California Independent
System Operator

California ISO Proxy Demand Resource (PDR) Project Implementation Plan (DRAFT) December 1, 2009

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1.0 - Introduction

Throughout 2008 and 2009 the California ISO (ISO) completed a comprehensive stakeholder process to further the ISO goal to increase demand response (DR) participation in its wholesale markets and to respond to stakeholders' request for a product that will facilitate the participation of existing retail demand response programs in the ISO wholesale energy and ancillary services markets.

In response to stakeholders input, the Proxy Demand Resource (PDR) proposal was developed. In order to simplify forecasting and scheduling, the PDR proposal set forth that the load serving entities (LSE) load continue to be forecasted and scheduled or bid-in at the default load aggregation point (DLAP). It was further proposed that the demand response provider (DRP) bid the demand response portion of the load into the ISO markets as a separately defined proxy demand resource. The LSE and the DRP could be the same entity or two separate entities.

A final proposal, located at http://www.caiso.com/241d/241da56c5950.pdf, was published on August 28th, 2009. The proposal incorporated participant feedback and refinement of the initial and straw proposals. It was presented and approved by the ISO Board on September 10th, 2009.

This proposal featured the following product design attributes:

- A DRP may participate in the ISO markets separately from the LSE;
- The LSE must approve the registration of a new proxy demand resource (PDR) requested by a DRP;
- A PDR is eligible to participate in the Day-Ahead energy market, 5-minute Real-Time energy market and ancillary services market to provide non-spinning reserve;
- A PDR bids to curtail load as a generator. The PDR is bid and settled at a Pnode (which could be a specific location or an aggregation of Pnodes) and settlement occurs directly between the ISO and the DRP's scheduling coordinator (SC);
- The LSE continues to forecast and schedule their total load at the default-LAP;
- Performance of the proxy demand resource 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 morning adjustment capped at 20%;
- The ISO will adjust the settlement of the LSE based on the measured performance of the proxy demand resource to ensure there is no double payment for the demand response;
- Demand response performance will be monitored by the ISO through a robust measurement and verification plan to ensure that demand response paid for was actually provided to the market.

Following completion of the final proposal, the CAISO began the internal design and implementation process that included detailed business scenario walkthroughs and began to finalize the following:

- Business Requirements
- Business Use Cases – to be a collaborative, scenario-driven process involving both internal and external entities and stakeholders.
- Design Impacts – identified impacted areas and resolution of design issues.
- Deployment Timeline – finalizing timeline of the following major project milestones:

- Development Phase (both internal & external)
- Market Simulation
- Go-Live Date

The objective of this Implementation Plan is to document the current implementation details and provide Market Participant's the information they need to effectively participate in the Proxy Demand Resource implementation workshops. The workshops are designed to stimulate discussions in order to further refine implementation details that Market Participants can use to develop their own implementation tasks needed to participate in market simulation and to establish readiness activities necessary to take advantage of the Proxy Demand Resource at go-live. The ISO plans to continue conducting implementation workshops and incorporating them into the remaining project timeline in order to share information and accept and incorporate stakeholder feedback into the plan.

This document is intended to provide participants additional information during the implementation phase. The contents are in draft form and will be finalized as part of the BPMs, Technical Specifications or other design documents. The information ultimately contained in BPMs, Technical Specifications or other formal documents supersedes any information contained in this implementation plan document.

2.0 – Proxy Demand Resource Implementation Summary

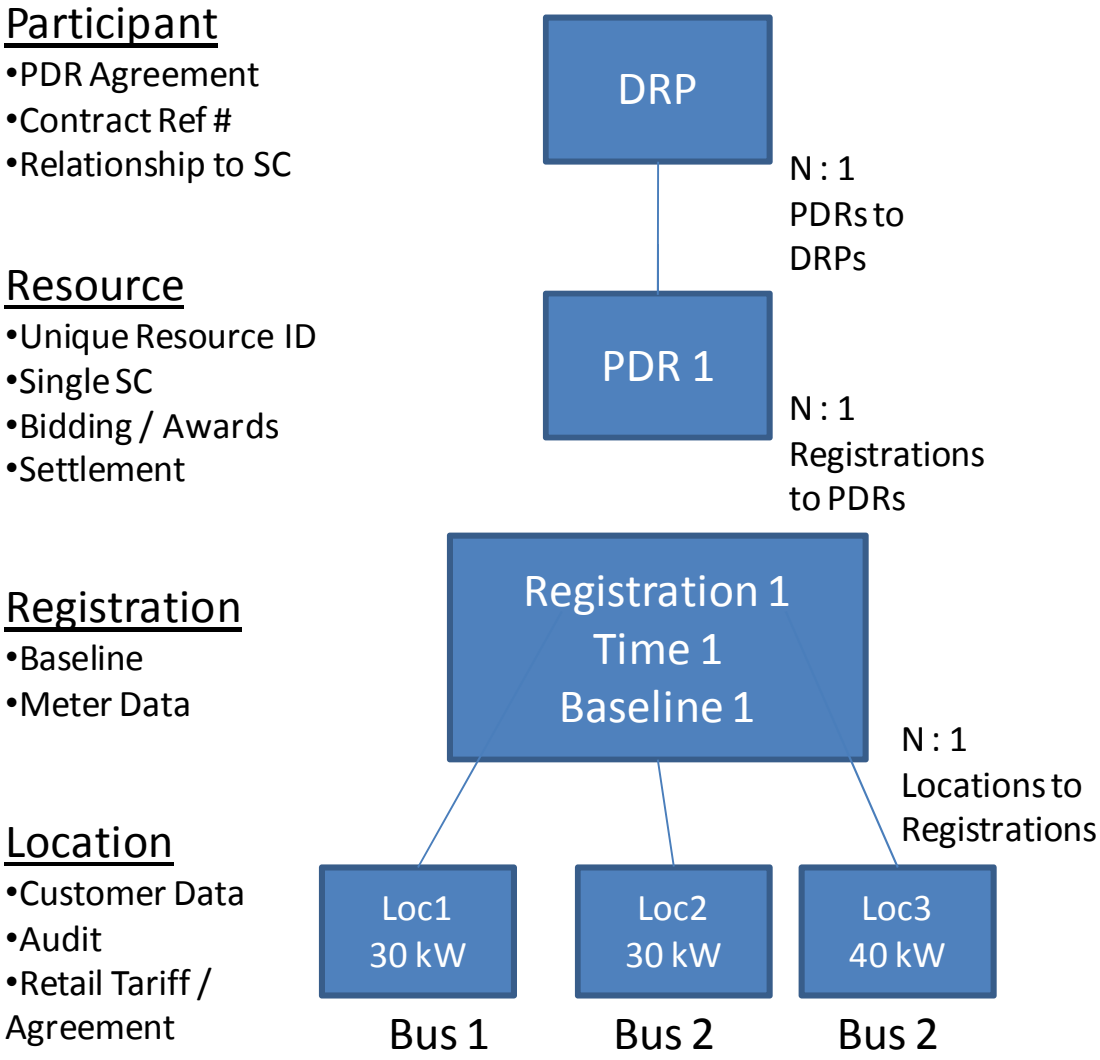
Table below outlines the Proxy Demand Resource final proposal recommendations. In addition, the application, system, and documentation impacts currently identified through internal implementation discussions are listed.

Subject	Final Proposal	Impacts
CAISO PDR Agreement	Demand Response Provider (DRP)	New Agreement
Registration	All agreements in place prior to Registration Information needed prior to obtaining a PDR Resource ID	PDR registration Process PDR approval Process New user interface to Demand Response Application (DRA) registration Establishing PDR Resource ID
Master File	RDT process followed	Specification and definition of RDT required information for PDR operating data
Market Participation	PDR can bid into the following markets: ✓ Day-Ahead energy market including RUC ✓ Day-Ahead and Real-Time Non-Spinning Reserve market ✓ 5- Minute Real-Time Energy market 10 PDR bid must represent the following: ✓ Must have a minimum load size of 0.1 MW (100kW) ✓ Smaller Loads may be aggregated together to achieve the 0.1 MW threshold. ✓ Bid segments may be as low as	Each PDR will have a unique resource id and be registered in the ISO master file. The PDR will be modeled as a pseudo generator and must be bid at the pnode or Sub-LAP. A PDR may not be self-scheduled and must be bid into the ISO markets at a non-zero price. Default Energy Bid will not apply to PDRs PDR bids will not be considered in LMPM – see posted DMM whitepaper titled **Local Market Power Mitigation for PDR** on the ISO website at:

Subject	Final Proposal	Impacts
	0.01 MW (10 kW)	Stakeholder Initiatives/ Current Initiatives/ Demand Response/ Proxy Demand Resource (PDR) http://www.caiso.com/23bc/23bc873456980.html
Meter Data Submission	Submittal of PDR underlying load data Submittal of historical load data for baseline development	PDR specific Meter Data Submission Process including one time submittal of 45 days historical meter data Requirements for PDR meter data submittal formats for Day-Ahead energy events, AS awarded capacity events, AS dispatch events, and RT imbalance energy events New user interface to demand response application (DRA) for submittal and retrieval of PDR meter data, baseline and performance data.
Baseline	Baseline methodology employing a 10 in 10 non event day selection method with set of rules for selection of baseline days including a symmetric multiplicative adjustment (*morning adjustment*) A "meter before/ meter after" baseline determination will be used for the purpose of compliance and settlement of capacity payments for A/S in No Pay	Implement customer baseline load calculation methodologies in DR application (DRA) Provide updates to incorporate baseline and PDR performance in BPM for metering Calculation of baseline "raw and adjusted" Calculation of PDR measurement values: ✓ PDR Generation Measurements (PDRGen) ✓ Default Load Adjustment ($DLA_{DLAPresourceid}$) -the LSE metered load adjustment for UIE) ✓ PDR No Pay Dispatch Performance (meter before /after) ✓ Real-Time Performance Measurement adjustment. Treatment for Direct Load Control PDR
Settlement	Settlement of the PDR will be as a proxy generator resource on the PDR resource ID The LSE's SC's UIE calculation will incorporate an adjustment to the actual settlement quality meter data (SQMD) based on the measured performance of all PDR's associated with the LSE's SC within a particular DLAP and specific DLAP resource id Compliance with AS dispatches requires that a PDR delivers the dispatched energy from the AS capacity within 10 minutes, as well as sustains the response throughout the duration of the dispatch.	UIE Charge Code No Pay Non-Spinning Reserve Charge Code No Pay RUC Charge Code Documentation – ✓ Configuration Guides, ✓ BD Matrix, ✓ Configuration Output file

Subject	Final Proposal	Impacts
Monitoring	Robust monitoring of PDR Performance	Establish comprehensive list of monitoring measurements for PDR performance in the market and process for monitoring.

