California Independent
System Operator Corporation

Draft Final Proposal for the Design of Proxy Demand Resource (PDR)

Revised on August 28, 2009

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DRAFT FINAL PROPOSAL FOR THE DESIGN OF PDR

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1. EXECUTIVE SUMMARY

To further the Independent System Operator (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, the ISO is proposing to implement a new demand response product offering, the *proxy demand resource* (PDR). This new product will initially enable approximately 500 MW[1] of demand response capability access to participate in the ISO wholesale markets. Additionally, the PDR product will allow demand response aggregators, also known as Curtailment Service Providers or CSPs, to bid demand response on behalf of retail customers directly into the ISO energy markets. This enhancement should result in increased market efficiency and improved grid operations.

The ISO recommends this market enhancement to implement the proxy demand resource product by summer 2010 in order to:

- Enable curtailment service providers to bid demand response directly into ISO markets;
- Integrate retail price responsive demand response programs into the ISO markets; and
- Meet FERC regulatory mandates to enable the comparable treatment of demand response resources in the organized wholesale electricity markets.

In conjunction with the ISO's existing participating load product[2], the proxy demand resource product will add to the demand response capability available to market participants. This proposal addresses concerns raised in stakeholder meetings and in written comments that the ISO's existing participating load program does not provide the flexibility needed to incorporate price responsive retail demand response programs into the ISO markets. The proxy demand resource product also addresses a number of issues communicated by stakeholders as barriers to participation in the ISO markets for a significant portion of the existing demand response capability in California. The issues addressed by the implementation of proxy demand resource are:

1 Data from Second Annual Report of the California Independent Systems Operator Evaluating Demand Response Participation in the CAISO for 2008 posted at: http://www.caiso.com/2338/233891875f7d0.pdf The new demand response capability provided through proxy demand resource accounts for most of the existing expected price response demand response capability in California

2 Refinements to functionality that are proposed to the ISO's existing Participating Load model are described in a separate document posted on the ISO website at: http://www.caiso.com/2070/2070c79e59140.pdf

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- Allows a CSP to bid demand response directly into the ISO energy and ancillary service markets and to participate separately[3] from the load serving entity as required by FERC Order 719;

- Allows retail demand response programs that are embedded as part of the investor-owned utility's load to participate in the ISO markets through a market bid rather than through a manual process,[4] as is the case today;

- Provides the flexibility to accommodate a direct access and direct participation paradigm where end-use customers may enroll and participate in demand response programs with one entity and have their load served by a separate entity; and

- Simplifies forecasting and scheduling requirements for load serving entities to more easily allow end-use customer participation.

FERC Order 719 issued in October of 2008, requires that ISOs permit a CSP to bid demand response on behalf of retail customers into the organized electricity markets. The ISO and its stakeholders use the term "direct participation" to convey this concept of a CSP bidding demand response resources directly into the ISO wholesale electricity markets.

This Draft Final Proposal for PDR has been revised from the initial version, which was posted on April 27, 2009 to incorporate stakeholder written comments received on May 11 as well as input from stakeholders received through a series of working group and stakeholder meetings held between April and July 2009.

The Market Surveillance Committee (MSC) issued an opinion to the April 27, 2009 proposal recommending that the ISO adopt a "buy your baseline" approach and move away from using an administratively determined baseline which pays a customer for reducing energy consumption relative to a baseline. The ISO considered the MSC proposal and determined that, absent significant changes to existing retail rate design, the MSC's suggested approach would provide limited incentive for customers to provide demand response.

PDR is not intended to be an all encompassing product and is considered an initial step to provide options for demand response to participate in the ISO markets. Additional demand response products will be added in the future as the ISO markets evolve and additional needs and opportunities are identified.

The July 21, 2009 version of this proposal was discussed at the stakeholder meeting held on July 28, 2009 and accommodates revisions based on feedback received in that meeting. The ISO will seek board approval on the design of PDR in September 2009.

3 The ISO and its stakeholders use the term "direct participation" to convey this concept of a DR aggregator bidding DR resources directly into the ISO's wholesale electricity markets.

4 Through a manual process, the IOUs notify the ISO of the quantity of DR activity they anticipate on a Day-ahead or Day-of basis so that, as appropriate, the ISO can adjust its load forecast for purposes of adjusting its Residual Unit Commitment procurement target.

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2. STAKEHOLDER PROCESS

The table below summarizes the key steps that have been conducted and key dates coming up in the stakeholder process on Proxy Demand Resource. All the documents referenced in the table, as well as Stakeholder comments, and meeting and conference call presentations are available on the ISO website at the following link:

http://www.caiso.com/23bc/23bc873456980.html

November 5, 2008	Demand Response Stakeholder Meeting
December 22, 2008	Issue Paper on Direct Participation posted
January 5, 2009	Stakeholder Conference Call
January 12, 2009	Stakeholder Comments Due on Issue Paper
January 15, 2009	Demand Response Stakeholder Meeting
February 9, February 20, February 25 , 2009	Working Group meetings to resolve PDR design
February 27, 2009	Stakeholder Conference Call
March 5, 2009	PDR Straw Proposal posted
March 12, 2009	MSC/Stakeholder Meeting
March 19, 2009	Stakeholder Comment Due on Straw Proposal
March 20 , 2009	Stakeholder Conference Call
April 14 , 2009	First version of Draft Final Proposal posted
April 22, 2009	Stakeholder Conference Call
April 24, 2009	Stakeholder Comments Due on Draft Final Proposal
April 30, 2009	PDR Stakeholder Meeting
May 12, May 26, June 9, June 23, July 20	Working Group meetings to resolve PDR design
July 21, 2009	Revised Draft Final Proposal posted
July 28, 2009	PDR Stakeholder Meeting
August 5, 2009	Final version of Draft Final Proposal Posted
August 14	Stakeholder written comments due
September 10 - 11	ISO Board of Governors Meeting

An implementation plan will be shared with stakeholders following the September Board meeting.

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3. PRODUCT DESCRIPTION

3.1. Background

The PDR product is intended to make it easier to administer end-use customer participation in ISO markets, and lessen the coordination requirements of forecasting, scheduling and curtailing load within Custom Load-Aggregation Points (CLAPs) by separate entities, i.e. the Curtailment Service Providers (CSPs) and the Load Serving Entities (LSEs).

In the January 15th Stakeholder Meeting, three options for the design of PDR were presented to market participants. Those options included:

1. PDR Option 1
Under the PDR 1 proposal, the bid to curtail load is submitted by the CSP using a proxy generator at the CLAP and the LSE schedules their load at the Default LAP. The LSE's Day-Ahead schedule is adjusted based on the quantity of the cleared Day-Ahead bid to curtail submitted by the CSP. Therefore, the LSE is getting paid implicitly the Day-Ahead price for that curtailed load that cleared the Day-Ahead Market. Bids to curtail load that clear the Real-Time Market are settled as uninstructed Deviation with the LSE. The CSP receives no direct settlement from the ISO under PDR option 1 and there is no baseline methodology employed by the ISO to determine performance of the curtailed load.

2. PDR Option 2
PDR Option 2 has the same characteristics as Option 1 with the exception that there is no adjustment made to the LSE's Day-Ahead Schedule for the cleared Day-Ahead bid to curtail load submitted by the CSP. Therefore all curtailed load is settled as uninstructed deviation with the LSE. This option was added to eliminate the need to establish a link between the CSP and LSE in the ISO's settlement system so that the ISO could adjust the LSE's Day-Ahead schedule by the CSP's cleared Day-Ahead PDR bid. Again, under this option, the CSP receives no settlement from the ISO and there is no baseline methodology employed by the ISO to determine performance of the curtailed load.

3. PDR A
Similar to the other two proposals, under the PDR A proposal all PDR bids to curtail load are submitted by the CSP at the CLAP and the LSE schedules their load at the Default LAP. The key differences with the PDR A proposal as compared to the other two options are that all settlement for curtailed load is directly with the CSP rather than with the LSE and performance of the curtailed load is determined through a baseline calculation. The LSE's Day-Ahead schedule is adjusted for both Day-Ahead and/or Real-Time curtailed load based on the performance of the CSP's curtailed load as measured by the baseline.

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Table 1 below illustrates a simple example of the three PDR options. The example assumes a single LSE to a single CSP and perfect compliance by the PDR resource. Additional examples that illustrate the three PDR options discussed are posted on the ISO website at:
http://www.caiso.com/2360/23608821fc90.xls

The assumptions for this example are as follows:

- LSE schedules 10 MW of Load in the Day-Ahead Market
- CSP clears 1 MW of load reduction in Day-Ahead and another 1 MW of load reduction in Real-Time
- Perfect compliance by PDR resource

Table 1 – Example of Basic Scenario for Three PDR Options

	PDR 1	PDR 2	PDR A
LSE Day-Ahead Demand Schedule			
LSE Cleared Day-Ahead Schedule	10	10	10
Adjustment	-1		
Adjusted Schedule for Day-Ahead Energy	9	10	10
CSP Operation in Day-Ahead Market			
CSP's Cleared Demand Bid Day-Ahead	-1	-1	-1
Settlement to CSP			-1
CSP Operation in Real-Time Market			
Cleared demand reduction Real-Time	-1	-1	-1
Settlement to CSP			-1
LSE Final Metered Demand			
Meter Read	8	8	8
Settlement to LSE			
Uninstructed Deviation	-1	-2	See Below
Calculation of UIE for PDR A			
LSE's Original Day-Ahead Schedule			10
Actual PDR (Baseline – Meter Reads)			-2
LSE Adjusted Day-Ahead Schedule			8
Actual Meter Read			8
Uninstructed Deviation			0

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3.2. Pros and Cons of Three PDR Options

Table 2 summarizes the Pros and Cons identified by the working group for each of the three PDR design options[5].

