CAISO Demand Response Resource User Guide

Guide to Participation in MRTU Release 1

August 30, 2007

DRAFT Version 1.0

Table of Contents

1 Introduction

In the September 2008 FERC Order, the CAISO was directed to work with market participants to present additional opportunities for Demand Response resources to participate in the CAISO market and to work with Load Serving Entities ("LSEs") to develop methods for the accounting of expected demand response within RUC procurement.

In this regard, five key demand resource working groups have been formed to help meet this important objective
The five working groups are:

Demand Response Participation in MRTU Release 1

- Lead agency- CAISO

Demand Response Participation in MRTU Post Release 1

- Lead agency- CAISO

Demand Resource Product Specification

- Lead agency- CEC

Infrastructure for Demand Resources

- Lead agency- CEC

Vision for Demand Resources

- Lead agency- CPUC

Each working group has specific objectives and resulting deliverables to produce with the over-arching objective being to enable greater participation from demand resources in the wholesale power markets.

This User Guide was developed in response to this directive and is a result of the CAISO working collaboratively with the CPUC, CEC and demand resource providers to advance the integration of demand resources into the CAISO's wholesale market design and grid operations through the Demand Response participation in MRTU Release 1 Working Group.

The CAISO MRTU Release 1 software will include limited functionality and ability for demand resources to participate directly in the CAISO wholesale markets. The CAISO markets for MRTU Release 1 will accommodate pump hydro units and aggregated hydro pumps that participate in the CAISO markets as participating load. Although the design is limited, it may possible for other types of demand resources to fit into this model allowing them to provide the CAISO imbalance energy as well as non-spinning reserve as a participating load. However, as currently designed the existing Demand Response Programs managed by the three Investor Owned Utilities in California, PG&E, SCE and SDG&E and others (herby referred to as Demand Response providers) were not designed to fit into the CAISO's participating load model. Since the existing Demand Response Programs will not be subject to change until 2009, the MRTU Release 1 Working Group was formed to develop a process by which the CAISO can immediately account for benefits provided by these Demand Response Programs in the CAISO energy markets.

1.1 About this Guide

The purpose of this user guide is to document a process that describes how existing Demand Response Programs and Demand Response resources can be incorporated into MRTU Release 1. This user guide is intended to be a living document that will be updated periodically to reflect added functionality and enhancements that further eliminate the manual processes described herein and seek to seamlessly integrate demand response resources into the CAISO's markets and its grid operations.

This user guide is the result of a collaborative effort by the Demand Response Participation in MRTU Release 1 Working Group. Further refinement to this guide is expected with the initiation of the MRTU Post Release 1 working group and its efforts.

1.2 CAISO Requirements

The entity submitting Demand Response data and/or bids to the CAISO must be a certified Schedule Coordinator.[1] A Scheduling Coordinator is an entity certified by the

[1] Other models for how demand response resources are delivered to the CAISO may evolve with time, e.g. the Curtailment Service Provider model used in some eastern ISOs; however, no changes to the Scheduling

CAISO for the purposes of undertaking functions such as scheduling, bidding, and settlement, and as further defined in Section 4.5.3 of the CAISO Tariff.

2 Day-Ahead Demand Response Programs

Day-Ahead Demand Response Programs are initiated by Demand Response providers and are triggered based on various conditions such as the day-ahead forecasted temperature, day-ahead forecasted demand and high price forecasts. Customers are notified the day prior to the event day that the program will be triggered.