The key elements of PDR participantion in the ISO markets take place at different levels which are described throughout this document. The diagram below provides an overview of the basic relationships and the terminology used. More detail is provided in the



Briefly,

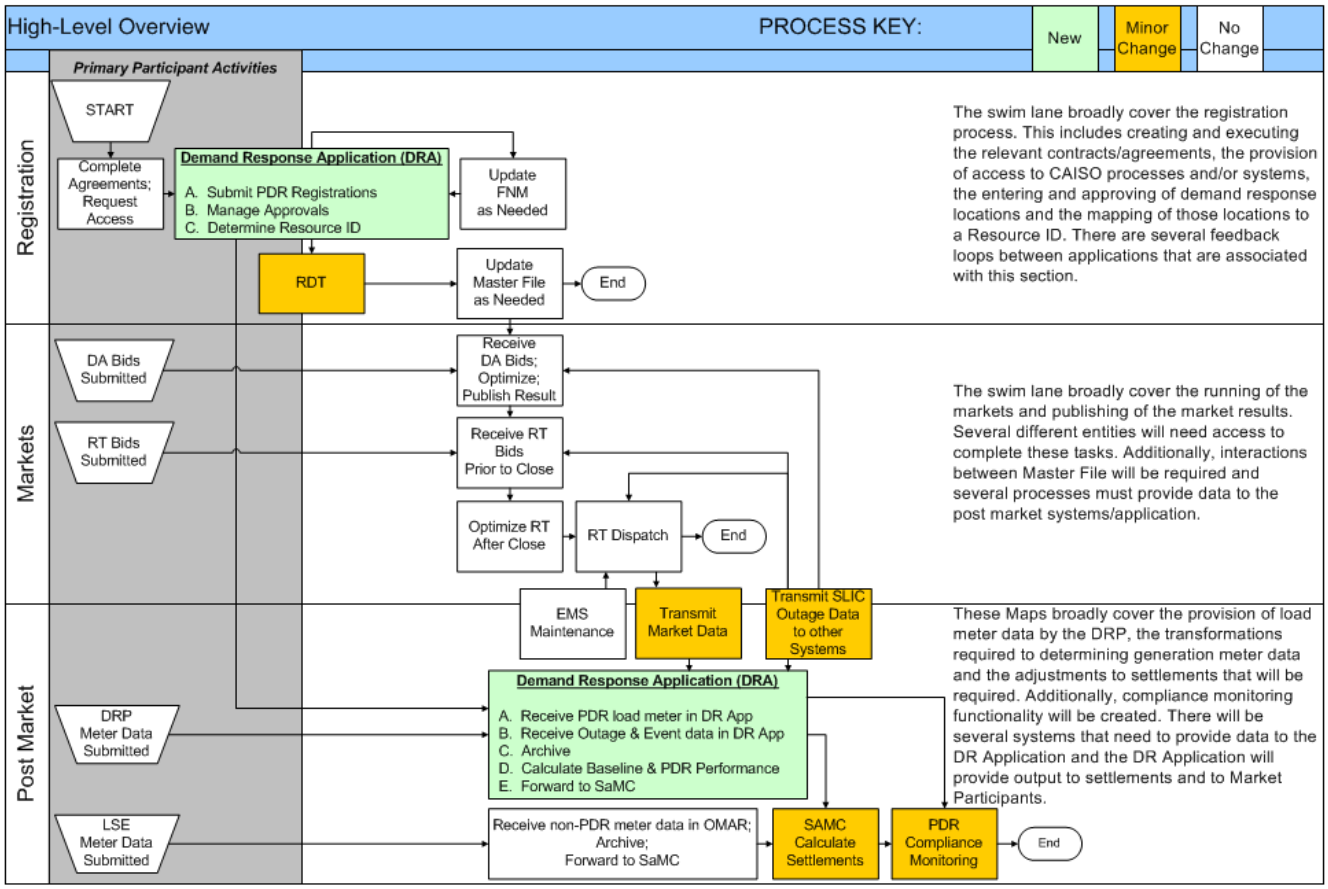
- A Location refers to a retail customer location that received transmission and distribution service from the UDC and which are uniquely identified by the UDC account number. Additionally, the Location receives retail energy from an LSE which may be different that the UDC. All Locations that are mapped to a single Registration must be contained in a single Sub-LAP. The DRP will enter information about the Locations in the Demand Response Application and the ISO may request data at this level for the purposes of audits.

- A Registration is composed of one or more Locations and is created in the Demand Response Application. The DRP will submit meter data at the Registration level and the Baseline will be calculated at the Registration level.
- A Resource is composed of one or more Registrations which are all within a single Sub-LAP. A Resource is defined for use in the CAISO markets and the DRP's SC will submit bids and receive awards and dispatches at the Resource level. Settlements are also calculated at the Resource level based on the performance of all Registrations mapped to the Resource.
- A DRP will execute the PDR Agreement and will either be an SC or contract with an SC for participation in the ISO markets.

More detail on these terms and concepts is provided in the sections below.

3.0 – Business Process Overview

The following diagram is provided to illustrate the PDR process from registration through participation in the CAISO markets into the CAISO's post market processing including metering, settlements and compliance monitoring.



A PDR is a combination of load scheduled by the LSE's SC at the Default LAP (DLAP) and a bid to curtail submitted by the DRP's SC using a separate proxy generator with a distinct generator resource id. The LSE and the DRP may be the same or different entities. A PDR may participate in the Day-Ahead, Real-Time, and non-spinning reserve markets as a generator resource. A PDR will be modeled as a proxy generator in the CAISO network model and is bid as an aggregate generator which may be as small as a single node or as large as an ISO defined Sub-LAP.

The scheduling, dispatch, and settlement of the PDR will be as a proxy generator resource on the PDR resource ID and the scheduling of the LSE base load will remain at the Default LAP.

PDR Performance will be measured using a predetermined baseline. The curtailed portion of the load is settled directly with the DRP's SC while the LSE's SC's UIE calculation will incorporate an adjustment to the actual settlement quality meter data (SQMD) based on the measured performance of all PDR's associated with the LSE's SC within a particular DLAP.

The objectives of the following sections are to describe process and application impacts due to Proxy Demand Resource. This will provide Market Participants the required information to begin their preparation for Proxy Demand Resource market simulation participation.

3.1 – CAISO PDR Agreement and Registration

Executing a Proxy Demand Resource Agreement

The ISO posted on its website the draft *pro forma* Proxy Demand Resource Agreement which is incorporated as part of the draft Tariff language for Stakeholder review, located at http://www.caiso.com/246b/246b7d812b000.pdf in Appendix B.

This agreement will need to be signed by a DRP and the ISO prior to requesting a PDR resource id. As with other ISO agreements, the PDR agreement will bind the DRP to the ISO Tariff. This will require that the DRP use a certified Scheduling Coordinator (note, the SC must be certified to submit settlement quality meter data) for all required tariff activities with the ISO. The agreement will also require that the DRP have sufficient contractual relationships, with the end use customers, LSE, and UDC and meet any Local Regulator Authorities requirement prior to participating in the ISO's market.

Use of a Certified Scheduling Coordinator
The ISO requires the use of a certified Scheduling Coordinator to be eligible to transact business directly with the ISO. 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 ISO 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 ISO of the Schedule Coordinator they will be using; this can be done by a letter submitted to the attention of the External Affairs group. 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 achieve these items with the ISO (for example: system requirements, credit requirements, demonstration of market proficiency, emergency procedures, and establishing qualifications to submit settlement quality meter data) independently.

Access to ISO Systems and Applications
Due to the nature of the transactions a DRP and Scheduling Coordinators performs in the ISO market, the ISO must have the ability to perform authentication and authorization for users. This requires a very specific process to obtain user access to ISO systems. Therefore, the DRP and the SC must have their External Point of Contact on record with the ISO. Through the External Point of Contact, the DRP and SC can request access to the needed system by submitting the "All Application Access Request form " (AARF) which can be found on the ISO's Information Security page under the reference tab of the Operations Center on the ISO website. Access to the Demand Response Application will be granted based on the information provided in the AARF.