	PDR 1	PDR 2	PDR A
Pros	• LSE paid Day-Ahead price for Day-Ahead DR • No baseline resulting in simple implementation for ISO • Settlement flexibility between CSP and LSE • PDR impacts the LMPs • LSE's Day-Ahead schedule is adjusted for power not consumed	• Easiest for the ISO to implement due to no baseline and no settlement impact • No linkage needed between CSP and LSE for purpose of settlements • Settlement flexibility between CSP and LSE	• DR dispatched at CLAP and paid CLAP price • Day-Ahead DR dispatch receives Day-Ahead price • Motivates DR to high priced CLAPs • Measurable and reportable performance of DR due to baseline • DR benefits accrue to CSP rather than LSE
Cons	• CSP has no obligation to perform • CSP benefits accrue to benefit of LSE • Need to allocate PDR specifically to each LSE to allow for adjustment of LSE DAM Schedule • Motivates DR to low price CLAPs • Dispatch price (CLAP) and settlement price (DLAP) at different location .	• CSP has no obligation to perform • CSP benefits accrue to benefit of LSE • Motivates DR to low priced CLAPs • Day-Ahead DR settled at Real-Time price • DR is not measurable and can get lost in Uninstructed Deviation	• LSE pays for power not consumed • Linkage between LSE and CSP needed for settlement same as PDR 1 • ISO managed baseline adds complexity to implementation and policy • Gaming concerns per LECG Money Machine (Load at DLAP and PDR @ CLAP) • Meter data required at customer level for ISO settlement

[5] This is a summary of the Pros and Cons and not a complete list of what was compiled in the working group meetings

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One of the key issues that came out of the January 15th ISO stakeholder meeting was that the ISO needed to quickly narrow down the PDR options. In order to meet this objective, the ISO worked with the existing stakeholder working group that originally developed the PDR A proposal to help refine and develop a consensus PDR proposal. The working group created examples for all three PDR options, determined pros and cons of each, discussed gaming concerns and settlements impacts. There were some differences in opinion among the working group regarding what the best option for PDR but ultimately, the ISO and the stakeholder working group came to the consensus that PDR A is the proposal that is the closest to the intent of FERC Order 719.

The PDR A option was selected and is referred to as PDR throughout this document.

3.3. Functionality

PDR-based demand response is the combination of load that is scheduled by the LSE using the Default LAP (DLAP) and a portion of that same load that is bid to be curtailed by the CSP at the Custom LAP (CLAP) using a proxy generator resource.

Demand Response participating as PDR may participate in the Day-Ahead Market (DAM) including Residual Unit Commitment (RUC), the 5-minute Real-Time Energy Market (RTM), and the Day-Ahead Non-Spinning Reserve Market at a CLAP. The configuration of a CLAP may be as small as a PNode, or as large as an ISO-defined Sub-LAP [6].

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The ISO recognizes that management of the data required for scheduling CLAPs may be difficult for CSPs that aggregate numerous small end-use customers, with frequent migration, i.e. enrollments and de-enrollments in a DR program. Therefore, the ISO proposes to provide CSPs the option to designate their DR resources as located in ISO defined Sub-LAPs rather than to define a CLAP.

Deleted: In this case the ISO will use standard distribution factors derived from the Energy Management System (EMS) State Estimator and stored in the Load Distribution Factor (LDF) library. The LDF library produces historical average LDFs based on a similar-day methodology.

The CLAP is a set of one or more load nodes, which is used for scheduling, pricing, and settlement with Loads. In the case of PDR resources, since the demand response is bid separately from the underlying Load and is represented by proxy generators, technically the mechanism for submitting bids uses Generation Distribution Factors (GDFs) rather than Load Distribution Factors (LDFs). Using the bid structures for generators as described in the ISO's Business Practice Manual for Market Instruments, GDFs may be submitted through SIBR as part of daily and hourly bid submissions. If GDFs are not provided through SIBR, the ISO will use GDFs for PDR resources that are provided when the PDR resource is registered, or as subsequently updated. This bid component consists of a set of Distribution Locations, which are the Connectivity Nodes (CNodes) associated with the resource, and Distribution Factors, which are the proportions of the resource capacity at each Distribution Location and are non-negative numbers that sum to 100% for the PDR resource. For metering and financial settlements, Settlement Quality

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6 A Sub-LAP is defined as a CAISO set of defined PNodes within a Default LAP

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Meter Data must be aggregated from all of the underlying loads that make up the Proxy Demand Resource, as described in Section 10.2."

PDR bids to curtail load will be submitted to the ISO as if the PDR were a generator, using all of the same characteristics and attributes set by the ISO for a generator's market participation.

In accordance with requirements defined in FERC Order 719, the LSE and the CSP may be the same entity or different entities. A bid to curtail submitted by a CSP will include load served by one (and only one) LSE. As a future enhancement to PDR, the ISO will consider the ability to aggregate multiple LSEs customers into a single PDR bid to curtail.

The settlement for the curtailed portion of the load would be settled by the ISO directly with the CSP at the PDR's specified CLAP, based on the LMPs of the PNodes that make up that CLAP. Any other settlements between the CSP and the LSE would be performed bi-laterally between the LSE and CSP outside of the ISO's settlement process.

Some market participants expressed support for the ISO formalizing an explicit settlement between the LSE and the CSP to compensate the LSE for the energy that it procured/scheduled which was then curtailed by the CSP. This would involve the ISO creating a hybrid settlement approach where, rather than settling with only the CSP, the ISO would settle with both the CSP and the LSE based on an agreed upon price and/or method. These market participants believed that having a formalized settlement may provide better financial "clarity" in the market and encourage more PDR participation. One option the ISO illustrated for discussion was the ISO paying the LSE the Day-Ahead DLAP price for cleared Day-Ahead PDR bids submitted by the CSP. This settlement, in effect, makes the LSE whole for energy purchased in the Day-Ahead market to support the load. The CSP would then be paid the difference between the DLAP price and the CLAP price for the demand reduction. However, a criticism of this approach is the Day-ahead price may not be representative of the actual price paid by the LSE for the energy; thus, other compensatory arrangements may still be needed outside of the ISO settlement process.

Other market participants supported the settlements as proposed, between the ISO and the CSP. These market participants believe that it would be difficult for the ISO to determine an appropriate price to settle between the LSE and CSP and it is better to be left outside of the ISO's process and resolved through bi-lateral agreements. If the ISO determines an inaccurate price there would still be the need for bi-lateral agreements to resolve the discrepancies.

After additional discussions with stakeholders the majority of stakeholders as well as the ISO agreed that the settlement between the LSE and the CSP should remain outside of the ISO's settlement process. Since there will be a need for commercial agreements outside of the ISO between the relevant parties to address the settlement, these

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agreements should be in place prior to registering a PDR resource with the ISO unless the parties agree otherwise.

Determination of actual PDR delivery will be derived from measurement of aggregate meter usage, calculated from a baseline determined using historical meter usage. The ISO proposes a "10-in-10" similar, non-event day selection methodology which is described in detail in Section 10.1. Verified performance against the baseline will determine the energy settlement with the CSP at the CLAP. The ISO proposes to determine performance versus baseline on an aggregate basis rather than by calculating each end-use customer's baseline versus actual and summing the results. 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.

4. DESIGN CONCERNS

4.1. LECG Gaming Concerns

The PDR proposal involves scheduling, dispatch, and settlement of the PDR at the CLAP and the scheduling of the LSE base load at the Default LAP. LECG identified gaming concerns in the case when DR dispatches are not settled at the same location as the underlying demand schedules which are explained in "Comments on the California ISO MRTU LMP Market Design", which is Attachment C to the ISO's May 13, 2005 amendments to its MRTU comprehensive design as filed with FERC, which are available at http://www.caiso.com/docs/2005/05/13/2005051314175518804.pdf).

The gaming opportunity for demand response that LECG identified (p. 62 in the LECG comments) is described as follows:

> *The sixth of the major implementation issues identified with the MRTU market design is the proposed mechanism for demand response. Since demand response buys power at the zonal/LAP price in the DAM and sells power back at the nodal price, demand response at nodes within constrained regions have a money machine whenever their actual load is less than their allowed maximum demand response offer. The LSE providing demand response would merely buy power equal to its demonstrated dispatch capability at the LAP price in the DAM and bid demand response at a low enough price to ensure it is dispatched nodally down to its planned consumption in RT, earning the difference between the nodal price and the zonal price for doing nothing. This would be equivalent to the effect of virtual demand purchases at zonal prices in the DAM that are settled at nodal pricing in real- time.*
>
> *A load's demonstrated dispatch capability is presumably limited by its maximum energy consumption but it may be economic to inflate this if the spread between*

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the LAP and nodal price is material over a large number of hours. The implicit subsidy in buying at the LAP and selling at the nodal price could become expensive to other consumers. This cost could be exacerbated by some of the other market design features, such as the way LAP bids are cleared in the DAM, which would tend to magnify the difference between the DAM LAP price and the RT nodal price.

Conversely, demand response resources would have little incentive to reduce load at times when congestion is low but prices high. Indeed, demand response loads in unconstrained portions of the transmission system might rarely have an incentive to provide demand response, as the RT nodal price would need to rise above the LAP price before it would be profitable for them to respond. If there is material congestion within the LAP, the RT LAP price could be higher than the nodal price for these loads, diminishing their incentive to participate in such programs.

The ISO believes that potential gaming opportunities for PDR are very limited for the following reasons:

- LECG's gaming concerns involve DR participation that occurs in a significant number of hours but DR programs that aggregate numerous customers, which is what PDR was developed to accommodate, have limits on hours of use and are more likely to involve infrequent operations.
- The DR resources will tend to be high priced resources which limits the probability of guaranteed dispatch which is a key element of LECGs gaming concern
- Gaming concerns involving strategic moves by customers to manipulate the outcome of the baseline calculation appear to be less likely when customers are part of larger aggregations, assuming the baseline is applied to the aggregate load.