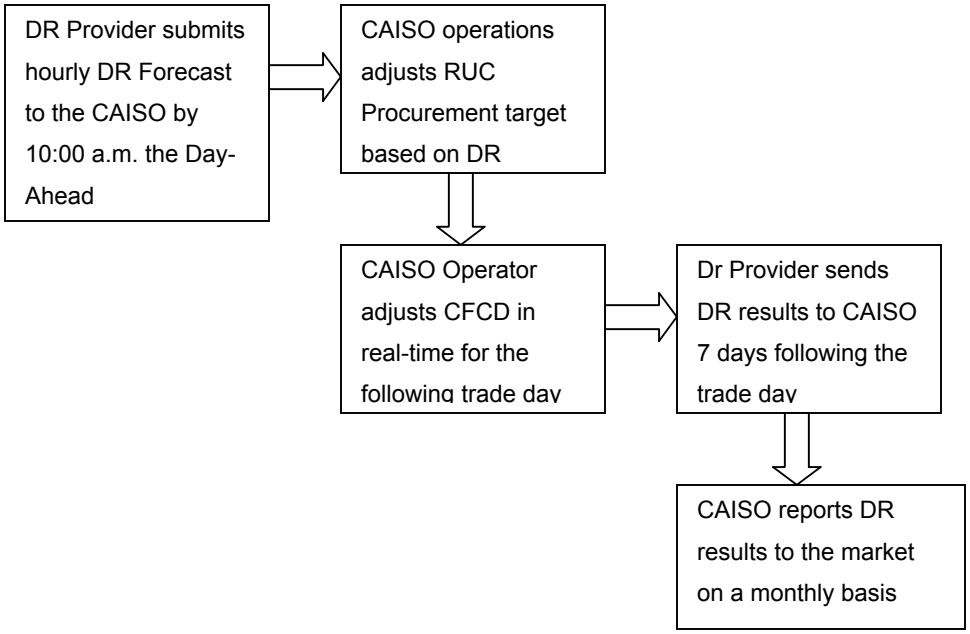
2.1 Process for Day-Ahead Programs

The following sections describe in detail the process for how Day-Ahead Demand Response programs will participate and be accounted for in the CAISO markets for MRTU Release 1.

The overall process is shown graphically below:

Process Overview:

Coordinator model are contemplated at this juncture given regulatory policy, settlement, and technical barriers that must first be addressed.



Process Definitions:

- **DR Forecast**: a MW quantity expected to be delivered … (MW)
- **CFCD:** CAISO Forecast of CAISO Demand, i.e. the CAISO load forecast used as benchmark to ensure sufficient resources are procured in the RUC process…
- **RUC Procurement Target** – quantity calculated from RUC process based on CFCD
- **DR Results**- Actual MW Quantity based on baseline and used to compare against DR forecast

2.2 Submission of Demand Response Forecast

Since Demand Response resources will not participate in the CAISO market in Release 1 through an explicit market bid, the CAISO will need to be notified via a manual process using an Excel spreadsheet when a Demand Response provider plans to call on a DR Program. Each Demand Response provider will submit a spreadsheet to the CAISO. The DR forecast is estimated by the Demand Response Provider based on historical performance in the particular DR program and is broken out by Demand Response Program, applicable RUC zones and relevant hours.

A RUC zone will correspond to defined areas representing UDC, MSS or load serving boundary for which the CAISO has sufficient historical CAISO Demand and relevant weather data to perform a demand forecast.

In the future as the CAISO's forecasting ability improves and becomes more granular there may be modifications to the existing RUC zones. The Daily DR Forecast Spreadsheet will need to be updated as these changes are made.

The CAISO has defined the following RUC Zones:

- PG&E UDC
- SCE UD
- SDG&E UDC
- NCPA MSS
- Anaheim
- Pasadena
- Azusa
- Banning
- Colton
- Riverside
- Vernon
- Humboldt
- North Coast/ North Bay
- Sierra
- Stockton
- Greater Bay
- Greater Fresno
- Kern
- LA Basin
- Big Creek/Ventura
- San Diego

The process for submitting the Demand Response Forecast to the CAISO is as follows:

1. Each day that a Demand Response provider is planning to call a DR program, it will fill out the Excel spread sheet "Daily DR Forecast for wd, mm-dd-yy", where mm-dd-yy is the date that the DR program is called for.

2. The spreadsheet has sections for both Day-Ahead and Day-of DR programs for a specific day. Day-Of programs are discussed in Section 5 below. If a Day-Ahead DR event is called, the Demand Response provider will fill out the Day-Ahead section of the form and e-mail the spreadsheet to the CAISO by no later than 10 a.m. the Day-Ahead which corresponds to the Day-Ahead Market close time.

