



IC-1 Demand Response Providers Adjust Consumers' Energy Consumption in
Response to ISO Dispatch Instructions

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ISO Smart Grid Use Case

Version 2.0

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Approvals:

Signature indicates acceptance of the IC-1 Demand Response Providers Adjust Consumers' Energy Consumption in Response to ISO Dispatch Instructions for Smart Grid Roadmap Project as complete and sufficiently detailed to allow the project to be successfully executed.

Heather Sanders

Date

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Revision History

Date	Version	Description	Author
	0.1	Document created	
06/25/2010	0.2	Review and edit content.	Glen Perez
07/15/2010	0.3	Updates include: <ul style="list-style-type: none"> Added sections for assumptions (section 5) and business rules (section 9) to the document Added activity diagram to section 10 Modified event flows in section 8 Updated requirements in section 9 Removed use case models section from the document 	Yinka Osoba
07/19/2010	0.4	Updates include: <ul style="list-style-type: none"> Added DRS application to list of actors and in flow of events Incorporated input from Heather Sanders & Glen Perez 	Yinka Osoba
07/20/2010	1.0	Accepted changes, updated explanation and requirements related to day-ahead awards separating them from dispatches, added numbering for requirements.	Heather Sanders
08/04/10	1.1	Incorporated comments from reviewers	Heather Sanders
08/04/2010	1.2	Updated activity diagram and accepted all changes	Yinka Osoba
08/09/2010	1.3	Incorporated comments, made DRP and PL to be more general, simplified flows and requirements to reflect general concept	John Goodin/Heather Sanders
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08/11/2010	1.5	Replaced "go to" with DOT dispatch instruction	Yinka Osoba
8/24/2010	1.6	Added comments about settlement quality meter data on and the role of the SC to submit meter data on page 5. Clarified telemetry requirements on page 7	Rizwaan Sahib
09/03/2010	1.7	Updated non functional requirements in section 8	Doug Walker/Yinka Osoba
09/14/2010	1.8	Updated Use Cases, Activity Diagrams, and descriptions based on meeting input	Tarak Thaker
10/14/10	1.9	Reviewed and accepted changes	Heather Sanders
10/19/10	2.0	Minor revisions and review	Tarak Thaker

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1. Use-Case: Demand Response Providers Adjust Consumers' Energy Consumption in Response to ISO Dispatch Instructions.

The ISO facilitates demand response providers to participate in the ISO markets. Since 1999, the mechanism for demand response resources to participate directly in the ISO's market has been the ISO's Participating Load Agreement. Under current ISO participating load tariff requirements, individual or aggregated loads of 1 MW or greater can provide ancillary services - non-spinning reserves, and real-time imbalance energy to the ISO. The participating load agreement enables load to participate in the ISO's ancillary services - non-spinning reserves market and in the ISO's real-time imbalance energy market. The participating load must be represented by a certified scheduling coordinator (SC) and must meet the technical standards for telemetry and metering.

FERC Order 719, issued in October 2008, requires that ISOs permit an aggregator of retail customers, also known as a demand response provider (DRP) to bid demand response on behalf of retail customers into the organized energy markets.

In response to the FERC Order 719 requirements, as well as the request from market participants for a product that could better accommodate existing demand response (DR) retail programs, the ISO and its stakeholders agreed that there was a need for a product in addition to the participating load Program. This work resulted in the development of the concept of the proxy demand resource (PDR) product. The PDR product addresses the following challenges:

- PDR enables the DRP to register and bid demand response resources directly into the ISO's energy and ancillary service markets independent of the load serving entity (LSE). This is a FERC requirement per Order 719.
- Allows retail DR programs operated by any ISO registered DRP to participate in the ISO's energy and ancillary services markets through a market bid.
- Does not require the base load associated with the DR resource or program to be pulled out and uniquely forecast and scheduled at the Custom LAP (CLAP), like participating load, which posed a barrier to demand response participation. The PDR product enables the underlying base load associated with the DR resource to be embedded in the LSE's overall load schedule at the default LAP level, while a separate bid for DR, represented as a proxy generator, represents the price-responsive demand at a Pnode or APnode.

This use case (IC-1) provides the needed requirements for the ISO to issue dispatch instructions to demand response providers and for these entities to receive and process ISO dispatches into appropriate actions to achieve the instructed megawatt quantity. These dispatch instructions are the product of the integrated forward market (IFM) and the real time market. These ISO markets and associated systems ensure the optimal and least-cost dispatch of supply and demand-side resources that are needed to satisfy system reliability needs.

