hours)

- G_{LMcons} – Typical consumption value (simple average of 10 non-event hours)

[7] Event hour is one in which the PDR-LSR was subject to an Outage or previously provided Demand Response Services (other than capacity awarded for AS or RUC).

[8] Curtailment sign convention is expressed as positive quantity representing energy storage output in a discharging mode. This convention used for both the typical use and performance evaluation calculations.

[9] Consumption sign convention is expressed as negative quantity representing energy storage input in a charging mode. This convention used for both the typical use and performance evaluation calculations.

Determine the simple average of the typical curtailment/consumption values:

$$G_{LM} = Min\ \{[(\frac{0+1+2+0+0+4+2+0+2+0}{10}) + (\frac{(-3)+0+0+(-2)+(-2)+0+0+(-2)+0+(-4)}{10})], 0\}$$

Then identify the typical value at or below 0:

$$G_{LM} = Min\ \{[1.1 + (-1.3)], 0\}$$

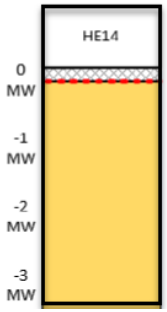
Resource is typically consuming load at -.2 MW

$$G_{LM} = -.2$$

4. Performance Evaluation Methodology: PDR-LSR (Consumption)

$\mathbf{G}(\boldsymbol{t}) =$ -3 MW (PMax)

$\boldsymbol{G_{LM}} =$ .4 MW



Performance Evaluation (LSR-Consumption) formula:

$LSR_{cons} = [G(t) - G_{LM}]$

- LSR_{cons} – Consumption value of PDR-LSR
- $G(t)$ – Load value of the energy storage device
- G_{LM} – Typical use value

Calculate the difference between the generation and typical use value:

$$LSR_{cons} = [-3 - (-.2)]$$

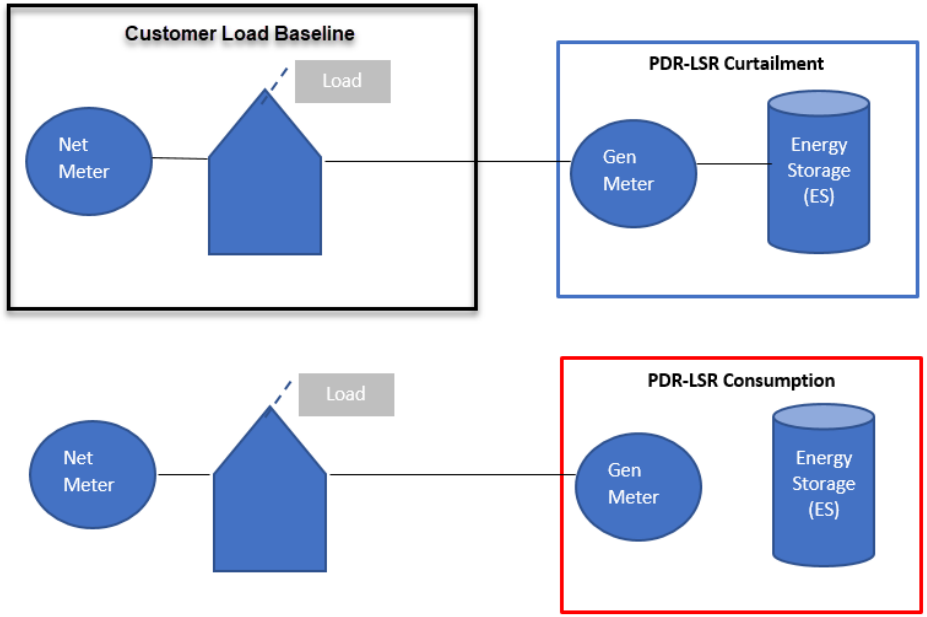
$$LSR_{cons} = -2.8\ MW$$

Resource provided -2.8 MW of load consumption

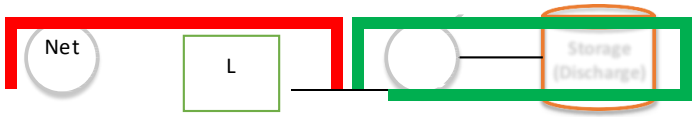
Performance Evaluation Methodology: PDR-LSR plus Customer Load Baseline[24]