3. Email Daily DR Forecast to the following CAISO email addresses:

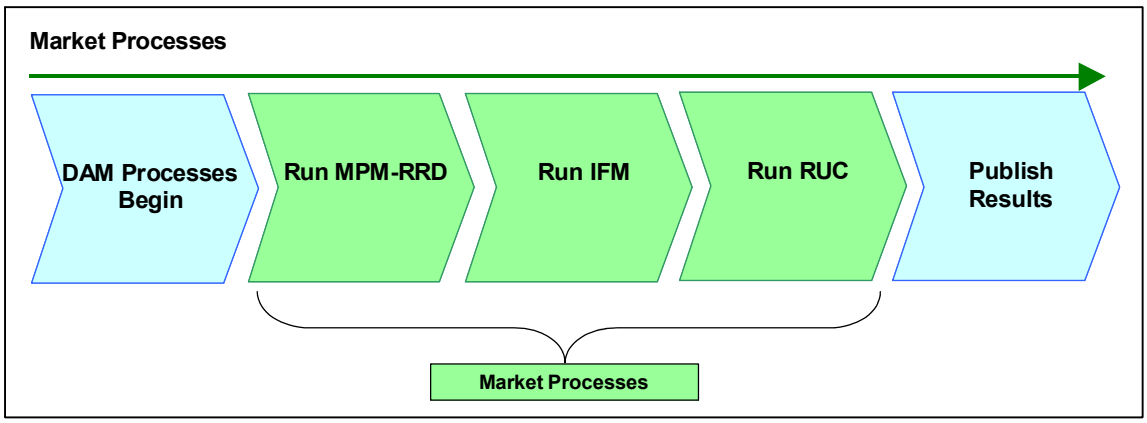
Shift Supervisors: CISOSS@caiso.com or ShiftSupervisors@caiso.com
Day-Ahead Market: CAISOMktOps@caiso.com
Hour-Ahead Market: MarketOpsHourAhead@caiso.com
Also cc: JGoodin@caiso.com;GPerez@caiso.com

Please see Attachment 1 below for samples of the Daily DR Forecast spreadsheet.

2.3 Accounting for Demand Response in the RUC Process

The purpose of the RUC (Residual Unit Commitment) is to procure additional capacity in the Day-Ahead Market that is required to meet the CAISO forecast of CAISO demand above what was committed in the IFM. The RUC process runs after the IFM is complete. See *Figure 1* below for CAISO Day-Ahead processes. The RUC process is based on specific requirements for serving expected CAISO Demand less any Demand scheduled in the IFM. These requirements are embedded in the RUC procurement target which is based on the CAISO Forecast of CAISO Demand (CFCD) and are established prior to the RUC run. The RUC procurement target is manually configurable by the CAISO operator and may be adjusted up or down based on various requirements. Please see the *"BPM for Market Operations"* section 6.7.2 for a description of situations where the RUC procurement target may be adjusted up or down by the CAISO operator.

Figure 1 – CAISO Day-Ahead Market Processes



Since Demand Resources, other than Participating Load, will not explicitly participate in the market in MRTU Release 1, the CAISO will manually adjust the RUC procurement

target by adjusting the CFCD in the relevant RUC Zone based on the Day-Ahead Demand Response Forecast submitted by the Demand Response providers' as described in Section 5 above. The RUC Procurement Target will be adjusted based on the MW quantity of forecasted DR submitted to the CAISO. The accounted for Demand Response will allow the CAISO to adjust the RUC procurement target downwards resulting in less RUC procurement. The CAISO must receive the Demand Response forecast by no later than10:00 a.m. the Day-Ahead in order to adjust the RUC Procurement Target.

Any changes to the RUC Procurement Target and reasons for the change will be logged in SLIC by the CAISO Operator and communicated to the market in the form of a report that will be posted on the CAISO website. It is still to be determined the format of the report and how often it will be posted. This guide will be updated with more detailed information when it becomes available.

2.4 Accounting for Demand Response in the Real-Time Market Unit Commitment Processes

The Real-Time Market ("RTM") consists of three processes working together: STUC, RTUC and RTED. Since non-participating load bids are not accepted into the RTM, the RTM and its processes use the CAISO Forecast of CAISO Demand (CFCD) to clear with supply in each of the processes. Please see Figure 2 below for a description of the CAISO Real-Time processes.