A DRP enlists end-use electricity consumers (consumers who could be either a utility or direct access customer) to aggregate their load curtailment capability into demand response resources that can participate in the ISO market. A DRP certified as an SC, or a SC acting on the behalf of a DRP, facilitates the interactions with the ISO. The SC will schedule and bid into the ISO markets to provide day ahead energy, ancillary services and/or real-time imbalance energy from demand response resources on behalf of a DRP. Schedules and bids that are submitted by the SC are evaluated against market needs and other supply-side resources. ISO market awards for energy and ancillary services represent the ISO's expected response from a demand response resource. The DRP's

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ability to deliver the expected response, based on the resource's day ahead award and/or dispatch instruction received in real-time via ADS sent to the DRP's SC, is dependent upon the DRP's ability to cooperatively work with consumers who are willing and able to adjust their energy consumption when dispatched by their DRP. The ISO expects the DRP to deliver the energy dispatched during the time frame prescribed for the service awarded, as applicable. The DRP's SC will be responsible for submitting settlement quality meter data every day. The meter data will be derived from the local regulatory authority approved interval meters. It will be used to calculate a baseline using historical meter data, and load reduction.

2. Brief Description

The purpose of this use case is to describe how the ISO will provide dispatch signals to the SC for bids against their portfolio and generated through the ISO market software for demand response participation. The SCs representing demand response resources will submit bids into the ISO Market based on the demand response capability of single or aggregated end use customer loads. Market results will be published in the ISO's customer market results interface system and dispatches will be sent via the ISO's dispatch system. The DRPs, operating as a SC or working with their SC, must be able to process ISO dispatch instructions to achieve the instructed megawatt quantity in the required timeframe.¹ Generally, the dispatch will require the end use customer to reduce their energy consumption; however, demand response can include an increase in energy consumption as well. The end use customer can return to their normal operations once instructed to do so by the ISO through the ISO's dispatch system.

It is important to note that this use case (IC-1) centers on demand response that is bid into the ISO market. This use case does not encompass demand response programs that are not bid into the ISO market.

¹ The propagation of the ISO's dispatch signal through a DRP's intermediary systems could impact the ability of the DRP to timely respond to the required demand response. DRPs must account for any such latencies in their response.

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3. Actors

<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
Demand Response Provider (DRP)	Organization	An entity that is responsible for delivering demand response services from a participating load or proxy demand resource, which has executed applicable agreements to comply with all applicable provisions of the ISO tariff.
Scheduling Coordinator (SC)	Organization	An entity certified by the ISO for the purposes of undertaking the functions specified in ISO Tariff Section 4.5.3. In general these activities include submitting bids, assuring response to dispatches and instructions, submitting settlement quality meter data, and settlements.
California Independent System Operator (ISO)	Organization	The California Independent System Operator (ISO) operates the state's wholesale transmission grid, providing open and non-discriminatory access supported by a competitive energy market and comprehensive planning efforts.
ISO Market Results System	System	Provides a user interface through which SCs' retrieve proprietary market results, such as day ahead energy schedules, ancillary service awards, and residual unit commitment awards. An API to this system is also available.
ISO Dispatch System	System	ISO dispatch system communicates real time commitment and dispatch instructions, and real time ancillary service awards to SCs.
DRP Receiving System for awards and dispatches (DRAACS)	System	A system that meets ISO technical requirements and is capable of receiving awards and dispatch signals from the ISO and processing the signal to the demand response method of the end use customer. This system can be a single system or composed of different modules to fulfill the task of receiving an ISO dispatch and for causing the action to achieve demand response. The ISO does not prescribe the requirements for this system other than what is discussed above. DRAACS (Distributed Resources Availability and Control System) is a generic system name.
DRP-Controlled Resource	System / Device	The mechanism in place that will create the needed demand response at the end use customer's facility. (This could be an energy management system with preset scenarios, a device that will change load, or manual actions by the end use customer.)
Load Serving Entity (LSE) / ESP	Organization	Any entity that serves end users within the ISO Balancing Authority Area and has been granted authority or has an obligation to sell electric energy to End Users located within the ISO balancing authority area.

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4. Assumptions

1. The scheduling coordinator, working with the demand response provider, will bid into the market based on the capability of their demand response resource such that the demand response resource can provide the capacity and energy awarded in the market.
2. If a resource is unavailable or incapable of responding to a dispatch instruction or fails to respond to a dispatch instruction in accordance with its terms, the resource shall be considered to be non-compliant with the dispatch instruction. The scheduling coordinator for the resource shall be subject to uninstructed imbalance energy.
3. The PDR product enables the underlying base load associated with the DR resource or program to be embedded in the LSE's overall load schedule at the default LAP level.
4. The PDR product assumes a separate bid for DR, represented as a proxy generator, will represent the price-responsive demand at a Pnode/APnode.

5. Preconditions

1. Demand Response Provider has enrolled end use customers that can reduce demand upon request, providing the DRP a predictable and verifiable change in demand when instructed.
2. The demand response provider is registered with the ISO and maintains contractual relationships with the end use customers and meets all applicable requirements.
3. The demand response provider is acting as, or has a certified scheduling coordinator acting on its behalf.
4. The scheduling coordinator has been certified by the ISO and is capable of interfacing with all the needed interfacing applications.
5. The scheduling coordinator is a SC Metered Entity, meeting all applicable requirements necessary to submit settlement quality meter data to the ISO.
6. The scheduling coordinator has submitted bids to the day ahead and/or the real-time ISO market and has been given an award for an ISO market product, or a dispatch, based on those bids.
7. The demand response provider has met all ISO and local regulatory authority requirements.
8. Proxy demand resources and participating loads that are greater than 10 MW or participating in the ancillary service market must meet ISO telemetry requirements. The current telemetry requirements are under review.
9. Proxy demand resources and participating loads that are capable of providing ancillary services must pass a resource certification test by the ISO to provide the service.