Since both the LSE and UDC for the underlying load customers of a PDR need the ability to review the appropriate load customer information during the PDR registration process, the ISO will need to maintain a list

of the responsible individuals from the LSEs and UDCs that will perform the review and approval of PDR registrations in the DR application. To ensure timely reviews, the ISO will request that the UDCs provide their contact information for the individuals that will perform the reviews. The ISO requests that prior to DRP entering their PDR information into the DR application, that they contact the ISO to ensure that the LSE of record for their PDR already has access to the DR application. If not, the DRP will need to provide the LSE contact information such that the ISO can arrange for their access.

3.2 – Applying for a PDR Resource ID

The PDR resource id is an ISO assigned resource id that represents a demand response unit in the ISO market. The PDR resource id will be used to bid, schedule, receive an award, and be settled on in the ISO market. There are certain steps that must be accomplished by the DRP, LSE, UDC and the ISO before the ISO can assign a PDR resource id. The following explains the different types of PDR resource ids and describes the application, approval and assignment steps.

Applying for a PDR resource id using the Demand Response Application and PDR Registration Process

PDR resource ids: pre-defined and custom resources
There are two types of PDR resources that can be used in the ISO market; pre-defined resources and custom resources. The pre-defined PDR resource ids allow for quicker assignment of the DRPs demand response to the PDR resource id. The custom PDR resource requires modifications to the full network model and therefore could have a timeline of up to 12 weeks for a DRP to apply and receive a custom PDR resource for use. The resources will look similar to this:

- Pre-defined: PGSA_1_PDRP01, where PGSA represents the location of the demand response by SUBLAP
- Custom resource: PRMNTE_6_PDRC01

The difference between the two types of PDR resources is basically that the pre-defined resources use pre-established Generation Distribution Factors (GDFs) to allocate the PDR performance (generation) to the associated APnodes of the SUBLAP. A custom PDR resource will be designed using historic demand data (provided by the DRP) for the specific network buses to calculate a unique GDF. For both pre-defined and custom PDR resource types, the GDFs will be static. If approved by the ISO to do so, a DRP may submit GDFs as part of its Bid for a given PDR. In order to be eligible to submit GDFs as part of a Bid, the DRP must request and receive approval from the ISO to dynamically Bid GDFs.

PDR resource id criteria
All PDR Resource ids will be associated to the end use loads represented by the DRP based on:

- The physical location, and
- The Load Serving Entity (LSE) of individual end use loads.

Therefore, prior to applying for a PDR resource id(s) the DRP must know which SUBLAP the end use loads are in and which LSE (and the LSE's SC) serves the load for the end use load. This information should be available to the DRP based on the requirement that they must have contractual relationships with the end-use customer, LSE and UDC. When requesting a PDR resource id, the DRP should group their end use loads by both the LSE and SUBLAP.

> Example 1: A DRP has 6 end use loads and requesting pre-defined PDR resource ids, what would be the minimum number of pre-defined PDR resources ids needed?

Customer	LSE	SUBLAP	PRD Resource id
1	A	SDG1	PDRP01
2	A	SDG1	PDRP01
3	B	PGF1	PDRP02

4	B	PGF1	PDRP02
5	B	PGSA	PDRP03
6	B	SDG1	PDRP04

Answer to Example 1 is 4 pre-defined PDR resource ids need to be assigned to this DRP.

Applying for a Custom PDR resource id

If the DRP believes that the pre-defined PDR resource ids are not sufficient for their needs, the DRP could request a custom PDR resource id. The DRP would have to identify the location of the end use customer loads by bus (however, must be in the same SUBLAP and represented by the same LSE) and provide sufficient historic load to demonstrate the appropriate allocation that will be required for the identification of unique GDFs. This information needs to be provided in to the ISO well in advance of receiving a PDR resource id. In addition to the internal analysis for the creation of the GDFs, the characteristics of the custom PDR resource must be identified in the full network model and requires a modification to the full network model. The full network model is modified approximately every 12 weeks.

Example 2: A DRP requests a custom PDR resource id for 4 end use loads that have the same LSE and are located in the same SUBLAP. Based on historic load of these 4 end use customers, 80% of the load is connected to Bus 1 and 20% of the load is connected to Bus 2. Here is how it will look:

Customer	LSE	SUBLAP	Location	Registration	GDF	Custom PDR Resource id
1	A	PGF1	Bus 1	Reg 01	0.8	PRMNTE_6_PDRC01
2	A	PGF1	Bus 1	Reg 01		PRMNTE_6_PDRC01
3	A	PGF1	Bus 2	Reg 02	0.2	PRMNTE_6_PDRC01
4	A	PGF1	Bus 2	Reg 02		PRMNTE_6_PDRC01

Registration Levels

The ISO will provide the ability to allow changes to the under lying end use load customers without having to issue a new PDR resource ids to the DRP. Registration levels were created to allow for flexibility for the DRP to revise their end use customers associated with a PDR resource, without having to request a new PDR resource id. The registration level will also allow for an 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 ISO at the registration level of the PDR resource id.

The DR application will allow the DRP to create registrations. These registrations must maintain the same standards as the over arching PDR resource, which is a registration must contain end use customers that are represented by the same LSE and located in the same SUBLAP. However, an additional granularity is required for the physical locations of a registration; that is the registration should contain the end use customers that are on the same bus in the SUBLAP. The DR application uses the term Location to identify the end use customer data and bus location. In addition, registrations will have defined start and end dates. This will allow for on-going changes to occur at the registration level without impacting the effective date of the PDR resource in the MasterFile.

Example 3: A DRP has 6 end use customers located in the same SUBLAP (PGF1) and are served by the same LSE. The customers are located at 3 different buses in the SUBLAP; therefore, 3 different registrations will be linked to the one PDR resource id.

Customer	LSE	SUBLAP	Location	Registration	PDR Resource id
1	A	PGF1	Bus 1	Reg 01	PDRP01
2	A	PGF1	Bus 1	Reg 01	PDRP01
3	A	PGF1	Bus 2	Reg 02	PDRP01

4	A	PGF1	Bus 2	Reg 02	PDRP01
5	A	PGF1	Bus 3	Reg 03	PDRP01
6	A	PGF1	Bus 3	Reg 03	PDRP01

In the above example all of the registrations had the same start date; however, the DR application will allow you to provide information on the applicable operational date for each of the registrations. This will be critical in the calculation of the baselines for the PDR Resource as will be discuss below in an example and in detail in the baseline section of this implementation plan.

Example 4: A DRP has originally 4 customers all with the same LSE and located in the same SUBLAP and are aggregated to one PDR Resource id (PDRP01). The PDR Resource id became effective in the ISO market on April 1, 2010. The DRP receives the approvals for adding 2 additional customers to the PDR Resource id (same LSE and located in the same SUBLAP) starting July 1, 2010. The DRP will create a second registration as shown below.

Customer	LSE	SUBLAP	Registration	PDR Resource id	Registration Start date	Registration End date
1	A	PGF1	Reg 01	PDRP01	04/01/10	06/30/10
2	A	PGF1	Reg 01	PDRP01		
3	A	PGF1	Reg 01	PDRP01		
4	A	PGF1	Reg 01	PDRP01		
1	A	PGF1	Reg 02	PDRP01	07/01/10	12/31/10
2	A	PGF1	Reg 02	PDRP01		
3	A	PGF1	Reg 02	PDRP01		
4	A	PGF1	Reg 02	PDRP01		
5	A	PGF1	Reg 02	PDRP01		
6	A	PGF1	Reg 02	PDRP01		

Note: In this example you see that the PDR resource id stayed the same. The meter data required for the baseline must represent the registrations and their timeline. So by 07/01/10, the DRP will need to submit to the ISO the appropriate historic data for Registration 02 so that the baselines can be properly calculated for future event dates after July 1.

There will be a unique registration for aggregated direct load control demand response (such as air conditioning cycling and variable light control programs). These registrations may include hundreds of individual customers that may or may not have interval metering for providing the meter data to calculate baselines and PDR performance, but must have some direct measurement of the performance. It is expected that the DRP will provide additional information on the design of their program and their method for calculating the PDR performance. The registration level in this case can will still be attributed to different bus locations in the SUBLAP and maintain the same LSE criteria for aggregation to a PDR resource.

Information required when apply for a PDR resource id

During the application process for obtaining a PDR resource id, the DRP must provide specific information about the end use loads involved in the demand response. This information is needed to allow the LSE, UDC, and ISO to efficiently review and approve the assignment of the PDR resource id. This information will be:

- Customer name
- Service address
- Service city
- SUBLAP location
- Bus location
- UDC service account number
- LSE and LSE's Scheduling Coordinator
- Operational information (service, curtailable quantity, load type, etc.)

Once appropriately entered both the LSE and UDC will have the opportunity to review the DRP's application information and approve or deny the PDR resource id assignment. Once the ISO receives both the LSE and UDC approval, the DRP will be notified of the PDR resource id assigned and will be requested to submit a resource data template (RDT) to provide the operational characteristics of the PDR resource to be implemented in the MasterFile.

3.3 – GDF Definitions

The ISO market systems will support bidding of a Proxy Demand Resource (PDR). The PDR location corresponds to an aggregated pricing node. Generation Distribution Factors (GDFs) are used to approximate the share of each of the locations (i.e. "generation" resources) that make up the PDR resource. Bids for the PDR resources are submitted for the aggregate generation resource representing the PDR, not for individual physical units, and schedules and dispatch instructions are similarly sent to the PDR resource id which may represent an aggregation of underlying resource locations. Since the ISO's FNM separately models each individual resource, GDFs provide the translation from market bids, schedules, and dispatch instructions to the individual units in the FNM.