In order to further mitigate possible gaming concerns and to ensure that DR resources using the PDR model have the characteristics that PDR is designed to accommodate, the ISO is proposing a combination of proactive and reactive measures to address gaming concerns which are described in Section 4.5 below.

4.2. MSC Opinion

The Market Surveillance Committee (MSC) issued an opinion to the April 27 proposal recommending that CSP's purchase their baseline in the preceding market, for example, purchase energy Day-Ahead to curtail in Real-Time and eliminate the use of a historical baselines that would pay customers not to consume energy based on where the load would have been had the demand response not occurred.

The ISO identified a number of issues with the MSC approach that present challenges to implementing this approach in the short term.

Those issues are:

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- Earnings would depend more on whether real-time prices are higher or lower than day-ahead prices than on the performance of the demand response resource.
- Possible conflicts with existing rules around direct access
- Limited incentive for customers to provide demand response due to existing retail rate design
- MSC proposal requires full participating load functionality which is not planned to be implemented until February 2011

The ISO considered the MSC's proposal and agree that baselines present possible gaming opportunities. The ISO also agrees that requiring the CSP to take a firm financial position to purchase the baseline relative to which a customer's demand reduction will be measured in a previous market would provide less opportunity for CSP's to be paid for demand response without actually providing any reduction in power consumption. However, absent changes to retail pricing there would be limited incentive for consumers to provide demand response. Even if there were retail rate changes, the price difference between Day-Ahead and the Real-Time markets may not be sufficient to encourage participation. It could also encourage participation only to gain the difference between the Day-Ahead and Real-Time price without providing any physical demand reduction.

The ISO views the MSC proposal as very similar to the ISO existing participating load program with the difference being the MSC proposal accommodates direct participation. The ISO will consider the MSC proposal as a variation to participating load but will move forward with PDR as a means to integrate demand response that is currently participating through IOU retail demand response programs into the ISO markets.

The MSC proposal is posted on the CAISO website at the following link:
http://www.caiso.com/239f/239fc54917610.pdf

4.3. Options to Address Gaming Concerns

Proxy-Demand Resources and Demand Response products in general, are susceptible to gaming. The reason for this is primarily because PDR settlements are unique in wholesale electric market design: the financial outcomes are based, in part, on historical data applied to performance during a demand response event. Demand reduction can only ever be estimated, never measured.

Additional factors include larger numbers of smaller resources participating and having those resources move in and out of PDRs more frequently than traditional resources move in or our of conventional markets. Add to this mix a large volume of metering information that needs to be accurately tracked and appropriately aggregated, and one finds a system that is inherently prone to gaming, in additional to traditional data errors.

The ISO realizes that gaming may occur in its PDR market and has documented these major areas of concern. To mitigate these gaming risks, it has also documented a set of

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techniques to use, both proactively and reactively, to identify and flag gaming, or at least reduce the impacts from gaming.

4.4. Areas of Concern for Potential Gaming

1. Baseline Manipulation

By employing techniques to artificially inflate historical usage or bias the selection of which days are used in the calculations, it is possible for a CSP to be overcompensated.

2. Morning Adjustment Manipulation

PDR settlements are also based on activity immediately before a demand response event, a component related to the "Morning Adjustment". Similar to Baseline Manipulation, a CSP may be overcompensated if the activity in the morning is artificially inflated. It is important to note that valid pre-event activities, such as AC pre-cooling, should be considered and handled appropriately.

3. CLAP/DLAP Arbitrage

Since the CSP is paid at the Custom LAP price and the remaining load pays for service at the Default LAP price, it is possible to strategically compose a PDR to take advantage of historic price differences among nodes. This problem is more likely to be issues if the LSE and the CSP are the same entity.

4. "Selective" Bidding

By utilizing high quality load forecasting, it is possible to predict fluctuations in normal usage patterns. By bidding a PDR as a "price taker" the CSP could be compensated for a "natural" reduction, as opposed to a reduction based on actions taken during an event.

5. Double Counting

Customers may, by accident or by design, be registered multiple times and therefore demand reductions would be compensated multiple times.

4.5. Techniques to Mitigate Gaming (Proactive)

A) "Good Faith" Language

The least costly mechanism to reduce gaming is likely the introduction of language in the CSP agreement that clearly states that gaming is not an acceptable practice in wholesale

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markets. This not only may this dissuade potential offenders, but also may give market participants adversely affected by gaming practices grounds for financial recuperation.

B) Morning Adjustment Cap

If a CSP has manipulated a PDR's morning adjustment by artificially increasing load before an event, applying a cap to the adjustment factor can mitigate the amount by which the inflation will impact the settlement. A morning adjustment cap does not eliminate all gaming techniques, but may reduce the number of incidents through reduced gains. Caps, however, carry the negative connotation that the market design is potentially flawed in some way that requires a protective measure.

C) Weather-Sensitive Adjustments

Instead of employing a morning adjustment based on load profile information, an adjustment may be performed using weather data, most commonly the local temperature at or near the PDR's location. Weather adjustments are more difficult to game, since the weather is not a under the control of the CSP. However, implementing a weather correction requires the creation of an entirely new set of data collection and validation mechanisms, adding cost to the overall system.

D) Convergence Bidding

Convergence (or virtual) bidding is a mechanism whereby market participants can make financial sales (or purchases) of energy in the Day Ahead market, with the explicit requirement to buy back (or sell back) that energy in the Real Time market. It is hoped that the introduction of Convergence bidding will reduce the arbitrage opportunities potentially made available to CSPs. **Convergence Bidding is planned to be implemented by February 2011.**

E) Revenue Cap

Establishing a cap on PDR revenues would eliminate extraordinarily high gains. However, establishing the level at which revenue is considered unreasonable is a difficult task. Additionally, employing a market cap implies fundamental flaws in the market design.

F) Bid Floor

Establishing a floor for PDR bids would eliminate any scheme where a "price taker" strategy is employed. Similar to a Revenue Cap, establishing the level and the arguments about implications to the market design are issues.

G) Baseline Qualification

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Baseline calculations are, by definition, controversial since they can only estimate demand, as there is no physical way to measure the demand. However, the baseline model can be applied to typical (non-event) meter data, and its predictive capability quality measured. The ISO could put a qualification requirement in place such that all PDRs meet a minimum quality of fit to the baseline model. This would eliminate highly variable loads from participating, or otherwise force them into aggregate PDRs where the effects can be averaged with other resources. The additional work in the qualification process would be onerous to ISO staff.

H) Registration Checks

During registration, the occurrence of PDR resources that either overlap in time or are registered in multiple PDRs will be screened. This is possible through commercial and industrial account number checks, and also through aggregates of residential customers comprising a single resource. The ISO does not intend to validate registration of individual residential accounts.

4.6. Techniques to Mitigate Gaming (Reactive)

The ISO will employ a battery of software tools and business processes to monitor and flag potential gaming incidents. Many of the proactive techniques previously discussed can be more easily monitored in the production data. In general, the ISO will look at certain metrics across all PDRs and flag those which fall outside typical ranges.

Some sample metrics that may be checked on a period basis include:

- Statistically high adjustment factors
- Statistically high revenues
- Statistically low bids
- Statistically poor baseline model fits

Additional metrics will be defined through the design process.

4.7. ISO Recommendation

The ISO proposes to not invoke revenue caps or bid floors initially. However, additional limitations may be placed on PDRs if it is determined to be necessary based on market analysis and participant behavior. If it is determined that additional mitigation measures are needed, the ISO will notify and discuss options with stakeholders.

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The ISO previously proposed that minimum bid limits and limits on number of hours be applied to PDR. Some stakeholders also submitted comments to the August 12 Draft Final Proposal supporting a minimum bid limit be applied to proxy demand resources to address potential gaming concerns. After further analysis and discussion with stakeholders the ISO determined that applying a minimum bid limit will not prevent any

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of the concerns listed in Section 4.4 above from occurring. The issue with baseline manipulation, which is the area most of the concerns are centered around, will not be resolved at all by applying a minimum bid limit. Baseline manipulation an still occur regardless of the bid price. A minimum bid limit may address partially the concern over CLAP/DLAP arbitrage but it only ensures the game cannot be played below a certain price. Adding a minimum bid limit at the onset of PDR is a concern to the ISO as it may limit participation of demand response in the ISO markets and ensure the market will pay more for demand response than may be warranted. Even if bid limits are applied a robust monitoring and verification plan will still need to in place for the ISO to ensure that PDR is getting paid for demand response that was actually provided to the market.

The ISO proposes to address concerns outlined in Section 4.4 using the following combination of both proactive and reactive techniques.

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¶
The ISO proposes the following

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- **Good Faith Language**

  Good faith language will be included in the Participating Load Agreement or Proxy Demand Response Agreement if it is determined that separate agreements are required.

- **Morning Adjustment Cap**

  The ISO has included a bi-directional 20% cap on the morning adjustment as part of the baseline proposal.

- **Weather Sensitive Adjustments**

  The ISO has identified this as a future enhancement to the PDR product.

- **Registration Checks**

  The ISO will perform registration checks as part of the registration process

- **Automated Metrics Reporting**

  The ISO will include the ability to monitor certain metrics in order to identify potentialas part of its software requirements as described in Section 4.6 above. The CAISO will benchmark with the other ISOs that have had similar demand response products in their market for some time, to develop an M & V plan. Specific metrics will be defined and in place by April 1, 2009.