Figure 2 – CAISO Real-Time Processes

Element	Acronym	Detail
Market Power Mitigation	MPM	Applies to all Bids received by T-75 before the operating hour
Hour-Ahead Scheduling Process	HASP	Looks at the next Trading Hour: -Pre-dispatches Non-Dynamic System Resources -Pre-dispatches AS on the interties -Provides Advisory Schedules in 15-minute increments
Short-Term Unit Commitment	STUC	Looks ahead 5 hours to commit any Short and Medium Start Units

Real-Time Unit Commitment	RTUC	Looks out between four and seven 15-minute intervals to ensure there is sufficient Capacity to meet the Demand. • Commits and de-commits Short Start and Fast Start Units • Procures additional AS
Real-Time Economic Dispatch	RTED	Runs every 5 minutes to meet the Imbalance Energy requirement

Since the CAISO generates new load forecasts for the RTM, the Demand Response MWs that were forecasted and accounted for in the RUC procurement target in the Day-Ahead market should also be accounted for in Real-Time by reducing the CFCD for the hours that the Demand Response program will be triggered. This ensures that the DR is carried through and accounted for when the CAISO commits additional generating units in the RTM.

Additional detail will be added to this section in the next version of the User Guide when a process is determined for adjusting the CFCD in the Real-Time Market.

2.5 Actual DR Performance

The actual DR response, based on application of the appropriate baseline methodologies, will be reported to the CAISO by in a separate spreadsheet titled “DR Expected Results”. This information will be sent to the CAISO within 7 days of the trade day after the event or as soon as possible thereafter. Please see Appendix 1 below for an example of the DR Expected Results spreadsheet.

3 Day-Of Price Responsive Demand Response Programs

Day-Of Price Responsive Demand Response Programs are initiated by Demand Response providers and may be initiated based on CAISO system conditions or other specific triggers such as forecasted load, expected heat rate indicator, forecasted or actual temperature, etc. CAISO declared system emergencies are covered under the Emergency Programs described in section 6 below.

Under Day-of Price Responsive Programs, customers are notified the same day the event will occur and, depending on the program, are given as much as 3 hours notice to as little as 15 minutes notice to curtail load.

3.1 Process for Day Of Programs

Demand Response providers will fill out the section for Day-Of Programs in the Daily DR Forecast spreadsheet and e-mail to the CAISO following the process described in Section 4.2 above as soon as possible after an event is triggered, but no later than the Trading Hour minus 75 minutes (Real-Time Market close time).[2]

Estimated actual DR response will be recorded in a separate spreadsheet titled "DR Expected Results for we, mm-dd-yy". This information will be sent to the CAISO within 7 days of the trade day that the Demand Response was activated or as soon as possible thereafter.

3.2 Adjustments for Day-Of Programs in the Day-Ahead and Real-Time Markets

The CAISO will make adjustments to the CFCD in Real-Time for the trading hour if Demand Response forecasts are received by the CAISO by T-75. If conditions are such that a Demand Response provider knows they will initiate a Day-of Program by 10:00 a.m. the Day-Ahead and sends that Demand Response forecast to the CAISO, the CAISO will adjust the RUC procurement target in the Day-Ahead Market as well as the Real-Time CFCD for the following day to account for the demand response.

The process for adjusting the CFCD in Real-Time is still under discussion. The user guide will be updated with more information as soon as possible.

4 Emergency Programs

Emergency Programs, also known as Interruptible or non-firm programs, are triggered based upon a CAISO declared Stage 2 or Stage 3 emergency or for a local transmission

[2] For example, Trade Hour 10 begins at 0900 and ends at 1000. As such, trading for Trade Hour 10 ends at 0745, i.e. T-75 minutes before the Trade Hour.

emergency. These programs may be initiated by the Demand Response provider themselves or by request from the CAISO.

4.1 Process for Emergency Programs

Demand Response providers will fill out the section for Day-Of Programs for the relevant Emergency Program in the Daily DR Forecast spreadsheet and e-mail to the CAISO following the process described in Section 4.2 above as soon as possible after an event is triggered.