The aggregate PDR resource is scheduled as an aggregate generating unit bid. The aggregate schedule is distributed to the individual generation resources using the specified GDFs, properly normalized to account for any outages.

GDFs are populated into the GDF table through two mechanisms.

1) The ISO maintains a default static set of GDFs for each aggregated generation resource corresponding to each PDR, which are based on quantities such as historical production load values at the load buses corresponding to each generating unit within the PDR resource.

   The static GDFs may be either the ISO's default values or custom values requested by the DRP and approved by the ISO. The DRP has to define the custom GDFs to replace the default ISO's GDFs. These default, and custom defined GDFs are pre-defined GDFs and are used if the SC representing the PDR does not submit GDFs as part of its Bid.

   The custom GDFs can be deployed based on the MasterFile deployment cycle without the need to wait for the FNM deployment cycle if only the GDFs values, not the makeup of the PDR resource, are changed from the default ISO values. On the other side, if the makeup of the PDR corresponding nodes are to be changed then the deployment of these custom PDRs in the market will follow the MasterFile as well the FNM deployment cycle.

2) If approved by the ISO to do so, a DRP may submit GDFs as part of its Bid for a given PDR. In order to be eligible to submit GDFs as part of a Bid, the DRP must request and receive approval from the ISO to dynamically Bid GDFs. A flag will be maintained in the Master File and processed by SIBR which will be used to determine whether dynamic GDFs feature is available for a given resource in the market systems. A DRP may request the changes of this flag by contacting their Client Representative.

3.4 – Resource Data Template

The existing ISO resource data template (RDT) will be used in order to finalize setup of the PDR in the MasterFile and establish it for market participation. The DRP will follow the established RDT process once a PDR has completed the registration approval process and obtained a resource id. The RDT is posted on the ISO website at the following link:
http://www.caiso.com/docs/2004/09/27/2004092714414413493ex.html

The PDR generator resources are modeled as the demand reduction portion of the load so the RDT parameters need to reflect the characteristic of the load reduction or curtailment of demand response. The following table describes the interpretation of some of the existing RDT fields for PDR resources and can be used as a reference when completing the RDT for a PDR.

Column Name	Column Code	PDR Definition
Maximum Generation Capacity	MAX_GEN	The most load that can be curtiled in your PDR. You will never be asked to curtial more than this number
Minimum Generation Capacity	MIN_GEN	The smallest load reduction which can be called to mark the beginning of an event
Minimum Dispatchable Level	MIN_DISP_LEVEL	Same as MIN_GEN
Minimum On Time	MIN_ON	Minimum amount of time that the ISO will request that you maintain a curtailment once a curtailment has been initiated
Maximum On Time	MAX_ON	Maximum amount of time that the ISO will request that you maintain a curtailment once a curtailment has been initiated
Minimum Off Time	MIN_OFF	Minimum time after load restoration, before the next load reduction
Maximum Startups Per Day	MAX_STRT	Maximum number of curtailments per day
Minimum Load Cost	MIN_LOAD_COST	Minimum amount of money you would accept to operate at your MIN_GEN level, per Hour
Reserve Capacity: Non-Spin	RSRV_CAP_NSPIN	The quantity of Non Spinning reserve for which the PDR resource is certified.

Additionally, a sample RDT has been created and is provided for additional information on how to interpret and complete a RDT for a PDR. It is posted on the ISO website titled "**Sample RDT and Field Description**" located at:

Stakeholder Initiatives/ Current Initiatives/ Demand Response/ Proxy Demand Resource (PDR)
http://www.caiso.com/23bc/23bc873456980.html

3.5 – SIBR bidding

The following SIBR bidding rules are applicable to SC's scheduling PDR's into those ISO Markets that they are eligible to in:

- Any submitted generation distribution factors (GDF's) from PDR's registered with a static distribution, as would be the case for a pre-defined PDR, would be replaced by the relevant default GDFs from the GDF library.
- A PDR registered with static distribution would not be allowed to have dynamic GDFs.
- If no GDFs are submitted for a PDR, which has been registered with dynamic GDF capability, the existing bid processing will fill in the relevant default GDFs.
- Energy self-schedules from PDR's in the Day Ahead Market (DAM) would be valid only if both of the following conditions exist:

    a) There is an AS self-provision bid for the same trading hour; and

b) The total self-schedule quantity is equal to the registered minimum capacity (Pmin) of the PDR. The Self-Schedule is required by the DAM applications to set the PDR Operating Mode to Must Run and by MQS as a self-commitment indication in the Bid Cost Recovery (BCR) calculations. Self-Scheduling above Pmin would not be allowed for PDRs in the DAM because they must bid economically.

- Energy self-schedules from PDR's in the real time market (RTM) would be valid only if both of the following conditions hold:

  a) There is a Day-Ahead schedule (DAS), a Day-Ahead AS award, or an AS self-provision bid for the same trading hour; and
  b) The total self-schedule quantity is less than or equal to the DAS for the PDR in that trading hour. The self-schedule is required by the RTM applications to set the PDR operating mode to Must Run and by MQS as a self-commitment indication in BCR calculations. Furthermore, if a resource with a DAS does not bid in RTM, SIBR inserts a template bid with a self-schedule at the DAS; this is required by the RTM applications to dispatch the resource at the DAS. Self-scheduling above the DAS would not be allowed for a PDR in the RTM because they must bid economically. The total self-schedule may be below the DAS (as low as Pmin) permitting an energy bid in the RTM below the DAS.

3.6 – CAISO Market Results Interface (CMRI) Reports

For all PDR resources, both the DRP's SC and the LSE's SC in which the PDR resides will have access to the following two new reports from the California ISO Market Results Interface (CMRI):

Day-Ahead Generation Market Results (CMRI)

- This would provide the Day-Ahead Schedule information for the PDR which would include scheduled quantities for Energy and the quantities awarded for RUC and AS. There is no bid price information included in this report

Expected Energy (CMRI)

- This report will contain the Total Expected Energy for Day Ahead, Real-Time, Instructed and total energy for the PDR. There is no bid price information displayed in this report. Report is available at T + 1

In the case where a DRP and LSE are separate entities, the LSE's SC would be provided with read only access to the reports listed above and only for the specific resource id's of any PDR's that are comprised of that LSE's customers.

The DRP's SC bidding the PDR resource would have access to the reports listed above in addition to all other available reports from CMRI that are relevant to the PDR resource.

Existing CMRI documentation that describes these two reports is located at
http://www.caiso.com/1c9d/1c9d761a5a8f0.pdf

This document will be updated as needed.

3.7 – Outages

From a systems perspective, no changes are required by participants who currently submit generation outages. The ISO will accept outage submissions for PDRs similar to how outage notifications are received and recorded for other generation units.[1]

There are two main reasons a PDR would submit an outage:

1. Unavailability of awarded AS capacity. If the PDR has sold AS to the CAISO in the IFM and experiences some sort of change in operations or equipment failure which makes it unable to delivery on its AS award, the PDR would submit an outage to SLIC. Since PDRs are modeled as generation resources in SLIC and in the Real-Time Market, logging the outage would notify the ISO systems and operators that the PDR is unavailable for dispatch of the energy underlying the AS award in the same manner as a conventional generation resource. A PDR should submit this type of outage as a ramp-rate outage. Submitting this type of outage reflects that there is a change in the PDR's ability to respond to ISO dispatches. This type of outage would result in No Pay on the AS Award.

Example:

- Total Load of 10 MW
- Pmax of 6 MW
- 0.5 MW per minute ramp rate
- The PDR is awarded 5 MW of Non Spin in the IFM
- After the IFM the DRP, DRP's SC or end-use customer determine that one of the three processes that are used to provide AS are not curtailable for the given hour, which reduces the ability to respond to an ISO dispatch of AS.
- The PDR's SC logs an outage in SLIC reducing the ramp rate to 0.33 MW (2/3 * 0.5 MW per minute).
- The ISO will calculate the AS that is undispatchable based on the reduced ramp rate. The maximum that can be provided in 10 minutes is 0.33 MW/min * 10 min = 3.33 MW. As a result, the PDR will receive a No Pay for 1.66 MWs of the Non Spin award (3.33 MW - 5 MW).

2. Failures of normal activity, which cause the affected day to not be valid for baseline energy calculations. As discussed above, PDR performance will be measured relative to a baseline. For example, if an office building which is closed on Fridays participates in PDR by offering to reduce HVAC load which is off on Friday, the facility will have lower consumption on this day. As a result, if this day were included in the baseline to measure response on an award day, it would understate performance by the PDR. Generally, the ISO will exclude days which are logged as outages from the baseline calculation.[2] A PDR should submit an outage of this type as a Pmax derate to zero MWs. For the purposes of selecting a day for consideration in the baseline, the concept of a partial outage does not exist. All ISO systems will also see the PDR as unavailable for this day.

When submitting an outage, the submitting entity must select an outage cause code (i.e. the reason for the outage). The ISO currently uses the NERC defined cause codes and the ISO [[has identified / will identify]] codes appropriate for PDR. Additionally, SLIC has a description field in which the submitting entity can describe the reason for the outage. PDR resources will be required to complete description field. The ISO will use the description field in its regular audits of PDR outages to ensure that outage submission is not used to manipulate the PDR baseline.