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  Should a PDR resource repeatedly fall outside of identified ranges, or fail multiple metrics, a market monitoring study would be performed to determine if there is a likelihood that the Proxy Demand Resource has been compensated for demand response that was not really provided to the market. In this case, the ISO will ask the CSP to provide data to support proof of performance. In the end, if a study concludes

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that the Proxy Demand Resource has been unduly compensated the PDR resource will be removed from further participation in the ISO markets.

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In the case of the baseline fit quality, the ISO will make available to market participants the same tool by which the ISO calculates baseline fit quality. By having this capability, they may calculate their own estimates of quality before qualifying a new resource and to perform periodic checks to make sure performance is being maintained over time.

5. QUALIFICATION

The terms Registration and Resource are used throughout this document.

- A **Resource** refers to a specific metered site or location.
- A **Registration** refers to the recognized entity capable and approved for participation as a PDR.

In the case of a where a single Resource is registered, the terms Resource and Registration may be used interchangeably. In the case of an aggregation, multiple Resources make up a Registration

Prospective resources must meet the prescribed qualification requirements as set for by the PDR. It is noted that individual PDR programs may have different qualification requirements.

General resource qualifications include:

1. A PDR must be represented by one CSP
2. A CSP representing a PDR must be a certified Scheduling Coordinator or be represented by a certified Scheduling Coordinator
3. CSP Proxy Demand Resources must be associated with a recognized LSE and Utility Distribution Company (UDC)
4. A PDR comprised of an aggregation of resources must all be within the same CLAP and associated with the same LSE
5. A PDR must meet necessary minimum metering requirements to participate in the target program including the ability to provide interval metering data at the necessary granularity. For many PDR programs the metering requirement is the ability to submit hourly interval data.
6. In the case of some programs, a PDR must meet minimum telemetry requirements. (Telemetry requirements refer to real-time or near real-time resource monitoring.)
7. Resources either as an individual registration or as part of an aggregation must meet the minimum load size and curtailment amount limits as set forth by an individual PDR program.

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8. PDR participation must be explicitly precluded by the LRA for UDC's that serve more than 4 million MWh in the previous fiscal year. For UDC's that serve 4 million MWh or under in the previous fiscal year, the LRA for such UDCs must explicitly notify the CAISO that direct participation by CSPs is allowed.[7]

The ISO originally intended to allow the load of multiple LSEs to be aggregated and comprise a PDR resource. After investigating implementation impacts on registration and settlements the ISO changed its proposal to begin with a single LSE to PDR requirement. While the ISO recognizes that this limitation decreases the benefits of load aggregation, the minimum load size of 100 KW should allow CSPs to work within this restriction. This feature will be considered for a future enhancement to PDR.

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6. REGISTRATION

6.1. Overview

Since multiple parties (LSE, CSP, UDC) may be impacted, a registration process is needed to manage the approval process for the registration of new PDR resources as well as to manage the movement of individual accounts within PDR aggregations. These requirements are unique to PDRs and require the development of a new process for the registration of these resources.

Stakeholders submitted comments to the August 12 version of the Draft Final Proposal that ranged from an LSE should have the ability to reject a registration for any reason to an LSE should be able to confirm the attributes of a registration are correct but they should not be able to reject the registration at all. Some stakeholders also requested that the ISO set as a pre-condition of the registration process that commercial agreements needed to settle PDR must be in place and that CSPs should have to provide the necessary data down to the level of the individual customer to the LSE so they may validate their settlements.

The majority of stakeholders involved in the stakeholder process for proxy demand resource agreed that additional settlement transactions beyond what takes place between the ISO and the curtailment service provider will occur outside of the ISO settlement process. The ISO will provide a registration system to ensure that a registered proxy demand resource has the approval of the load serving entity whose load may be part of an aggregate proxy demand resource prior to participating in the wholesale markets. The ISO assumes commercial agreements are in place when the proxy demand resource is registered and approved by the relevant parties. As such, the ISO will not ensure the existence of a commercial agreement as part of the registration process. Nor will the ISO require data for settlements are exchanged between the curtailment service provider and

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[7] See FERC Order 719-A (128 FERC P 61059) (issued Jul 16, 2009) at Paragraph 51.

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the load serving entity as a condition of registration. These commercial arrangements are to be addressed by the contracting parties and, appropriately, take place outside of ISO processes. Any rules defined for these commercial agreements should be defined by the local regulatory authority, where applicable, as the ISO has no jurisdiction or authority over this matter. If the local regulatory authority defines specific rules, then ISO may consider adding additional conditions as a precursor to registration of the proxy demand resource.

The CPUC stated in their comments to the August 12 Draft Final Proposal the following: "The CPUC staff expects to address such agreements in a CPUC proceeding in the near future. The CPUC staff believes that creating these agreements is not within the purview of the CAISO, and supports the CAISO deferring this matter to the Local Regulatory Authorities."

Since the load is served by the load serving entity and the load serving entity will pay for Day-Ahead power that is not consumed as a result of the dispatch of the proxy demand resource, the load serving entity does ultimately have the ability to approve or reject a proxy demand resource registration.

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6.2. CSP, LSE, and UDC Registration

As noted above, a PDR must be represented by a CSP and recognized by an LSE and UDC. These three logical entities may be one, two, or three physical entities. Each physical entity must be registered as a market participant through the standard application process.

6.3. Goals of the PDR Registration Function

The Registration requirements and process enables:

- Capture required characteristics of each PDR
- Provides series of controls to ensure the appropriate acknowledgement to required parties of PDR registrations, most important being those to the LSE and/or UDC so that changes to functions such as forecasting can be altered.
- Unique identification of the target resource to identify duplicate or overlapping PDR registrations
- Manage effective dates to potentially match CSP contracts

A Registration entry is the first step toward PDR participation and involves a workflow process that requires involvement by the corresponding LSE and UDC for the resource. This Registration process is to be initiated by the CSP that is representing the resource. Once a registration is entered, the corresponding LSE and UDC entities for that resource must approve the Registration before it can become active and participate in the wholesale markets.

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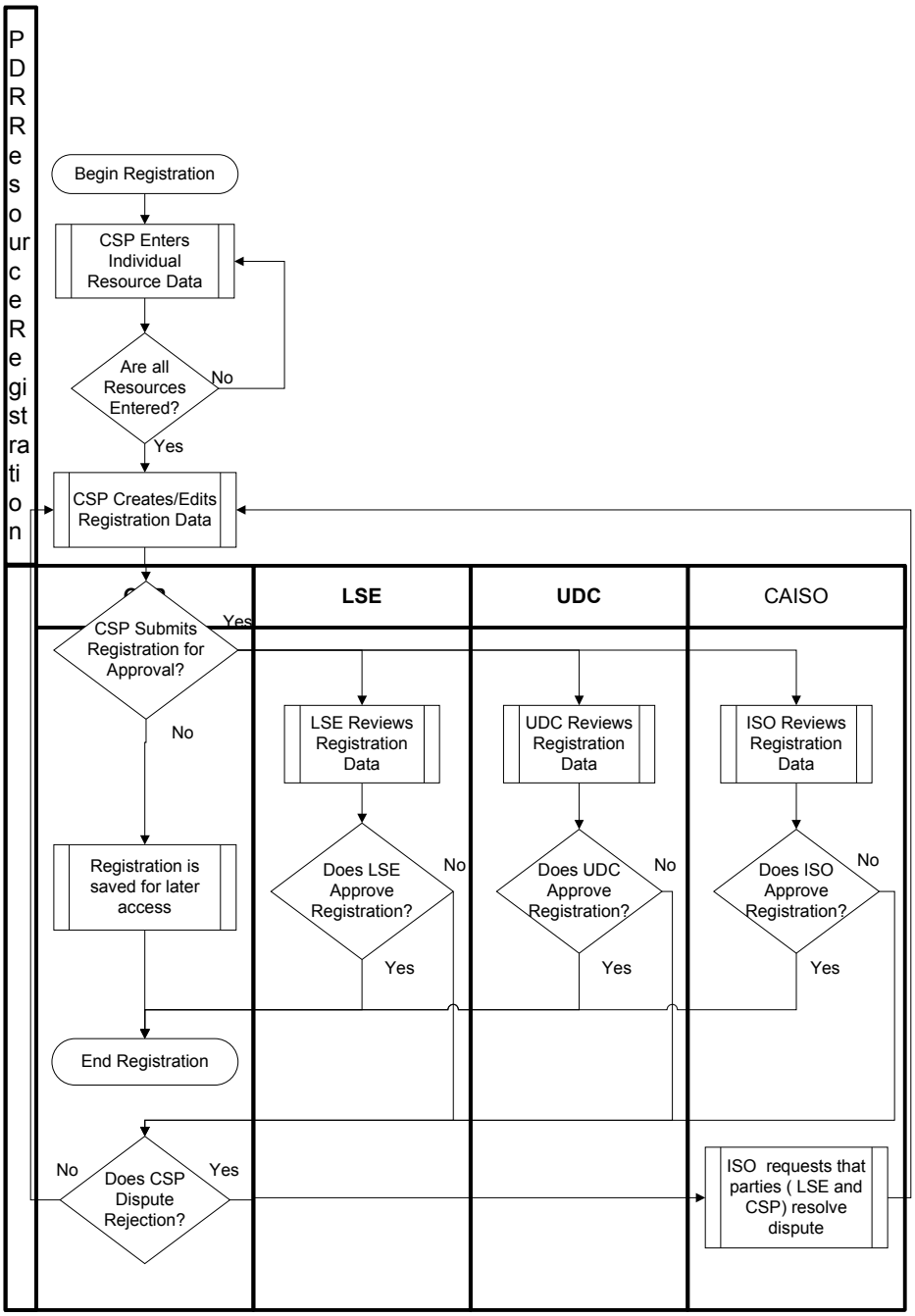
PDR Resource Registration
Begin Registration
CSP Enters Individual Resource Data
Are all Resources Entered?
No
Yes
CSP Creates/Edits Registration Data
LSE
UDC
CAISO
CSP Submits Registration for Approval?
Yes
No
LSE Reviews Registration Data
UDC Reviews Registration Data
ISO Reviews Registration Data
Registration is saved for later access
Does LSE Approve Registration?
Does UDC Approve Registration?
Does ISO Approve Registration?
No
Yes
End Registration
Does CSP Dispute Rejection?
ISO requests that parties (LSE and CSP) resolve dispute

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The Registration process will be highly dependent on the system that manages it and will have a significant impact on the actual process.