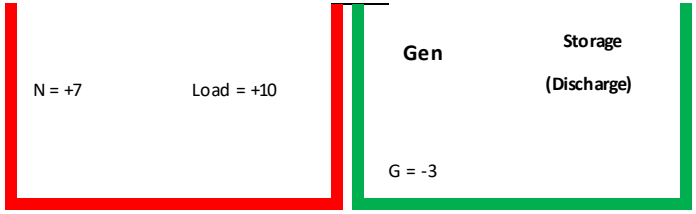
PDR-LSR plus Customer Load Baseline[24][20]: The Load is providing load curtailment and the behind-the-meter storage is providing both load curtailment and consumption.

[24] PDR-LSR+Day Matching 5/10, PDR-LSR+Day Matching 10/10, PDR-LSR+Weather Matching, and PDR-LSR+Day Matching Combined.



1. **Below is a simplified example of Facility Load Curtailment + PDR-LSR**





a. Calculate how many MW the facility load contribute to load curtailment.

$$DR_{Load}(t) = \max\{B_{N-G}(t) - [N(t) - \min(G(t), 0)], 0\}$$

Table 5: Examination of 10 similar non-event days and the total MWhs delivered during event period

	5/1	5/2	5/3	5/4	5/5	5/8	5/9	5/10	5/11	5/12	5/15	5/16	5/17	5/18	5/19	5/22	5/23	5/24	5/25	5/26	5/29
Facility load[6]	E	E	11	E	E	E	12	E	13	10	10	E	10	E	E	E	11	10	E	12	11

$$B_{N-G}(t) = \frac{11 + 12 + 13 + 10 + 10 + 10 + 11 + 10 + 12 + 11}{10}$$

$B_{N-}(t) = 11$

$G(t) = \max\{11 - [7 - (-3)], 0\}$

$G(t) = \max\{1, 0\}$

$G(t) = 1$ MW

Facility provided 1 MW of load curtailment

b. Combine the facility load CLB with the MW of load curtailment provided by Energy Storage.

$LSR_{totalcurt}(t) = DR_{load}(t) + LSR_{curt}(t)$

$(t) = 1 + 2.6\ MW$

$(t) = 3.6\ MW$

Facility and energy storage provided 3.6 MWs of load curtailment

c. Calculate the PDR-LSR Consumption.

The PDR-LSR Consumption only apply to the behind-the-meter Energy Storage device. See steps 3 and 4 above for examples.

[6] Facility load is expressed as positive quantity.

Appendix E- DRRS Location Type – Baseline Method Reference Matrix

Location Device Type	Baseline Methods for Registration
Energy Storage (ES)	PDR-LSR* PDR-LSR+Day Matching 5/10* PDR-LSR+Day Matching 10/10* PDR-LSR+Weather Matching* PDR-LSR+Day Matching Combined* MGO+Day Matching 5/10* MGO+Day Matching 10/10* MGO+Day Matching Combined* MGO+Weather Matching* Weather Matching Meter Generation Output Day Matching Combined Day Matching 10/10 Day Matching 5/10 (Residential Only) Control Group

Electric Vehicle Supply Equipment (EVSE)	EVSE res* EVSE res+Day Matching 5/10* EVSE res+Day Matching 10/10* EVSE res+Day Matching Combined* EVSE res+Weather Matching* EVSE non-res* EVSE non-res+Day Matching 10/10* EVSE non-res+Weather Matching* EVSE non-res+Day Matching Combined* Weather Matching Day Matching Combined Day Matching 10/10 Day Matching 5/10 (Residential Only) Control Group
Neither ES Nor EVSE	Day Matching Combined Day Matching 10/10 Day Matching 5/10 (Residential Only) Weather Matching Control Group