The ISO will be making some enhancements to add validation checks which ensure that PDRs are not able to enter generator outage information that does not apply to PDRs (e.g. a Pmin rerate). If incorrect outage types are entered, either through the GUI or the API, an error message will be returned. However, no new fields will be created and participants will not need to make any modifications to their systems to submit or retrieve outage information.

[1] Currently, generation units submit outages through SLIC. However, the ISO is upgrading its outage management system. Once that upgrade is complete, both generation and PDR will use the new system.
[2] Please see Section 3.8 for additional detail on the baseline methodology.

3.8 – Meter Data Submission, Baseline and PDR Performance Measurements

3.8.1 Meter Data Submission

A PDR is an SC metered entity (SCME) therefore the SC representing the PDR must have a Meter Service Agreement (MSA) in place supporting their ability to submit settlement quality meter data (SQMD) to the ISO. During the time of registration of the PDR, access to the Demand Response Application (DR application) will be granted based on the information provided in the AARF.

Access will include set up for the SC to have the ability to submit SQMD for the registered PDR's they represent into the DR application. During the registration process, forty five (45) days of meter data will need to be submitted for establishment of the PDR's baseline. Upon receipt of a PDR resource id, all forty five (45) days of historical meter data will be submitted at one time into the DR application as part of the registration process. This meter data will be required for the PDR prior to participation in the market.

SQMD will be submitted to the DR application for the PDR as Channel 1 (load) at the registration level assigned in the DR application; this could be SUBLAP level, Bus level or APnode level. The key aspect of the registration level is that the SQMD for both the baseline and the event day will need to be submitted to the ISO at the registration level for the PDR resource id. The SQMD will be required to be submitted for all underlying load at the registration level for the PDR resource id on a daily basis following current payment acceleration timelines beginning with the active date of the PDR resource id.

Format for Data submissions

- One hour intervals for Day-Ahead energy and/or for all hours in which the PDR is not awarded ancillary services (AS) or has not been dispatched for AS and/or RT imbalance energy
- Intervals of five (5) minutes for all hours in which the PDR is awarded ancillary services (AS) or has been dispatched for AS and/or RT imbalance energy
- Upon DRP request and ISO approval, 5 minute meter data can be created by parsing 15-minute recorded meter data into three equal 5-minute intervals.

3.8.2 Baseline Approach

The customer baseline (CBL) is used to calculate how much a PDR should be paid for reducing load. The CBL establishes a method for setting a customer baseline load, an estimate of how much electricity a customer would have used had it not reduced its use in response to Day-Ahead and Real-Time prices. This is compared against the actual load of the PDR during the time of the event.

The following section specifies the methodology employed to calculate the customer baseline for determination of a PDR performance.

BASELINE METHODOLOGY

- 10 in 10 non event day selection method (an average of the load in the last 10 eligible days)

BASELINE WINDOW

- The baseline window for meter data will be 45 calendar days from which the 10 most recent eligible days will be selected.
- The selection of baseline data will include a number of the most recent days, excluding different Day-Types and previous events days (definitions below)
- Two different Day-Types will be supported:
    - Weekday (Monday through Friday)

- Weekend/Holiday (Saturday, Sunday, or any NERC Holiday)

- A previous event day is any day on which there was either a PDR event or an outage recorded in SLIC. Previous event days are specific to the PDR.

PDR market participation	status	event day
Day-Ahead Schedule	yes	yes
Real Time Energy Dispatch	yes	yes
AS Capacity Award only	yes	no
AS Energy Dispatch	yes	yes
RUC Capacity Award only	yes	no
Outage	yes	yes

- The selection of baseline days is performed by iterating backwards through the acceptable days prior to the event day.
- Once the target number of days is reached, selection ends.
- If the target number of days is not reached, but the minimum number of days is reached, the baseline is calculated on the selected days (see below).
- If the minimum number of days is not reached, the highest usage prior event days within the baseline window will be used to reach the minimum number of days. The highest usage event days are defined as the highest totalized load for the resource during event hours.
- Target & Minimums are defined as:

	Weekday	Weekend/Holiday
Target	10	4
Minimum	5	4

- There is no elimination for “abnormally low” or “abnormally high” usage days.
- The baseline shall be calculated as a simple hourly average of the selected days metering. (*Note: five-minute meter data received for the selected days will be converted to hourly data for the purposes of calculating the baseline as calculation is based on the average MWh consumption for each hour of the event period across all the selected days).*
- The baseline will be calculated at the Registration level to facilitate versioning of the underlying customers in a Registration

AGGREGATION

- PDR Resources can be defined over multiple Registrations within a single Sub-LAP
- Registrations may be composed of Locations that are at different physical points on the grid.
- PDR Resources which are composed of multiple Registrations, or of a single Registration with multiple locations at different physical points on the gird, will be modeled as aggregate generators. Baselines will be calculated on sum of the meter data from the individual Registrations and not on the sub-aggregation resources

LOAD POINT ADJUSTMENT

- The baseline calculation will include a symmetric multiplicative adjustment, *morning adjustment*, unless otherwise requested by the DRP and approved by the CAISO.
- The multiplier will be calculated by averaging at the 4 hours prior to the event, excluding the hour immediately prior to the event start and defined as the ratio of the average load for these 3 hours relative to the same 3 hour average of the CBL calculation data set. The same multiplier will be applied to each hour of the event.
- If the multiplier will be capped at both a 20% increase (load ration = 1.2) and a 20% decrease (load ratio = 0.8).

REAL-TIME PERFORMANCE MEASUREMENT ADJUSTMENT

- A Real-Time adjustment will be applied if the PDR was RT dispatched during the event hour AND 5-min load data has been supplied for all underlying registrations for the entire event period
- The Real-Time adjustment calculates a generation measurement for each 5-minute interval by subtracting the 5 minute interval load from the pro-rated hourly baseline.

3.8.3 Baseline and PDR Performance Measurements - DR Application Calculations

The following details the calculation of raw and adjusted baselines and the performance measurements used in the settlement of PDR:

Baseline Variables	
r	= registration
e	= event day
d	= historical basis day (days used for the baseline)
h	= hour (hours of the defined event)
m	= 5 minute interval (0,5,10…55)
x	= discrete AS dispatch event for a PDR
n	= number of 5 minute intervals in the specific AS dispatch event
Adjustment Variables	
s	= adjustment window size (always 3)
t	= adjustment window offset (always 2)
i	= adjustment window start hour (for the defined method, this is always min(h) – 4)
j	= adjustment window end hour (for the defined method, this is always min(h) – 2)

Baseline

A raw baseline for the registration (**r**) for a given PDR for the event day for each event hour using the historical basis days identified through the iterative process is calculated first:

$$\text{Raw Baseline}_{reh} = (1 / (\text{count}(d)) * \sum_d \text{Load}_{rdh}$$

Where Load is the SQMD submitted for underlying load at the registration level for the PDR resource id

Next the adjustment ratio is calculated which will be used for this registration for the entire event day based on the first event hour of the day. Note that **h** (the event hours) are those for the entire PDR, and are thus the same for all underlying registrations that are effective on the event day.

$i = \min(h) – s - t + 1$
$j = \min(h) - t$
I f (i<1)
- then $\text{Adjustment}_{re} = 1$
- else $\text{Adjustment}_{re} = \max(0.8 , \min(1.2, \sum_{h=i..j} \text{Load}_{rdh} / \sum_{h=i..j} \text{RawBaseline}_{rdh}))$

Finally, the final adjusted baseline for the registration for the event day for each event hour is calculated.

$$\text{Baseline}_{reh} = \text{Adjustment}_{re} * \text{Raw Baseline}_{reh} (1 / (\text{count}(d)) * \sum_d \text{Load}_{rdh}$$

PDR Generation Measurements

Each registration will have its own generation curve, calculated as the difference between that registrations baseline and the load for the registration for each event hour.

$Gen_{reh} = Baseline_{reh} - Load_{reh}$

The PDR totals will be based on the underlying registrations that are effective on the event day.

$PDRLoad_{eh} = \sum_r Load_{reh}$

$PDRBaseline_{eh} = \sum_r Baseline_{reh}$

$PDRGen_{eh} = \sum_r Gen_{reh}$

Note, PDRGen = max (0,PDRGen)

For those time periods when a PDR was RT dispatched during the event hour AND 5-min load data has been supplied for all underlying registrations for all whole event hours, the following Real-Time adjustment will be made to the PDR generation measurement in order to simulate a Real-Time PDR generation curve. SQMD in Intervals of five (5) minutes must be submitted for all whole hours in which a PDR is awarded ancillary services (A/S) and/or dispatched for RT imbalance energy.

$PDRGen_{em} = 1/12 * PDRBaseline_{reh} - \sum_r Load_{rem}$ (for each m in h)

Default Load Adjustment (DLA)

A Default Load Adjustment (DLA) will be used to adjust the UIE settlement of the LSE for the measured performance of all PDR's associated with the LSE's SC within a particular DLAP. The DLA will also be based on the underlying registrations that are effective on the event day within a given DLAP load resource id.

$DLA_{DLAPresourceid} = \sum PDRGen_{DLAPresourceid}$

The PDR performance measurement will be provided as a generation quantity and the DLA data will be provided as a load quantity.