Of specific note in the registration process above is:

1. As will be noted later, LSEs and UDCs only review and approve data that is pertinent to their operations. For the LSE's this is expected to be account related data. For the UDC's this is expected to be mainly meter related data. (In the case where the LSE has contracted another entity to provide the metering data, the approval for metering information may also be the responsibility of the LSE.
2. In general, the LSE or UDC may reject a Registration request on the ground that it is inaccurate or forbidden by regulation. Some examples[8] of possible rejection reasons include:
    - Incorrect information listed in the application
    - Resource(s) not associated with the LSE and/or UDC
    - Resource(s) registered with another CSP for the same product/time
    - Conformance with local regulatory agency requirements
    - Absence of necessary commercial agreement between parties
3. If either the LSE or UDC rejects a registration, then if the other entity (LSE or UDC) has yet to review the registration, then it is removed from that queue.
4. If either the LSE or UDC rejects a registration, and the other entity (LSE or UDC) has already approved the registration, then it will be required to re-approve the modified registration if and when it is re-submitted for approval.
5. If either the LSE or UDC reject a registration and the CSP disagrees with that rejection the ISO will contact the relevant parties and request that parties resolve the dispute. The ISO will have limited ability to resolve disputes and will not arbitrate disputes around the registration of PDR resources.
6. In order to expedite the registration process and avoid unnecessary delays, there will be a 10 day time limit for approvals. If the associated LSE or UDC has not taken action on a particular registration request in that amount of time, the registration shall be automatically approved.
7. As implied by the diagram, a CSP can enter in a resource registration without automatically submitting it for approval. If a resource is not submitted for approval the CSP is able to edit the registration data or delete the entire registration without requiring any actions by the LSE or UDC.
8. Once a registration is submitted for approval, the CSP does not have the ability to modify the registration in any way.
9. If during the approval process, the CSP discovers an error in the registration data or needs to change the registration in any way, the CSP can cancel the registration request or retract the registration. If the CSP initiates this action, then the

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[8] These are guidelines as to why a registration could be rejected and is not meant to be an exhaustive list

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resubmitted registration must be approved by both the LSE and UDC regardless of whether one of these entities had approved the earlier submission.

10. In the event that a registration contains resource information already included in another active registration, an alert shall be given to the incumbent CSP to enable the defense of that resource. If the CSP takes no action, the existing registration shall be considered abandoned and made inactive in order to allow the new registration to become active. The time period for incumbent registration defense shall be 10 days, the same as the time period for LSE/UDC approvals.
11. If the Registration is an aggregation of multiple resources, the CSP can enter the data for each resource without initially associating them with a registration.
12. Aggregations must contain resources that are all associated with the same LSE and UDC. In other words, locations from multiple LSEs or UDCs cannot be combined into one aggregation registration.
13. Resources contained in an aggregation must all also be within the same CLAP.
14. Once an aggregation is registered, the CSP cannot change the makeup of that registration without having to resubmit the aggregation for approval.
15. The frequency of changes allowed to an aggregation will be highly dependent on the responsiveness of the managing system. In general, frequent changes to aggregations are not desirable in the initial implementation. However a system that can process changes to registrations is highly desirable so as to maximize the availability of registered resources.
16. If a specific resource within an aggregation cannot actively participate in a specific event, the CSP should consider the impact of that condition before bidding in that Registration since the Registration is considered as a whole and not on an individual resource basis.
17. If a specific resource within an aggregation is no longer available for participation, the CSP should immediately resubmit the Registration for approval by either replacing the resource with another resource or simply eliminating that resource from the aggregation.

6.4. Registration Data

How Registration and Resource data are to be stored and managed are yet to be determined. The expectation is that the existing CAISO Resource Data Template will be used in some form. The template is posted on the CAISO website at the following link:

http://www.caiso.com/docs/2004/09/27/2004092714414413493ex.html

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7. SCHEDULING & BIDDING

A CSP must be a Scheduling Coordinator (SC) or be represented by a SC to bid a PDR into the ISO markets[9]. Once a CSP becomes certified for participation in ISO markets and registers its resources, actual participation proceeds with the submission of bids for energy and/or capacity products (e.g., Ancillary Services). The CSP's preparation of markets bids involves collection of aggregated data for its end-use customers, and forecasting the availability of price responsive resources for the operating day, as well as business decisions such as determining its bid price.

A PDR must have a minimum load size of 0.1 MW (100 kW) to participate in the CAISO markets. Smaller Loads may be aggregated together to achieve the 0.1 MW threshold. The bid segments may be as low as 0.01 MW (10 kW).

Each proxy demand resource 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 node, CLAP, or Sub-LAP. A PDR may not be self-scheduled and must be bid into the ISO markets at a non-zero price.

A Scheduling Coordinator (SC) that represents a 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]

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The ISO previously proposed that Proxy Demand Resource be eligible to participate in HASP. However, after further analysis, the ISO determined that including an in area resource in HASP presents a significant implementation effort. In addition, basing the ability for proxy demand resource to participate in HASP on hourly metering may create undesirable incentives for proxy demand resources to participate in HASP and is inconsistent with the treatment given to other in area resources. Lastly, since MRTU start-up the ISO has experienced some price volatility in the HASP market and does not want to make any significant changes to HASP until these issues are resolved.

The ISO will re-evaluate allowing Proxy Demand Resource to participate in HASP when Participating Load enhancements are implemented in February 2011.

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An SC submitting a bid for proxy demand resource will be subject to the same process, bid validation, and market timelines as for any other generating bid submitted to the ISO markets. The process for bid submission and bid format is described in detail in the *BPM for Market Instruments* which is posted on the ISO website at:

Deleted: 10 Participation in HASP vs, the 5-minute Real-Time Energy market depends on the metering installed for the participating end-use customers. Only¶ customers with hourly metering intervals are eligible to participate in HASP, while only customers with sub-hourly metering intervals are eligible for 5¶ minute dispatch.

9 SC Certification Requirements are located at: http://www.caiso.com/1c44/1c44cf8a723b0.pdf

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https://bpm.caiso.com/bpm/bpm/list

8. NOTIFICATION

The ISO recognizes that LSEs as well as CSPs need to be aware of PDR enrollments and schedule changes that may occur between Day-Ahead and Real-Time and Real-Time dispatch of PDR resources. LSEs will base their load schedules on the actual usage of the customers who they serve, and lack of knowledge about PDR schedule changes affecting their customers could cause error in their forecasts. Regarding the mechanics of schedule and dispatch notifications, the ISO has existing mechanisms for communicating schedules in the DA market, and dispatches in the RT market. Other than to communicate MW quantities of demand schedules and dispatches to both the CSP and LSE, the ISO has identified no need to change the existing notification mechanisms, and plans to continue to use the existing mechanisms.

The ISO proposes that both the LSE and the CSP have access to the following information on PDR resources:

- 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[11] (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

- Real-Time Dispatch information (ADS)

In the case where an LSE and a CSP are separate entities the LSE would be provided with read only access only to the reports listed above and only for the specific resource IDs of any PDRs that are comprised of that LSE's customers.

The CSP 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.

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<#>This report would display binding schedules for PDR participating in the hourly Real-Time Market and would display advisory schedules for PDR resources participating in the 5-minute Real-Time Market. HASP Binding results relevant to Hourly Pre-Dispatched Resources. There is no bid price information included in this report. ¶

11 Expected Energy is the total Energy that is expected to be generated or consumed by a resource, based on the Dispatch of that resource, as calculated by the Real-Time Market (RTM), and as finally modified by any applicable DOP corrections. Expected Energy includes the Energy scheduled in the Integrated Forward Market and it is calculated "after-the-fact," at T+1

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If the LSE and the CSP are the same entity than both the LSE and the CSP would have access to all available reports in CMRI that are relevant to the PDR resource unless the ISO is requested to limit access for certain users.

Both the LSE and CSP would be required to have access to ADS to receive real-time dispatch information from the ISO. For the LSE, the access to ADS would be read-only for the PDR resource.

9. ANCILLARY SERVICES REQUIREMENTS

As stated in section 6 above, demand response participating as PDR may participate in the Day-Ahead Market (DAM) including RUC, the hourly or 5-minute Real-Time Energy Market (RTM) and the Day-Ahead and/or Real-Time Spinning Reserve and Non-Spinning Reserve Market. A PDR resource that meets the requirements of Non-Spinning Reserve or Spinning Reserve may participate in the Ancillary Service (AS) markets as well as the Energy markets.

The requirements for Participating Loads to qualify to provide Non-Spinning Reserve are established by the ISO Tariff, particularly Appendix K (Ancillary Service Requirements Protocol. Further discussion of these requirements is stated in the Participating Load User Guide, for which the most recent version is available at:

http://www.caiso.com/233c/233cd878397d0.pdf

In particular, section 3.5 of the User Guide, "Certification of Services - Ancillary Services", describes the requirements and process for qualifying a specific resource for Non-Spinning Reserve. The ISO expects that these requirements for qualifying to provide Non-Spinning Reserve, and for participating in the market (bidding, settlement, etc.), will also apply to PDR resources, because the structure of using the proxy generator for the real-time demand response is the same as is used for Participating Load in MRTU Release 1 and described in the current User Guide. The Draft 4/26/09 *Draft Final Proposal* noted that Spinning Reserve may have technical requirements beyond those required for Non-Spinning Reserve. The outcome of these issues depends largely on seeking WECC interpretation of the technical requirements for these services. Because actual participation in ISO markets appears likely to occur for energy storage systems before PL resources, and because the technical specifications for these services appears to be the same (i.e., requirements for non-generation resources regardless of technology), the development of these technical specifications will occur in a parallel stakeholder process for energy storage systems. The AS requirements for PDR will be revised as needed to reflect the outcome of WECC interpretation as well as the stakeholder process on AS requirements for non-generation resources. Until that occurs, PDR can only qualify to provide Non-Spinning Reserve.