The CAISO will continue to follow the process defined in CAISO Operating Procedure No E-511 when making a request to a Demand Response provider to trigger an Emergency Program.

Since emergencies are unpredictable and emergency responsive programs are dispatched as a last resort grid reliability measure, the CAISO does not intend to adjust the RUC Procurement Target or the Real-Time CFCD to account for the Demand Response provided by these programs.

Estimated actual DR response will be recorded in a separate spreadsheet titled “DR Expected Results for we, mm-dd-yy”. This information will be sent to the CAISO within 7 days of the trade day that the DR responded or as soon as possible thereafter.

5 Load Impact Protocols

Demand Response performance is determined by the Demand Response provider based on the difference between the meter read and the calculated energy baseline. Currently, load impact protocols used to determine baselines may differ by program type and/or by the three primary Demand Response providers, PG&E, SCE, and SDG&E. In the near future, there will likely be a need to agree to a set of load impact protocols applicable to determining Demand Response Program performance for CAISO operational use and purposes. This issue of appropriate and applicable load impact protocols is currently being addressed by the CPUC in the DR Rulemaking (R.07-01-041) proceeding.

The paragraphs below provide a summary of the current baseline methodologies used by PG&E, SCE and SDG&E to determine DR performance.

PG&E

PG&E is using a 3 in 10 baseline where the hourly average is based on the three (3) highest energy usage days of the immediate past ten (10) similar days. The three (3) highest energy usage days are those days with the highest total kilowatt hour usages during the program hours. The past ten (10) similar days will include Monday through Friday, excluding PG&E holidays and will additionally exclude days when the customer was paid to reduce load on an interruptible or other curtailment program or days when rotating outages were called.

SCE

To be determined- Need assistance from SCE to complete this section.

SDG&E

To be determined- Need assistance from SDG&E to complete this section.

6 Reporting DR Results to the Market

The CAISO proposes to publish the Demand Response results as part of the Monthly Market Performance Report that is posted on the CAISO website at http://www.caiso.com/1c27/1c27dd0dcfe0.pdf.

The report would include a new section on Demand Response that would include the hourly DR forecasts, the MW reduced from the CAISO Forecast (CFCD) if applicable and the final DR results. As Demand Response resources continue to play a larger role directly in the CAISO markets this report will be enhanced to show more data.

This report is subject to discussion and approval by the CAISO as well as DR providers in September 12th working group meeting.

7 Post MRTU Demand Response Enhancements

The CAISO will form a Demand Response Post Release 1 working group as discussed in Section 1 above, to address the future enhancements that will allow Demand Response resources to participate directly in the CAISO markets as dispatchable resources.

The design that is under consideration will allow demand resources, also known as Participating Load, to submit three-part bids similar to a generators' start-up, minimum load and multi segment energy bid that would consist of load curtailment cost, minimum load reduction cost, and a multi segment load energy bid. Under this full dispatchable demand resource model, the Participating Load will have the opportunity to participate directly in the Day-Ahead energy market, RUC, Non-Spinning Reserve, and the Real-Time Imbalance Energy Market.

For more information on future enhancements associated with Demand Response please refer to most recent Issue Paper entitled " Post Release 1 MRTU Functionality for Demand Response" posted on the CAISO website at the following link: http://www.caiso.com/1c08/1c0810a2e527b0.pdf

8 References

Other documents that provide background or additional detail directly related to the *CAISO Demand Response Resource User Guide* are:

- BPM for Market Operations
- 5 – Year Market Initiatives Road Map
- Residual Unit Commitment Zones under MRTU
- Issue Paper – Post Release 1 MRTU Functionality for Demand Response
- CAISO Operating Procedure No E- 511
- The Market 201 Training Workbook

8.1 CAISO Contacts

Please contact Margaret Miller at mmiller@caiso.com or 916 608-7028 or John Goodin at jgoodin@caiso.com or 916 608 -7154 with questions or comments on the *Demand Response Resource User Guide.*

9 Appendix 1 – Glossary of Terms

To be completed

10 Attachment A – Template for Submission of DR Data

To be completed in next version of the User Guide

11 Attachment B – Demand Response Product Matrix