$PDRGen_{em} = 1/12 * PDRGen_{reh}$ (for each m in h)

$DLALoad_{em} = 1/12 * DLAGen_{reh}$ (for each m in h)

PDR No Pay Dispatch Performance (meter before/after in 5 minute intervals)

Compliance with AS dispatches requires that a PDR delivers the dispatched energy from the AS capacity within 10 minutes, as well as sustains the response throughout the duration of the dispatch. In contrast, the baseline methodology for Instructed Imbalance Energy settlement measures response relative to typical usage. Therefore, the ISO will use a "meter before/ meter after" approach for the purpose of compliance and settlement of capacity payments for AS No Pay, even though the settlement of Instructed Imbalance Energy will use the 10 in 10 non-event day selection method. The meter before/after amount calculated by the DR application is called PDR No Pay Dispatch Performance.

Note: SQMD in Intervals of five (5) minutes must be submitted for all whole hours in which a PDR is awarded ancillary services (AS) or has been dispatched for AS and/or RT imbalance energy.

First, PDRLoad total for the unique PDR AS dispatch event x is calculated. Unique PDR AS dispatch events are defined as each contiguous time period where the PDR Non-Spin IIE > 0. Note that m=0 represents the interval immediately prior to the event, with 1 to n as the subsequent 5 minute intervals.

$PDRLoad_{exm} = \sum_r Load_{rem}$ (for each registration for m=0..n that is within x)

Finally, calculate the performance for each interval after the event start.

$$PDRNoPayDispatchPerformance_{exm} = PDRLoad_{exm=0} - PDRLoad_{exm} \text{ (for each m=1..n)}$$

Five-minute PDR No Pay Dispatch Performance values provided within the DR application will be submitted to the settlement system as a generation quantity. Five-minute PDR No Pay Dispatch Performance values will be summed to the ten-minute Settlement Interval to determine No Pay compliance with dispatch instructions. An example of the calculation of PDR No Pay Dispatch Performance is shown in Section 3.9 example for No Pay for Undelivered Capacity.

Direct Load Control PDR Generation Measurement

The ISO would like to implement a process in which a baseline method could be presented by the DRP at registration with subsequent review and acceptance by the ISO as part of the PDR registration process. The DRP would use this accepted methodology to develop the PDR baseline and to calculate the Direct Load Control PDR performance. The DRP's SC would then be responsible to submit SQMD, representing the Direct Load Control PDR performance, to the DR application as Channel 4 (generation) for that PDR resource id. The ISO would like to discuss further with stakeholders the approach for Direct Load Control PDR measurement.

3.9 - Settlements

Settlement for the PDR's curtailed portion of the load will be settled by the ISO directly with the DRP at the PDR's specified PNode. The DRP will be paid the Day-Ahead LMP at the PNode for Day-Ahead PDR and the Real-Time LMP at the PNode for Real-Time PDR. Any other settlement between the DRP and the LSE would be performed bi-laterally between them and will occur outside of the ISO's settlement process.

In accordance with this process, bids to curtail load that clear the Day-Ahead and/or Real-Time Market will appear as a reduction to the LSE's Day-Ahead load Schedule for the purpose of settlement of uninstructed deviation. The LSE will still pay for Day-Ahead Scheduled load at the Day-Ahead DLAP price. For the purpose of the Uninstructed Energy calculation, settlements will adjust the LSE's meter data for that DLAP. The reason for the adjustment to the LSE's meter data is to avoid double payment, i.e. payment to the DRP for energy from the PDR in addition to payment to the LSE for uninstructed deviation based on the curtailment performed by the PDR in that DLAP.

In the case where the PDR does not perform according to the Day-Ahead Schedule or Real-Time dispatch the adjustment to the LSE's meter data ensures that the LSE would not incur uninstructed deviation charges due to non compliance by the PDR resource.

PDR/LSE UIE Settlement Example

The following example is provided to illustrate the settlement of Uninstructed Imbalance Energy (UIE) for PDR and the LSE in which the PDR is located. The example includes the following assumptions:

- LSE schedules 100MW in the Day-Ahead Market
- LSE has perfect load forecast
- DRP clears 10 MW in Day-Ahead Market and
- DRP clears an additional 5 MW in 5-minute Real-Time Market
- PDR resource does not have perfect performance
- Day-Ahead DLAP price = $ 80
- Day-Ahead PNode price = $ 95
- Real-Time PNode Price = $100

	LSE	DRP
LSE's DA Demand Schedule		
Cleared DA Schedule	100 MW	
LSE owes ISO 100MW * DLAP price CC 6011 Day-Ahead Energy, Congestion Losses settlement	$8,000	
DRP's operation in DA Market		
Cleared PDR		10 MW
ISO owes DRP 10MW * PNode Price CC 6011 Day-Ahead energy, congestion & losses Settlement		($950)
DRP's operation in RT Market		
Cleared Demand Reduction (5-minute Market)		5MW
Settlement to DRP		
ISO owes DRP 5 MW * RT PNode Price CC 6470 Real-Time IIE		($500)
PDR Generation Measurement (PDRGen)		14 MW
Uninstructed Deviation (based on deviation between performance and Day-Ahead Schedule)		
DRP owes ISO 1 MW * RT PNode Price CC 6475 Real-Time UIE settlement		$100
LSE's DLAP Final Metered Demand		
Meter Read	86 MW	
Settlement to LSE		
Calculation of "Uninstructed" deviation :		
LSE's DLAP DA Schedule	100 MW	
Default Load Adjustment ($DLA_{DLAPresourceid}$)	14 MW	
Actual meter read for DLAP	86 MW	
LSE's DLAP Adjusted Meter (Actual Meter Read + Aggregated PDR Performance)	100 MW	
Uninstructed deviation to LSE (LSEs Adjusted Meter – LSE's DA Schedule)	**0 MW**	
LSE owes ISO 0 MW * RT DLAP Price CC 6475 Real-Time UIE settlement	$0	
Total Net Settlement		
DRP		**($1,350)**
LSE	**$8,000**	

The following Charge Codes have been identified as having potential impact from PDR. Further ISO implementation discussions are in progress to determine if any changes will be necessary. This could potentially affect the following:

- CG PC MSS Netting
- CG PC Measured Demand Over Control Area

Supporting documentation for Real Time Energy pre-calculation inclusive of changes for PDR will be posted on the ISO website at:

Stakeholder Initiatives/ Current Initiatives/ Demand Response/ Proxy Demand Resource (PDR)
http://www.caiso.com/23bc/23bc873456980.html

CG CC 6224 No Pay Non-Spinning Reserve Settlement

No Pay is a mechanism to rescind Spin and Non-Spin capacity payments when a resource does not provide the Ancillary Service (AS) in Real-Time. Since the PDR is a combination of a load resource and a generation resource, the No Pay assessment will use both resource types to determine AS compliance. There are three categories of No Pay that will apply to PDR: 1) Undelivered Capacity, 2) Unavailable Capacity and 3) Undispatchable Capacity, the Undelivered category will use a "meter before/meter after" calculation to determine if the PDR responded to dispatch instructions from AS Capacity. The Unavailable category will use the PDR load meter to determine if the PDR resource has adequate load to accommodate the Non-Spin Capacity Schedule. The Undispatchable category does not use any meter data.