One difference between the operation of PDR resources and Participating Load resources is that PDR resources' real-time settlement for Energy is relative to the calculated

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baseline, whereas Participating Load's real-time Energy settlement is relative to day-ahead schedules. As described in section 10, the ISO will determine the PDR response for Energy Settlements using a 10 in 10 non-event day selection method. However, compliance with AS dispatches requires determination that a resource has delivered the required capacity within 10 minutes, as well as sustained response throughout the duration of the dispatch of Energy from AS capacity. In contrast, the baseline methodology for Energy Settlement measures response relative to typical usage. Therefore, the ISO will use a "meter before/ meter after" baseline determination for the purpose of compliance and settlement of capacity payments for AS, even though the delivery of Energy will use the 10 in 10 non-event day selection method. The "meter before/ meter after" method will establish the baseline for AS compliance as the metered usage at the time when Energy is dispatched from AS capacity. If the PDR demand does not remain below the "meter before" baseline, minus the dispatched capacity, for the duration of the dispatch, the resource will be subject to the "No Pay" provisions of the ISO Tariff. Examples of settlements of dispatches from Ancillary Service capacity are provided in the Participating Load User Guide.

10.METERING & TELEMETRY

10.1. Metering

The following section describes responsibilities, relationships and the metering requirements that will be used to derive the settlement, performance and compliance, as applicable, of Proxy Demand Resources. Additional details about the responsibilities of Scheduling Coordinator Metered Entities and metering requirements can be found in the CAISO Business Practice Manual for Metering at: http://www.caiso.com/17ba/17baa8bc1ce20.html

10.2. Metering Overview

The CAISO will establish formal agreement between the CAISO and the Curtailment Service Provider ("CSP") as the 'owner' of Proxy Demand Resources. The CAISO and the CSP will enter into a Participating Load Agreement (or similar agreement) for their Proxy Demand Resources. To Schedule, bid and settle Proxy Demand Resources, the CSP may perform these duties as a registered certified Scheduling Coordinator with the CAISO, or the CSP may contract for these services through a CAISO certified Scheduling Coordinator. The CAISO expects the Scheduling Coordinator who is representing these SC Metered Entities (i.e. the Proxy Demand Resources) to aggregate the Settlement Quality Meter Data ("SQMD") for each Proxy Demand Resource. Each Proxy Demand Resource may be an aggregate of SQMD for one or more loads within a Custom LAP, where a Custom LAP is constrained geographically within a SubLAP. Thus, a Custom LAP can be a small as a single load settled at a PNode [12] within a SubLAP or as large as a Custom Lap that

[12] A PNode or 'Pricing Node' is 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 settlement.

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represents multiple loads that are settled based on the weighted-average of all of the PNodes that are contained within a SubLAP. Either way, SQMD must be aggregated from all of the underlying loads that make up the Proxy Demand Resource. The CAISO's expectation is that the aggregate SQMD can be disaggregated down to the underlying loads, for audit and inspection purposes by the CAISO, or by the CAISO's Authorized Inspector, where and when necessary, subject to Local Regulatory Authority requirements.[13] In addition, Scheduling Coordinators for SC Metered Entities, i.e. Proxy Demand Resources, must conduct Scheduling Coordinator Self-Audits annually as further described in the BPM for Metering and in CAISO Tariff Section 10.3.10.

The CAISO's authority to audit a Scheduling Coordinator's SQMD is important to support the proviso of 'trust but verify' given the CAISO has no formal agreement with the end-use customers that are ultimately providing the energy service to the CAISO. The CAISO would expect to infrequently rely upon its audit authority; however, audits, if and when necessary, will be an important enforcement tool to build credibility and trust around this nascent resource in CAISO markets.

10.3. Meter Service Agreements

10.3.1.1. Meter Service Agreement for Scheduling Coordinators

A Scheduling Coordinator for a SC Metered Entity must sign a Meter Service Agreement for SCs (MSA SC) with the CAISO. The Scheduling Coordinator for a SC Metered Entity is responsible for providing SQMD for Scheduling Coordinator Metered Entities it represents. Such agreements specify that Scheduling Coordinator require their SC Metered Entities to adhere to the meter requirements of the CAISO Tariff applicable to Scheduling Coordinators for SC Metered Entities, which include those set forth in Section 6 of the BMP for Metering. A pro forma version of the Meter Service Agreement for Scheduling Coordinators is set forth in Appendix B.7 of the CAISO Tariff.

10.3.1.2. Scheduling Coordinator Agreement

Prior to commencing the process to become certified to provide SQMD for SC Metered Entities, a Scheduling Coordinator must sign a Scheduling Coordinator Agreement. A pro forma version of the Scheduling Coordinator Agreement is set forth in Appendix B.1 of the CAISO Tariff.

10.3.2. Metering Process

Proxy Demand Resources will be represented as Scheduling Coordinator ("SC") Metered Entities. As illustrated in Figure 1, a Scheduling Coordinator for a SC Metered Entity will aggregate Settlement Quality Meter Data ("SQMD") for its Proxy

[13] Additional Information about Audit and Testing by the CAISO can be found in CAISO Tariff Section 10.3.10.2 and in the BPM for Metering.

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Demand Resource and submit that data into the CAISO's Settlement Quality Meter Data System[14] (OMAR) per CAISO data format (MDEF), requirements, and timing. The CAISO will use the SQMD in conjunction with a Customer Baseline Load calculation (CBL Engine) to determine the financial settlement between the CAISO and the Scheduling Coordinator for the Proxy Demand Resource.

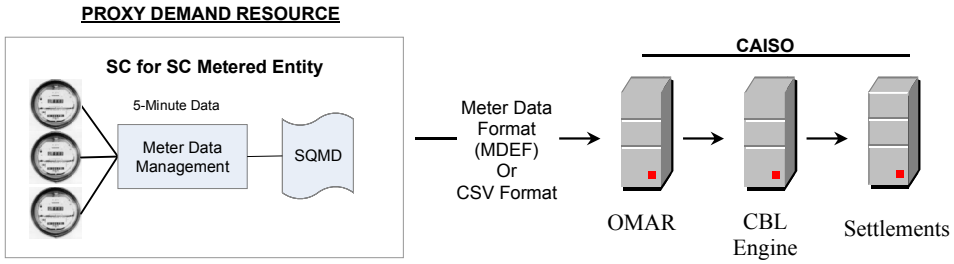

Figure 1- Meter Data Process Flow

10.3.3. Meter Data Intervals

Participation in the following markets or providing the following services requires meter data be collected and submitted to the CAISO with the appropriate level of granularity. As specified in CAISO Tariff Section 10.2.9.2 and the BPM for Metering,[15] subject to any exemption granted by the CAISO, Scheduling Coordinators for SC Metered Entities must record meter data in Standard Time as follows:

- At 5-minute intervals for Proxy Demand Resources that provide Ancillary Services or 5-minute dispatchable Real-Time Imbalance Energy.
    - The CAISO's preference is to receive interval data that has been recorded in 5-minute intervals.
    - However, given many larger commercial and industrial customers have meters that read on 15-minute intervals, the CAISO will accept 15-minute recorded meter data intervals provided the Scheduling Coordinator parses the 15-minute recorded SQMD into three equal 5-minute intervals.

At one hour intervals for Day-ahead energy

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[14] Operational Meter Analysis and Reporting: OMAR Online is a web-based application that allows users to view, download, graph, and submit settlement quality meter data to the CAISO. Presently OMAR On-line is available for web access and OMAR is available as a FTP option.

[15] The CAISO will make appropriate modifications to this and other relevant tariff sections and BPMs to incorporate the changes necessary to integrate Proxy Demand Resources as agreed to by the CAISO and stakeholders.

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10.3.4. Distribution Loss Factors

When a Proxy Demand Resource is connected to a UDC's Distribution System, the responsible SC must submit adjusted interval SQMD by an estimated Distribution System Loss Factor ("DLF") to derive an equivalent CAISO Controlled Grid level measure. Such estimated DLFs must be approved by the relevant Local Regulatory Authority prior to their deployment. The SC must aggregate its equivalent CAISO Controlled Grid-level Meter Data for its Scheduling Coordinator Metered Entities.

10.3.5. Meter Data Submission

SQMD to the CAISO must be submitted no later than the day specified in the CAISO Payment Calendar, as specified in the BPM for Settlements and Billing. The most current CAISO Payment Calendar is posted on the CAISO website at: http://www.caiso.com/docs/2001/09/21/200109210951225246.html.

SQMD must be submitted using one of CAISO's approved Meter Data Exchange Formats (MDEF) or CSV format. Additional information about MDEF and CSV file formats can be found on the CAISO Website at: http://www.caiso.com/docs/2005/10/01/2005100114481329995.html

10.3.6. Meter Data File Versioning

As an enhancement to OMAR-Online, file versioning will be available with the Payment Acceleration version of OMAR On-line. Users will be able to view the content of their data (status flag, values, and time stamp) for a given resource to assist them in analyzing their Settlement Statements. OMAR On-line will incorporate a 'version' drop down box that will enable participants to view any version individually or concurrently.