Both ES and EVSE	PDR-LSR* PDR-LSR+Day Matching 5/10* PDR-LSR+Day Matching 10/10* PDR-LSR+Weather Matching* PDR-LSR+Day Matching Combined* MGO+Day Matching 5/10* MGO+Day Matching 10/10* MGO+Day Matching Combined* MGO+Weather Matching* Weather Matching EVSE res* EVSE res+Day Matching 5/10* EVSE res+Day Matching 10/10* EVSE res+Day Matching Combined* EVSE res+Weather Matching* EVSE non-res* EVSE non-res+Day Matching 10/10* EVSE non-res+Weather Matching* EVSE non-res+Day Matching Combined*

	Meter Generation Output Day Matching Combined Day Matching 10/10 Day Matching 5/10 (Residential Only) Control Group

Note: Baseline methods in asterisk (*) are new with ESDER 3B and those not in asterisk (*) are existing methods.

Appendix F – Summary of DR Resource Types, Bidding, and Energy Services

DR Resource Type (DR_TYPE)	Bid Dispatchable Option (BID_DISP_OPT)	Bid Range	Services	Market Dispatch	Description
PDR	60, 15, or 5	NBT Price to Bid Cap	Energy, Spin and Non-Spin, and Residual Unit Commitment (RUC).	Economic, Day-Ahead, and Real-Time	Bids into the ISO Markets as Supply
RDRR	60, 15, or 5	NBT Price to Bid Cap	Energy	Economic, Day-Ahead, Reliability Real-Time	Bids into the ISO Markets as Supply; used for reliability purposes
PDR_LSR ***Curtailment*** Resource ID	15, or 5 Must be the same for both Curtailment and	***Curtailment*** **Resource ID:** NBT Price to Bid Cap.	***Curtailment*** **Resource ID:** Energy, Spin and Non-Spin, and Residual Unit Commitment (RUC)	Economic, Day-Ahead, and Real-Time	***Curtailment*** **Resource ID:** Bids into the ISO Markets as Supply

A Single Resource	***Consumption*** Resource ID	Consumption Resource ID	***Consumption*** **Resource ID:** Negative Bid Floor to < $0	***Consumption*** **Resource ID:** Energy	**Note:** Curtailment and Consumption Resource ID may be dispatched independently.	***Consumption*** **Resource ID:** Bids into the ISO Markets as NGR – Dispatchable Demand Resource (DDR)

Appendix G – Request for use of adjustment factors outside established min/max values

The ISO offers many different Performance Evaluation Methodologies for Demand Response Providers (DRPs) to select, as a way to calculate their performance in load reduction. These methodologies include load adjustment factors to align baseline data with actual conditions during dispatch. The CAISO tariff provides different load adjustment caps for different methodologies. However, under sections 4.13.4.1(c) and 4.13.4.4(c) of the CAISO tariff, DRPs may submit a request to the CAISO to use an alternate load adjustment factor cap ratio to calculate their performance. The CAISO may approve alternative factors where warranted, and where there is no risk that their use will result in disingenuous or inaccurate results.

DRPs can submit such requests to PDR@caiso.com based on the template provided at the Demand Response and Load webpage. The request must list all applicable resource IDs, identify the resource performance evaluation methodology used, and select the applicable months the DRP may use the alternative load adjustment factor. Only months from May to October are eligible. The request must be approved by the CAISO prior to use in Demand Response Energy Measurement (DREM) and for market settlement. Alternate load adjustment factor cap ratios for use in DREM calculations will only be approved for subsequent months, not for partial months or retroactively. Requesting parties agree to comply with the terms set forth in the CAISO tariff, the CAISO's BPM for demand response, and the request form. Failure to meet these conditions will result in revocation of the approved request.

To monitor the impact of adjustment factor caps outside of those currently established for the Day Matching and Weather Matching performance methodologies, the CAISO is requiring submittal of CBL and BASE measurement type data for an expanded number of the hours currently submitted by DR resources.

The following table identifies the current MRI-S data submittal requirements for these measurement types and the new requirements that will be imposed as a condition of approval for use of an alternate load adjustment factor cap ratio.