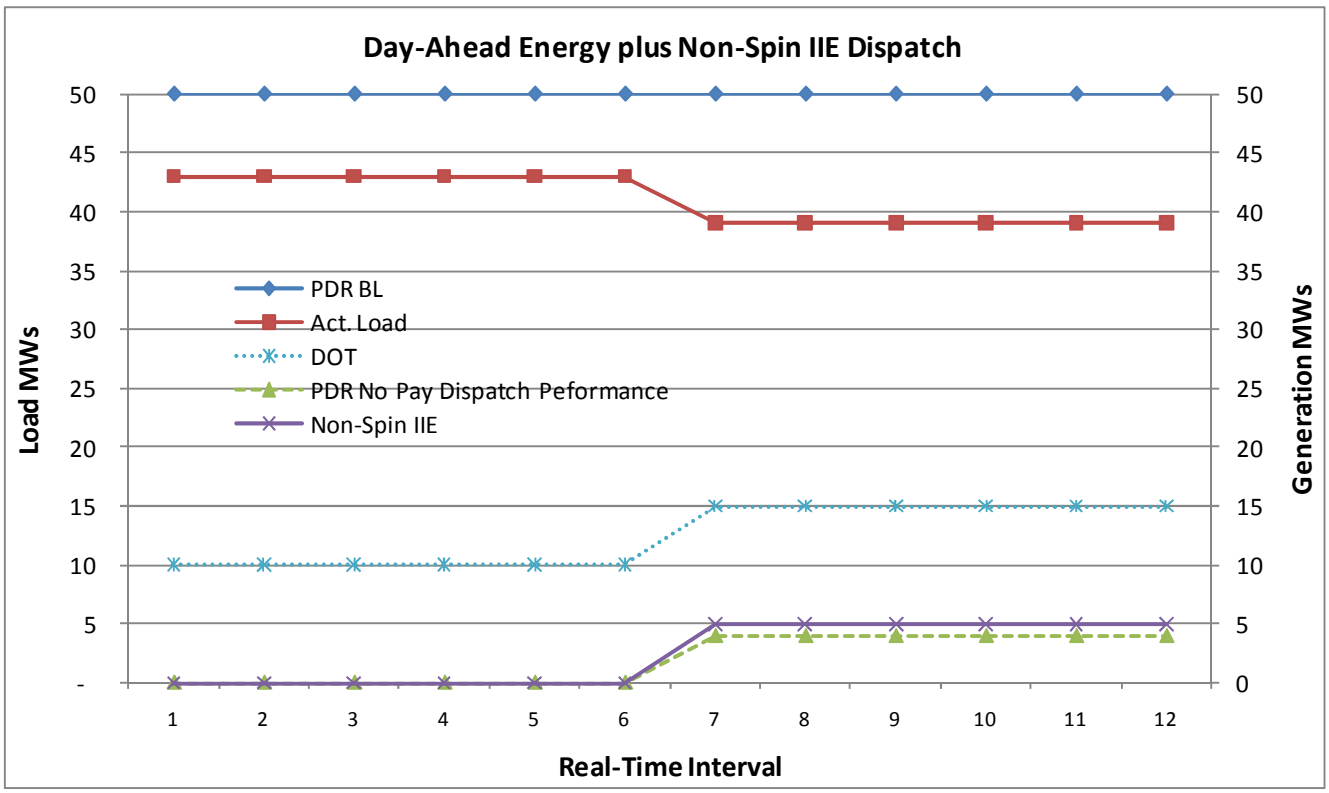
No Pay Settlement

No Pay for Undelivered Capacity Example

If dispatched for Non-Spin Instructed Imbalance Energy (IIE) in real time, the PDR must deliver 90% of expected Non-Spin IIE in each Settlement Interval to keep the total Non-Spin Capacity Payment. The difference in meter before the interval and after the interval will be used to determine amount of Non-Spin Energy delivered. The meter before/meter after calculation is described in Section 3.8 and is called PDR No Pay Dispatch Performance.

Assumptions

- PDR has a 10 MW Day Ahead Energy Schedule
- PDR has a 5 MW Non-Spin Capacity Schedule
- PDR is dispatched in Real-Time for 5 MW of Non-Spin IIE at minute 30
- PDR load meter before the dispatch event is 43 MW and after the event the PDR load meter is 39 MW (and remains at 39 MW for the rest of the dispatch) so that the PDR No Pay Dispatch Performance is 4 MW.



IF, (Delivered Non-Spin IIE ≥ (1 – Tolerance Factor) * Non-Spin IIE)
THEN, Undelivered Non-Spin Capacity = 0
ELSE, Undelivered Non-Spin Capacity [MW] = max(0, Dispatchable Non-Spin Capacity – Delivered Non-Spin IIE)

IF (4 MW ≥ (1 - 0.1*5 MW)
THEN Undelivered Non-Spin Capacity = 0
ELSE, Undelivered Non-Spin Capacity = max(0, 5 MW – 4 MW)
Undelivered Non-Spin Capacity = 1 MW

Where Energy calculations are made as follows:
Delivered Non-Spin IIE for PDR Generator [MW] = min (Non-Spin IIE, PDR No Pay Dispatch Performance)
= min (5 MW, 4 MW)
= 4 MW

- The PDR must deliver 90% of the 5 MW of Non-Spin IIE that was dispatched or 4.5 MW[3].
- The PDR No Pay Performance value is 4 MW so the PDR failed the Undelivered No Pay test.
- No Pay will rescind payment for 1 MW of Non-Spin Capacity in this example hour.

No Pay for Unavailable Capacity Example

If not dispatched for Non-Spin energy, a PDR must have enough load to drop to accommodate the amount of the Non-Spin capacity schedule.

Assumptions:

[3] The No Pay and RUC Non-Compliance examples are shown in this paper as MW values for simplicity. No Pay and RUC Non-Compliance settlement are performed on a ten-minute MWh interval basis. In this example, the 5 MW dispatch is 0.833 MWh of Non-Spin IIE in each Settlement Interval.

- PDR load resource has a 20 MW Day Ahead Energy Schedule
- PDR generator has a 20 MW Non-Spin Capacity Schedule
- PDR is not dispatched for Non-Spin IIE
- PDR load meter is 13 MW

Unavailable Capacity for PDR generator [MW] = max(0, min(Load Schedule for PDR Load – Non-Spin IIE – PDR Load Metered Energy), max (0, Dispatchable Non-Spin Capacity – Delivered Non-Spin IIE – PDR Load Metered Energy))

= max(0, min(20 – 0 – 13), max(0, 20 – 0 – 13)) = **7 MW**

Since the PDR Load Meter for the time period is only 13 MW, there is only 13 MW of capacity available for the PDR to drop if called upon for energy out of Non-Spin Capacity. Therefore 7 MW of Non-Spin Capacity is unavailable and will be rescinded by the No Pay program.

No Pay for Undispatchable Capacity Example

PDR generator must bid a ramp rate for Energy that is sufficient to deliver total Non-Spin capacity schedule in 10 minutes.

Assumptions:
- PDR generator has a 12 MW Day Ahead Energy Schedule
- PDR generator has a 10 MW Non-Spin Capacity Schedule
- PDR is not dispatched for Non-Spin IIE so the DOT for the PDR is 12 MW (DA Energy Schedule)
- PDR generator submits a Real-Time Energy curve with a ramp rate of 0.7 MW/minute.
- Based on the ramp rate of 0.7 MW/minute, RTM calculates that the PDR can deliver 7 MW in 10 minutes. This calculation is the Available Operating Reserve.

Dispatched Non-Spin Capacity [MW] = DOT[4] – Day Ahead Energy Schedule
= 12 MW – 12 MW = **0 MW**

Undispatched Non-Spin Capacity [MW] = Total Non-Spin Schedule – Dispatched Non-Spin Capacity
= 10 MW – 0 MW = **10 MW**

Ramp-Limited Non-Spin Capacity [MW] = min(Undispatched Non-Spin Capacity, max(0, Available Operating Reserve))
= min(10 MW, max(0, 7 MW)) = **7 MW**

Undispatchable Non-Spin Capacity [MW] = Total Non-Spin Schedule – Dispatched Non-Spin Capacity – Ramp-Limited Non-Spin Capacity
= 10 MW – 0 MW – 7 MW = **3 MW**

The PDR generator's energy curve shows that that ISO can only dispatch 7 MW in 10 minutes based on the ramp rate of 0.7 MW/minute. The PDR generator was awarded10 MW of Non-Spin capacity, however 3 MW is undispatchable and will be subject to No Pay based on the Available Operating Reserve and ramp rate.

CG CC 6824 RUC Non-Compliance Settlement

RUC No Pay Settlement

The PDR generator that has Residual Unit Commitment (RUC) Capacity Award will be subject to RUC Non-Compliance charges to rescind the RUC Award capacity payment if the RUC capacity is not provided in Real-

[4] DOT is Dispatch Operating Target.

Time. There are 3 categories of RUC Non-Compliance: 1) Undispatchable RUC Capacity; 2) Undelivered RUC Capacity and 3) Ineligible RUC Capacity. Undispatchable RUC Capacity charges are applied when the PDR generator does not have sufficient capacity to accommodate the Day Ahead Energy Schedule, Day Ahead Non-Spin Capacity schedule and RUC Capacity (both Award and RA RUC). Undelivered RUC Capacity charges are applied when the PDR generator does not have enough metered energy to meet expected energy. Ineligible RUC Capacity charges are applied when a resource is a Resource Adequacy Resource and should have bid it's Resource Adequacy Capacity as RA RUC but instead bids the Resource Adequacy Capacity as RUC Award.

Undispatchable RUC Capacity Example

Assumptions:

- PDR generator has a 8 MW Day Ahead Energy Schedule
- PDR generator has a 3 MW Day Ahead Non-Spin Capacity Schedule
- PDR generator has a 2 MW RUC Award
- RTM calculates the PDR Generator's Maximum Ex Post Capacity is 12 MW

Dispatchable RUC Capacity [MW] = min(RUC Total Capacity, max(0, (maximum ex-post capacity – Max(Day-Ahead Energy Schedule, Minimum Load Dispatch)) – Day-Ahead Total Non-Spin Schedule))
= min(2, max(0, (12 – max(8, 0)) – 3))
= **1**
Undispatchable RUC Capacity [MW] = max(0, RUC Total Capacity – Dispatchable RUC Capacity)
= max(0, 2 – 1)
= **1**
Undispatchable RUC Bid Capacity [MW] = min(RUC Bid Capacity, Undispatchable RUC Capacity)
= min(2, 1)
= **1**

The PDR generator will receive a RUC Non-Compliance charge for 1 MW since the Maximum Ex Post Capacity of the resource was 12 MW but the resource has a total of 13 MW of obligation in the Day Ahead Market.

Undelivered RUC Capacity Example

Assumptions:

- PDR generator has a 8 MW Day Ahead Energy Schedule
- PDR generator has a 4 MW RUC Award
- Pmax of the PDR generator is 20 MW so the Tolerance Band calculation is the max of 5 MW or 3% of 20 MW which equals 5 MW.
- Expected Energy is 8 MW (Day Ahead Energy Schedule)
- RUC Schedule is 12 MW. RUC Schedule is the total amount committed by IFM and RUC
- PDR Generation is 2 MW

IF, Metered Energy + Tolerance Band < Expected Energy AND IF, Metered Energy < RUC Schedule
THEN, Undelivered RUC Capacity [MW] = RUC Total Capacity ELSE Undelivered RUC Capacity = 0
IF 2 MW + 5 MW < 8 MW and IF 2 MW < 12 MW, THEN Undelivered RUC Capacity = **4**

Undelivered RUC Award Capacity [MW] = min (RUC Award, Undelivered RUC Capacity)
= min(4, 4)
= **4 MW**

The PDR generator needed to generate at least 8 MW (expected energy amount) in order to meet the requirements to provide RUC Award. Since it did not, it will lose payment for 4 MW of RUC Award.