10.3.7. Meter Data Access

Third parties, such as a load-serving entity, may have access to CSP's Proxy Demand Resource's meter data provided that access is formally authorized by the Scheduling Coordinator for the Proxy Demand Resource and approved by the CSP who, for contractual purposes, is both the Proxy Demand Resource's 'owner' and the 'SC Metered Entity.' The vehicle to enable third party access to meter data is Schedule 5 of the Meter Service Agreement for Scheduling Coordinators, which must be modified and submitted for approval by the CAISO prior to granting meter data access.

Once the CAISO has approved the modification to Schedule 5 of the MSA SC, the Scheduling Coordinator for the SC Metered Entity may submit the *User Application Access Request Form* (see below for link)
to the CAISO to enable the CAISO to cut a digital certificate. The digital certificate will enable the third-party user to access OMAR On-line, and in so doing, view and download data for the authorized Proxy Demand Resource(s).

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10.3.8. Metering Reference Material

- CAISO BPM for Metering found at:
  https://bpm.caiso.com/bpm/bpm/version/000000000000006

- Meter Service Agreement for Scheduling Coordinators
  http://www.caiso.com/docs/09003a6080/03/e3/09003a608003e3ab.pdf

- OMAR On-line Overview
  http://www.caiso.com/1b9a/1b9ae49968000.pdf

- OMAR On-line Software Digital Certificate Instructions:
  http://www.caiso.com/1bd7/1bd7beb45bdc0.pdf

- User Application Request Form found at:
  http://www.caiso.com/docs/2000/03/01/2000030110195926538.xls

- Settlement Technical Documentation, including CAISO Payment Calendar found at:
  http://www.caiso.com/docs/2005/10/07/2005100710004922506.html

10.3.9. Telemetry Requirements for the Provision of AS

10.3.10. Telemetry Overview

A Proxy Demand Resource can offer ancillary services to the CAISO if it can meet the standards and eligibility for that particular ancillary service. Curtailment Service Providers that wish to participate Proxy Demand Resources in the CAISO's ancillary services market are required to first establish real-time visibility of that Proxy Demand Resource with the CAISO's Energy Management System ("EMS"). A Proxy Demand Resource's real-time consumption must be securely conveyed to the CAISO through telemetry using an Energy Data Acquisition and Concentration ("eDAC")[16] device or system, ICCP[17] link, or any other CAISO approved method or device for securely conveying this information to the CAISO's EMS.

In general, current practice is that Proxy Demand Resources that provide Ancillary Services must convey Telemetered data to the CAISO's EMS using the DNP 3.0 - level 2 protocol or via ICCP. The eDAC is a field device that is capable of translating data into a DNP 3.0 protocol using either the CAISO's Energy Communications Network or through a secure internet connection using PKI/SSL.

[16] The eDAC is a "real time" data collection device or system that is capable of reliable acquisition, concentration, and timely communication of telemetry data to the CAISO's EMS using DNP protocol, as set forth in the CAISO's standards for EMS Telemetry for the provision of ancillary services.

[17] ICCP or Inter-control Center Communications Protocol is a real time data exchange protocol providing features for data transfer, monitoring and control.

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10.3.11. Telemetry for Settlement Purposes

The CAISO is engaged in the Participating Load Pilot projects where this concept of relying on telemetered data for energy settlements (versus relying on traditional settlement quality meter data) is being explored. Until the CAISO can evaluate the results from this pilot and consider whether or not there are acceptable policies for the use of telemetered data for settlement purposes, the CAISO is deferring this issue. For the initial release of the Proxy Demand Resource product, the CAISO will rely on SQMD from CAISO or Local Regulatory Authority approved meters.

10.3.12. Point of Telemetry Reporting

The CAISO's position is that the point of telemetry reporting should be at the same point where the load is measured for energy settlement purposes, which, in many cases, will be the retail service meter. This convention will prevent discrepancies, and potential disputes, between SQMD data used for settlement purposes and telemetered real-time load curtailment data used for operational purposes. However, if a CSP can make a case that it can provide better, more operationally reliable data to the CAISO by monitoring load data at levels below the meter used for settlement purposes, then the CAISO will consider this upon written request by the CSP on a case-by-case basis as part of the PDR application process.[18]

10.3.13. Telemetry Connection Options

Curtailment Service Providers currently have three (3) options from interfacing a Proxy Demand Resource with the CAISO's EMS. The three options are:

1. ICCP connection over the Energy Communication Network
2. eDAC device over the CAISO's Energy Communication Network
3. eDAC device over a secure internet connection

Additional information about deploying an eDAC device and other related information can be found below in section 9.6.2- Telemetry Reference Material.

a. Option 1: ICCP over the Energy Communications Network

The Inter-control Center Communications Protocol ("ICCP") was developed to allow two or more utilities to exchange real-time data, schedule, and control commands. ICCP exists as an option for Proxy Demand Resources to communicate Real-Time data to the CAISO's EMS. To increase reliability and security, all ICCP communications must take place over the CAISO's Energy Communications Network.

[18] The PDR application process will be detailed in the forthcoming User Guide.

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Figure 1 below illustrates the overall data flow of the ICCP connection option over the ECN and is described with an overview of the numbered components below:

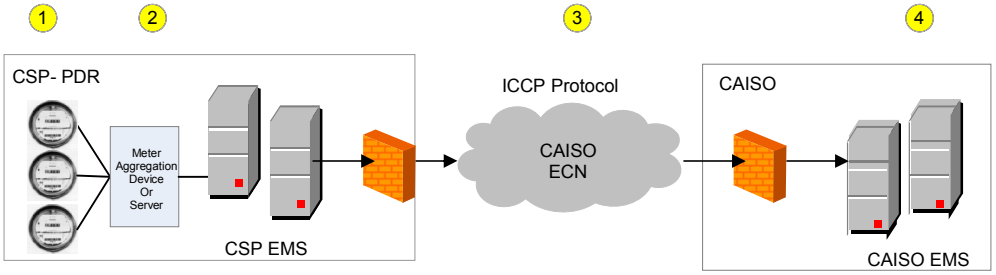

Figure 1 – Telemetry Data Flow Using ICCP over the ECN

1. **Proxy Demand Resource Real-time Data:** Proxy Demand Resources shall individually or in aggregate provide meter or other real-time data feeds that are capable of timely and accurately supplying the data needed for CAISO telemetry.

2. **Client EMS:** The CSP will capture and convey aggregated Proxy Demand Resource data through an Energy Management System, or other suitable device capable of communicating via ICCP.

3. **ECN Communication with CAISO:** This option shows transmission of telemetry from an EMS to the CAISO using the Energy Communications Network (ECN), a private communications network established by CAISO. Communication links to the ECN usually go through a firewall(s) and High Voltage Protection.

4. **CAISO Systems:** The destination of the telemetry via ICCP is the CAISO EMS.

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b. Option 2: eDAC over the Energy Communications Network

i. Data Flow – ECN Connection

Figure 2 below illustrates the overall data flow of the ECN connection option and is described with an overview of the numbered components below:

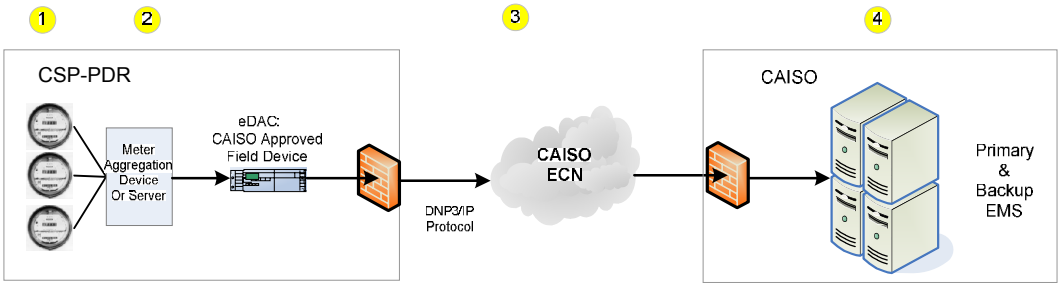

Figure 2 – Telemetry Data Flow using an eDAC over the ECN

1. **Proxy Demand Resource Real-time Data:** Proxy Demand Resources shall individually or in aggregate provide meter or other real-time data feeds that are capable of timely and accurately supplying the data needed for CAISO telemetry.
2. **eDAC device Integration:** The interface between the eDAC device and the Proxy Demand Resource meter or real-time data feed can be any protocol convenient to the Proxy Demand Resource.
3. **ECN Communication with CAISO:** This option shows transmission of telemetry from the eDAC device to the CAISO using the Energy Communications Network (ECN), a private communications network established by CAISO. Communication links to the ECN usually go through a firewall(s) and High Voltage Protection.
4. **CAISO Systems:** The destination of the telemetry is the CAISO EMS. All Proxy Demand Resource telemetry arrives at the CAISO on the TCP/IP transport layer using DNP3 - LEVEL 2 protocol.

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c. Option 3: eDAC Requirements over Secure Internet Connection

i. Data Flow - Secure Internet Connection

Figure 3 identifies the overall data flow of the Public Internet connection option and is described with an overview of the numbered components below:

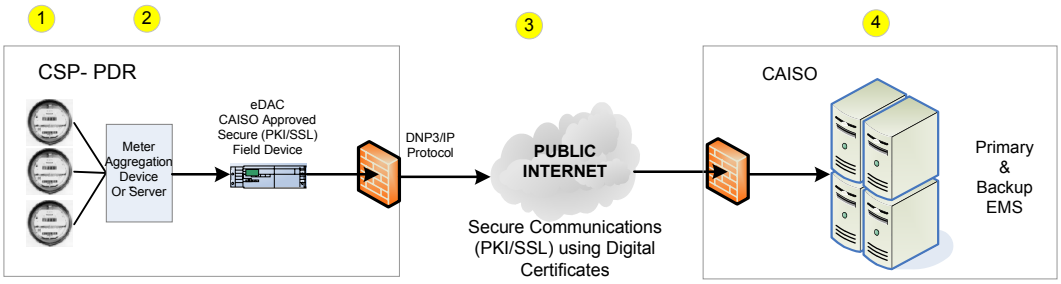

Figure 3 – Secure Telemetry Data Flow using an eDAC over the Internet

1. **Proxy Demand Resource Real-time Data:** Proxy Demand Resources shall individually or in aggregate provide meter or other real-time data feeds that are capable of timely and accurately supplying the data needed for CAISO telemetry.