➢ **Measurement Type**	➢ **Adjusted/Unadjusted**	➢ **Periods Covered**
➢ BASE	➢ Adjusted for intervals where TEE>0; Unadjusted for all other hours	Current requirement: ▪ Calculated customer load baseline (CLB) values used to derive DREM. ▪ BASE data represents the customer load baseline used to calculate the DREM attributed to the pure load reduction only.

		▪ BASE data is submitted for trade dates when the resource/registration is being actively bid into the market for the hours in which it is bid. New requirement: In addition to the above BASE data submittal time frames, data will be required for 4 hours preceding and 4 hours after a demand response event if they fall outside the hours in which the resource/registration is being actively bidding into the market. ➢ **Data Granularity: Hourly** ➢ **By resource ID**
➢ CBL	➢ N/A	Current requirement: Underlying load data used in the customer load baseline calculation **90 days of historical data prior to the day of the event** is required. New requirement: In addition to the above, underlying load data **for day of event** specifically the 4 hours preceding and 4 hours after a demand response event used to derive baseline adjustment factor. ➢ **Data Granularity: Hourly** ➢ **By resource ID**

➢

The CAISO also requires additional information for those resource IDs using the Day Matching Combined performance evaluation methodology. This will include submitting, hour by hour, the percent of BASE (unadjusted baseline) and CBL (intra-day load) that is attributed to the residential service accounts within the aggregation.

Measurement Type	% Residential	
BASE	**Data Granularity: Hourly** **% of** Calculated customer load baseline (CLB) values used to derive DREM attributed to **residential** customer load baseline.	
CBL	**Data Granularity: Hourly** **% of underlying Load (CBL)** for DAY OF Event and 90 days historically serving residential customer	For resources using the Day Matching Combined methodology **By resource ID**

All additional data will be submitted to the CAISO using MRI-S following meter data submittal timelines. Modifications to the MeterData_v1.XSD to add an additional element "Percent Residential" that will represent the percentage of the measurement quantity that is using the 5 in 10 methodology in a day-matching combined baseline methodology are anticipated. This will be an optional element and so the version will not need to change.

Appendix H: RDRR Discrete Dispatch Option Above 100 MW[25]

The following attestation form is used to request an exception to the 100MW discrete dispatch cap, and for subsequent increases in capacity for RDRRs already approved above the cap.[26] This attestation must be completed and attached to a CIDI ticket with the Subject Line "Demand Response Attestation.". If the CAISO approves the attestation, the CAISO will make the appropriate changes within the Masterfile (noting the exception) and the CIDI ticket will be closed. For any desired changes to this attestation after its submission, please contact your Client Representative.

Demand Response Attestation

RDRR Discrete Dispatch Real Time Dispatch Above 100 MW

I, [_____, Title, Department, Demand Response Provider], with my knowledge and experience given my position with [Demand Response Provider], am requesting:

1. A new registration of an RDRR using the discrete dispatch option above 100 MW for [Resource ID].

   OR

2. An increase of an existing RDRR using the discrete dispatch option to [Resource ID] from below 100 MW to over 100 MW as: [New MW]
   OR

3. An increase by 50 MW or greater to a previously approved discrete dispatch RDRR value above 100 MW for [Resource ID] to [New MW value]. On [insert date] in CIDI ticket no. [CIDI ticket number], the RDRR received an approved value of [Approved MW value].

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25 Appendix H contains updates that have not yet been approved (PRR 1465)

26 The Scheduling Coordinator will be responsible for updating their Pmax by submitting a change to their Generator Resource Data Template (GRDT).

For updates to more than one resource, please attach an excel file.

I attest to the following regarding the discrete RDRR I am requesting:

1. The RDRR is located at a single site;
2. The RDRR cannot safely or operationally be split into multiple loads;
3. The RDRR does not the ability to operate under the Marginal Real-Time Dispatch Option.

I declare under penalty of perjury pursuant to 28 USC 1746 and the laws of the State of California that, to the best of my knowledge, the foregoing is true and correct. Executed on [month, day, 20_] ("Execution Date").

Demand Response Provider

By: _____

[Name, Title, Demand Response Provider]