Ineligible RUC Capacity Example

Assumptions:

- PDR generator has a 5 MW Day Ahead Energy Schedule
- PDR generator has a 3 MW RUC Award and 0 MW RA RUC Capacity
- PDR generator is an RA Resource for 8 MW.

Day-Ahead Committed Capacity [MW] = Max (Day-Ahead Energy Schedule, Minimum Load Dispatch) + Day-Ahead Total Non-Spin Schedule + RA RUC Capacity
= max(5 MW, 0 MW) + 0 MW + 0 MW
= **5 MW**

Ineligible RUC Award Capacity [MW] = Min (RUC Award Capacity, RUC Award Capacity – Undispatchable RUC Award Capacity, Max (0, Resource Adequacy Capacity - Day-Ahead Committed Capacity))
= min(3 MW, 3 MW – 0 MW, max(0, 8 MW – 5 MW))
= **3 MW**

The PDR generator is a Resource Adequacy Resource and should have offered the 3 MW of capacity as RA RUC, not RUC Award. Resource Adequacy Resources should not receive a RUC Award payment for capacity that should have been offered as RA RUC that is priced at $0/MW.

4.0 – Tariff/BPM Impacts

Business Practice Manual Impacts

		Expected Impact
Ref#	**BPM**	**PDR**
1	Managing Full Network Model	Medium
2	Congestion Revenue Rights	None
3	Market Instruments	Low
4	Outage Management	Low
5	Reliability Requirement	None
6	Market Operations	Low
7	Compliance Monitoring	Low
8	Metering	Medium
9	Scheduling Coordinator Certification & Termination	Low
10	Rules of Conduct Administration	None
11	BPM Change Management	None
12	Definitions & Acronyms	Low
13	Settlements & Billing	Medium
14	Credit Management	None
15	Candidate CRR Holder	None
16	Transmission Planning Process	None

These changes will follow CAISO's BPM change management process and be made in parallel with the tariff development. BPM drafts are scheduled to be published in the first quarter of 2010.

Changes to the tariff will follow CAISO's standard process for reviewing and obtaining stakeholder input on tariff language. The Proxy Demand Resource Draft Tariff Language Fourth Replacement CAISO Tariff has been posted as of November 19, 2009 for discussion purposes located at http://www.caiso.com/246b/246b7d812b000.pdf.

The Tariff update process for PDR will continue through January 2010.

5.0 - Technical Specifications – External Interfaces

This section identifies Proxy Demand Resource impacts related to external user interfaces, external systems, and software applications that require communications or data exchanges between CAISO and Market Participants. In addition, Technical Documentation has been developed which will provide additional information on the market participant facing interfaces to new ISO applications being introduced with PDR. Additional technical information is posted on the ISO website located at:

Stakeholder Initiatives/ Current Initiatives/ Demand Response/ Proxy Demand Resource (PDR)
http://www.caiso.com/23bc/23bc873456980.html

User Interfaces

New Demand Response Application Features

1. Registration entry, maintenance, review, and approval.
2. PDR underlying Load meter data submittal, viewing, and downloading (XML).
3. PDR calculated measurement data viewing and downloading (XML).
4. PDR baseline viewing and reporting (XML), including days selected for baseline creation.
5. CAISO Multi-Application (CMA) software digital certificates for user authentication.
6. CAISO Portal access.

CMRI
Use existing interfaces for PDR Resources.

SIBR
Use existing interfaces for PDR Resources.

Master File
Use existing interfaces for PDR Resources.

SLIC
Use existing interfaces for PDR Resources.

ADS
Use existing interfaces for PDR Resources.

Hardware Interfaces

There are no new hardware interfaces as a result of PDR.

Software Interfaces

Settlements

- No changes to the XML Schema Definition (XSD) are required.
- An updated Configuration Output file and BD Matrix will be provided prior to the start of the market simulation.

Metering

New Demand Response Application

Underlying load meter data for PDR Resources shall be submitted and retrieved in new XML format. See DRAFT of Interface Specification for PDR Data Exchange Services specification posted on project site. The following APIs are planned for the PDR data:

1. Submit API for PDR underlying Load meter data.
2. Retrieve API for PDR underlying Load meter data.
3. Retrieve API for PDR results data (PDR performance measurements)

CMRI
Use existing APIs for PDR Resources.

SIBR
Use existing APIs for PDR Resources.

Master File
Use existing APIs for PDR Resources.

SLIC
Use existing APIs for PDR Resources.

ADS
Use existing APIs for PDR Resources.

EMS
Use existing telemetry interfaces.

Communications Interfaces

Registration workflow notifications will occur via e-mail.

6.0 - Testing Approach

This section describes the high level testing approach for Proxy Demand Resource.

The ISO plans to conduct a Market Simulation from March 1 through April 30. Additionally, the ISO plans extensive internal testing efforts in advance of Market Simulation. The ISO's planned testing efforts are outlined below.

- DR Application
    - Functional
    - Integration
        - Master File
        - OMAR
        - SLIC
        - Settlements
- SIBR, IFM and RTM
    - Functional
    - Integration
        - CMRI
        - ADS
    - Performance
- Master File, SLIC, OMAR, Settlements and Compliance
    - Functional
    - Integration
        - IFM
        - RTM
- Market Simulation

The details and test plan for the Market Simulation are currently under development and more detail will be provided in future updates to this document and discussed with market participants at a future PDR Implementation Workshop.

The ISO is committed to providing PDR functionality prior to the summer of 2010 for those participants that are ready to take advantage of this product. However, the ISO realizes that not all participants will be ready at the time of the initial implementation and also that the build-out of participant systems will take place over time. The ISO will provide an ongoing test environment for participants to test enhancements to their systems as well as allow new participants an opportunity to implement new systems.

7.0 – Training

Training materials, when available, will be posted on the Training page of the ISO website. In addition, comprehensive training sessions will be provided in 2010 prior to the start of Market Simulation and prior to project implementation that would outline the changes to the existing Markets as a result of PDR. Training materials may include topics such as resource registration, RDT submittal, bidding and scheduling, outage reporting, meter data submittal, baseline methodologies, and settlement implications of this project.

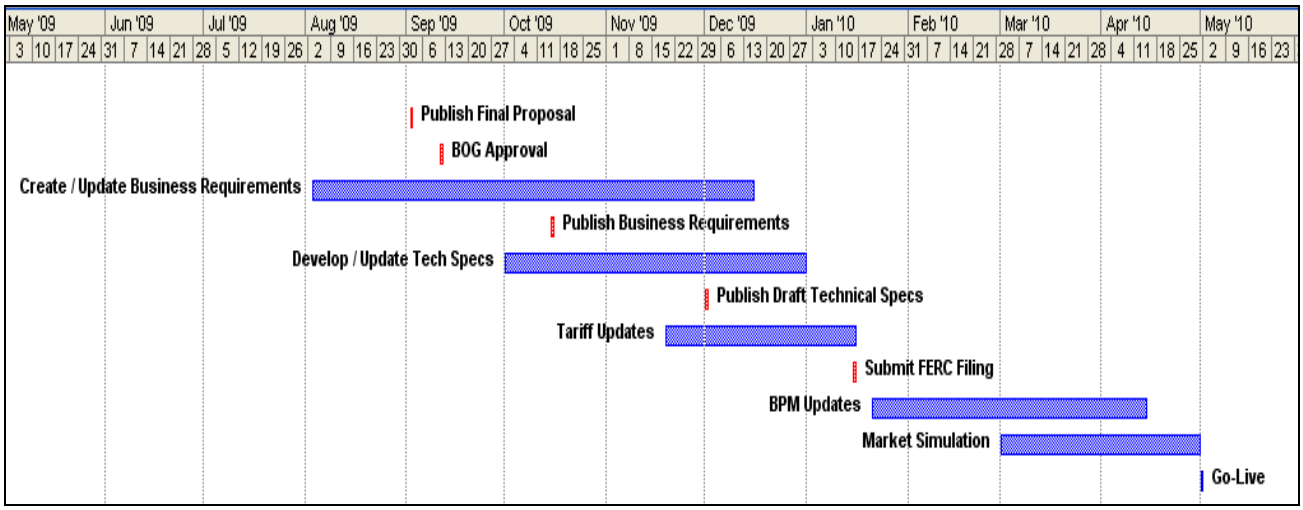
8.0 - Deployment Readiness Activities

Proxy Demand Resource is scheduled for implementation on May 1st, 2009.

The major milestones with target dates are provided in the table below.

Milestone	Target Date	Status
Publish Final Draft Proposal	9/2/2009	Posted
CAISO BOG Approval	Sep 10-11, 2009	Approved
Publish Business Requirements	10/15/2009	Published; responses to stakeholder questions drafted (to be posted soon)
Publish Technical Specifications	12/1/2009	Draft specification published.
Submit FERC Filing	1/15/2010	Draft posted to website; stakeholder call scheduled.
Publish BPM Drafts	Q1 2010	In progress.
Begin Market Simulations	3/1/2010	
End Market Simulations	4/30/2010	
Go-Live	5/1/2010	

More information on the documents listed in the table is available at:
http://www.caiso.com/23bc/23bc873456980.html



As the implementation of PDR progresses, the ISO will add additional detail to this section on testing, software deployments, training, registration and other topics.