2. **eDAC device Integration:** The interface between the eDAC device and the Proxy Demand Resource meter or real-time data feed can be any protocol convenient to the Proxy Demand Resource.

3. **Internet Communication with CAISO:** an Internet Service Provider (ISP), using Private Line, Frame Relay, DSL and/or ISDN services. Dial-up is not an acceptable form of Internet connectivity to the CAISO.

4. **CAISO Systems:** The destination of the Proxy Demand Resource telemetry is the CAISO EMS System. All Proxy Demand Resource telemetry arrives at CAISO on the TCP/IP transport via the Internet as PKI encrypted DNP 3.0 - LEVEL 2.

10.3.14. Telemetry Timing Requirements

For a Proxy Demand Resource to provide ancillary services, the Proxy Demand Resource must be able to provide telemetered data to the CAISO EMS on a four-second basis. If an aggregation function is utilized, each meter behind the server must be polled no less frequently than once per minute, with each read being an instantaneous value, i.e. the meter data values do not need to be averaged over the one-minute polling period.

Figure 4 provides a high level overview of the telemetry data flow timing for Proxy Demand Resources that are directly communicating through an eDAC device to the CAISO EMS.

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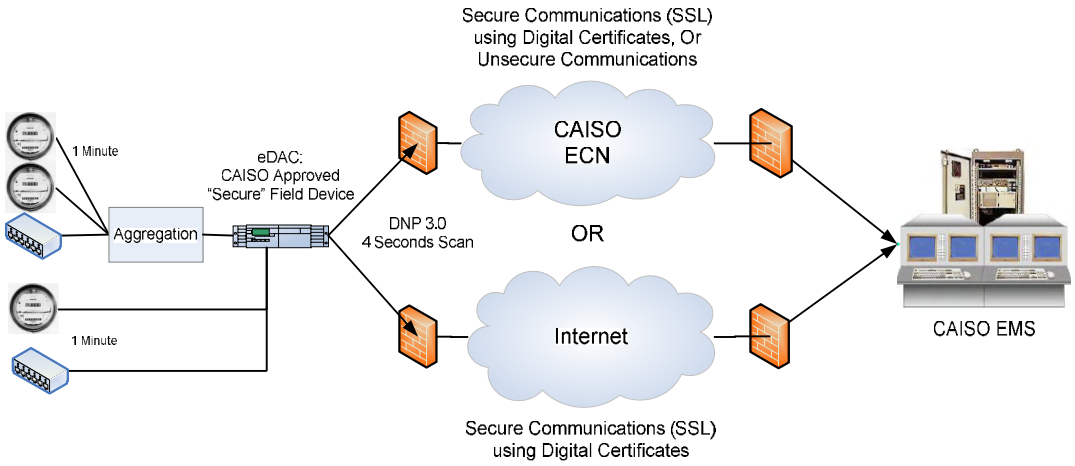

Figure 4 – Proxy Demand Resource Ancillary Service Telemetry Requirements

10.3.15. Telemetry Reference Material

- Acceptance Testing Process for New DNP 3.0 Field Devices

  The CAISO utilizes existing approved eDAC devices from specific vendors. If a CSP wishes to use a device that has not been certified, then that device must undergo the testing and validation procedure to meet the standards specified in the following documentation on the CAISO website:
  http://www.caiso.com/docs/2001/08/01/2001080113371918170.pdf

11. SETTLEMENTS

11.1. Baseline

The PDR shall initially support the following baseline methodology. As the program expands, additional baseline methods may be added as necessary.

BASELINE METHODOLOGY

- 10 in 10 non event day selection method

BASELINE WINDOW

- The baseline window for meter data will be 45 calendar days. No extensions to this window are defined.

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- 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 any operational anomalies, such as an outage. Previous Event Days are specific to the PDR.
- The selection of baseline days is performed by counting a number of 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.
  - If the *minimum* number of days is not reached, the highest usage 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.

AGGREGATION

- Aggregate Resources will be allowed within the geographic area of a single Sub-LAP
- Aggregate Resource baselines will be will be calculated on sum of the meter data from the individual resources (or on the submitted aggregation), and not on the sub-aggregation resources

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Some market participants comments to the April 12 Draft Final Proposal support applying the baseline calculation to each individual customer rather than to the aggregate of customers. The proxy demand resource proposal is a wholesale demand response program. While individual resources may meet the minimum participation requirements, it is also expected that many smaller resources will "pool" together as an aggregate resource. The treatment of such an aggregate resource will be on par with a single participating resource. Registration and qualification will be on the aggregate, dispatch will be on the aggregate, and hence performance evaluation should equally be on the aggregate.

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EVENT DAY ADJUSTMENT

- The CBL calculation will include a symmetric, multiplicative Load Point Adjustment (Morning Adjustment) unless otherwise requested by the CSP 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).
- Weather sensitivity adjustments may be examined as a future enhancement.

11.2. Customer Baseline (CBL) Study

The ISO performed a study of the proposed baseline methodology using sample load data provided by PG&E for load in Fresno and the Bay Area. Details of the study were discussed with market participants at the July 28 stakeholder meeting.

The following observations resulted from the study:

- CBL tends to be more accurate as number of aggregated loads increase
- CBL accuracy is higher for larger, more predictable loads
- When load profile vary widely from one day to another, the CBL can have sizable deviations
- When morning loads do not correlate well with peak loads, (e.g., for some agricultural pump loads), the unadjusted CBL can be more accurate
- The adjustment factors can fall outside 1 $\pm$ 0.2, (e.g., for loads with irregularly varying morning loads)
- The CBL method can result in large deviations with single customer loads

For more details on the baseline study please see the presentation posted on the ISO website at:

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http://www.caiso.com/23f4/23f4da0b5f2e0.pdf

11.3. Settlements Methodology

The ISO proposes that the settlement for the curtailed portion of the load be settled by the ISO directly with the CSP at the PDR's specified CLAP. The CSP would be paid the Day-Ahead LMP at the CLAP for Day-Ahead PDR and the Real-Time LMP at the CLAP for Real-Time PDR. Determination of actual PDR delivery would be derived from measurement of aggregate meter usage, calculated from the 10 in 10 non event day selection method described in section 10.1 above. Verified performance against the baseline would determine the energy settlement with the CSP at the CLAP. Any other settlements between the CSP and the LSE would be performed bi-laterally between the LSE and CSP and 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 and adjustments to the LSE's Day-Ahead schedule would be for purposes of calculating uninstructed deviation in settlements only. The purpose for the adjustment to the LSE's schedule is to avoid double payment, i.e payment to the CSP for energy from the PDR in addition to payment to the LSE for uninstructed deviation based on that curtailed. 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 Day-Ahead schedule ensures that the LSE would not incur uninstructed deviation charges due to non compliance by the PDR resource.

11.4. Settlement Example

Example 1 below displays the charge codes that will come into play for the settlement of PDR. This example includes the following assumptions:

- LSE schedules 100 MW in the Day-Ahead Market
- LSE has perfect load forecast
- CSP clears 10 MW in Day-Ahead Market
- CSP 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 CLAP Price = $ 95
- Real-Time CLAP Price = $ 100

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Settlements Example 1

	LSE	CSP
LSE's DA Demand Schedule		
Cleared DA Schedule	100 MW	
LSE owes ISO 100MW * DLAP price CC 6011 Day-Ahead Energy, Congestion Losses Settlement	$-8000	
CSP's operation in DA Market		
Cleared PDR		10 MW
Settlement to CSP		
ISO owes CSP 10MW * CLAP Price CC 6011 Day-Ahead Energy, Congestion & Losses Settlement		$950
CSP's operation in RT Market		
Cleared Demand Reduction (5-minute market)		5MW
Settlement to CSP		
ISO owes CSP 5 MW * RT CLAP Price CC 6470 Real-Time Instructed Imbalance Energy		$ 500
Performance of PDR as determined by 10 out of 10 baseline		14 MW
Uninstructed Deviation (Based on deviation between performance and Day-Ahead Schedule) CSP owes ISO 1 MW * RT CLAP Price CC 6475 Real-Time Uninstructed Imbalance Energy Settlement		- $100
LSE's Final Metered Demand		
Meter Read	86	
Settlement to LSE		
Calculation of "Uninstructed" Deviation :		
LSE's Original DA Schedule	100	
"Actual PDR" (baseline - meter reads)	-14	
LSE's Adjusted DA Schedule	86MW	
Actual Meter Read	86 MW	
"Uninstructed" Deviation to LSE	$0	
Total Net Settlement		
CSP		**$1350**
LSE	**$ - 8000**	

12. NEXT STEPS

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The ISO will seek Board approval on the design of PDR in September 2009 and plans to implement PDR by May 2010.

The ISO requests that Stakeholders submit written comments to mmiller@caiso.com by close of business August 14 in order for those comments to be considered in the ISO Board documents.

13. ACKNOWLEDGEMENTS

The ISO would like to thank all of the individuals that participated in the demand response working group for their tireless devotion to the completion of this proposal for PDR. Many hours were spent traveling, many hours were spent debating, and compromises were made to move this initiative forward. The ISO sincerely thanks you for your contributions and devotion to this project.

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