6. Post-conditions

1. The demand response resource delivers the energy and capacity as dispatched by the ISO.
2. The ISO is able to maintain its area control error by receiving a predictable and reliable response from participating loads and proxy demand resources through the actions of demand response providers who are managing the underlying aggregated end-use customer loads.

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7. Flow of Events

7.1 Basic Flow: DRP/PL controls end user demand

Step #	Actor	Description of the Step	Additional Notes
#	<i>What actor, either primary or secondary is responsible for the activity in this step?</i>	<i>Describe the actions that take place in this step. The step should be described in active, present tense.</i>	<i>Elaborate on any additional description or value of the step to help support the descriptions. Short notes on architecture challenges, etc. may also be noted in this column..</i>
1	ISO Dispatch System	The ISO directs the DRP through real time dispatches sent from the ISO dispatch system, to adjust demand by a fixed amount, a dispatch operating target (DOT) instruction with a specific time.	
2A	Scheduling Coordinator	The Scheduling Coordinator (if involved) manages the communication between the ISO Dispatch System and the DRP.	
2B	Scheduling Coordinator	The Scheduling Coordinator (if involved) submits meter data to the ISO DRS.	
3	Demand Response Provider (DRP) / DRAACS	DRP acquires the dispatch signal through its receiving system for dispatches and detects the need to adjust DRP-controlled resources and sends the specific signal to meet the change in demand	e.g. switch off AC units, increase thermostat set points, manage motor loads through variable speed drives, dim lighting
4	Demand Response Provider (DRP) / DRAACS	DRP notifies the LSE/ESP of resource dispatch.	
5	Demand Response Provider (DRP) / DRAACS	DRP sends dispatch signals to DRP-Controlled Resources.	
6	DRP-Controlled Resources	DRP-Controlled Resource automatically responds to signal from DRP (automation is important, manual DR may also be acceptable as long as the response occurs)	Depending on the level of automation, the DRP-Controlled Resource may not detect the event based on the controls they have given to the DRP or conveyed to the building energy management system (e.g. change in thermostat or dim lighting) and event duration.
7	Demand Response Provider (DRP) / DRAACS	DRP monitors power consumption to assure that demand response achieved is as dispatched by the CASIO and as expected.	DRP may use sampling/statistics to ensure probability of delivering expected energy, but may not have "visibility" to each customer

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Step #	Actor	Description of the Step	Additional Notes
8	Scheduling Coordinator	The scheduling coordinator detects the DR-Controlled resource response and performs settlements and other processes.	
9	ISO Dispatch System	The ISO detects resource response and directs the DRP through real-time dispatches to end the original directed change and return to its normal operation	

8. Requirements

#	Business Requirements	Associated Scenario #	Associated Step #
BRQ-001	The ISO shall provide dispatch information to the scheduling coordinator for the DRP. The dispatch information shall consist of: <ul style="list-style-type: none"> A fixed MW value A specific time 	7.1 7.2	2,7 2
BRQ-002	DRP shall be able to acquire and adjust demand (increase/decrease) dispatch information from the ISO dispatch system through its receiving system for dispatches.	7.1 7.2	3,8 3
BRQ-003	DRP shall adjust demand (increase/decrease) upon receipt of the ISO dispatch signal	7.1 7.2	3 3
BRQ-004	DRP shall be able to forward/convey information to directly controlled end use customers via their demand response mechanism to take the desired demand response action	7.1 7.2	4,9 3
BRQ-005	End use customer demand response mechanism directly controlled by the DRP shall be able to receive information from the DRP via their demand response mechanism.	7.1 7.2	5,10 3
BRQ-006	End use customer demand response mechanism controlled by the DRP shall be able to respond to the controls to achieve the desired demand response	7.1 7.2	4,10 3
BRQ-007	DRP shall be able to assess the demand response activities of its end use customers	7.1 7.2	4,9 5
BRQ-008	DRP shall be able to detect whether or not the desired demand response action has been achieved by its demand response resources	7.1 7.2	4,10 3
BRQ-009	When the DRP detects that the desired demand response action has not been achieved by its demand response resources, the DRP shall be able to initiate further action, as time permits, to fulfill the ISO dispatch instruction	7.2	4
BRQ-010	Proxy demand resources participating in real time, non-spin, or greater than 10 MWs and participating loads, shall be capable of telemetering real time information to the ISO.	7.1	6

Requirements highlighted in grey in the above table are applicable to DRP/PL and have been included to communicate use case intent and basis for further discussion.

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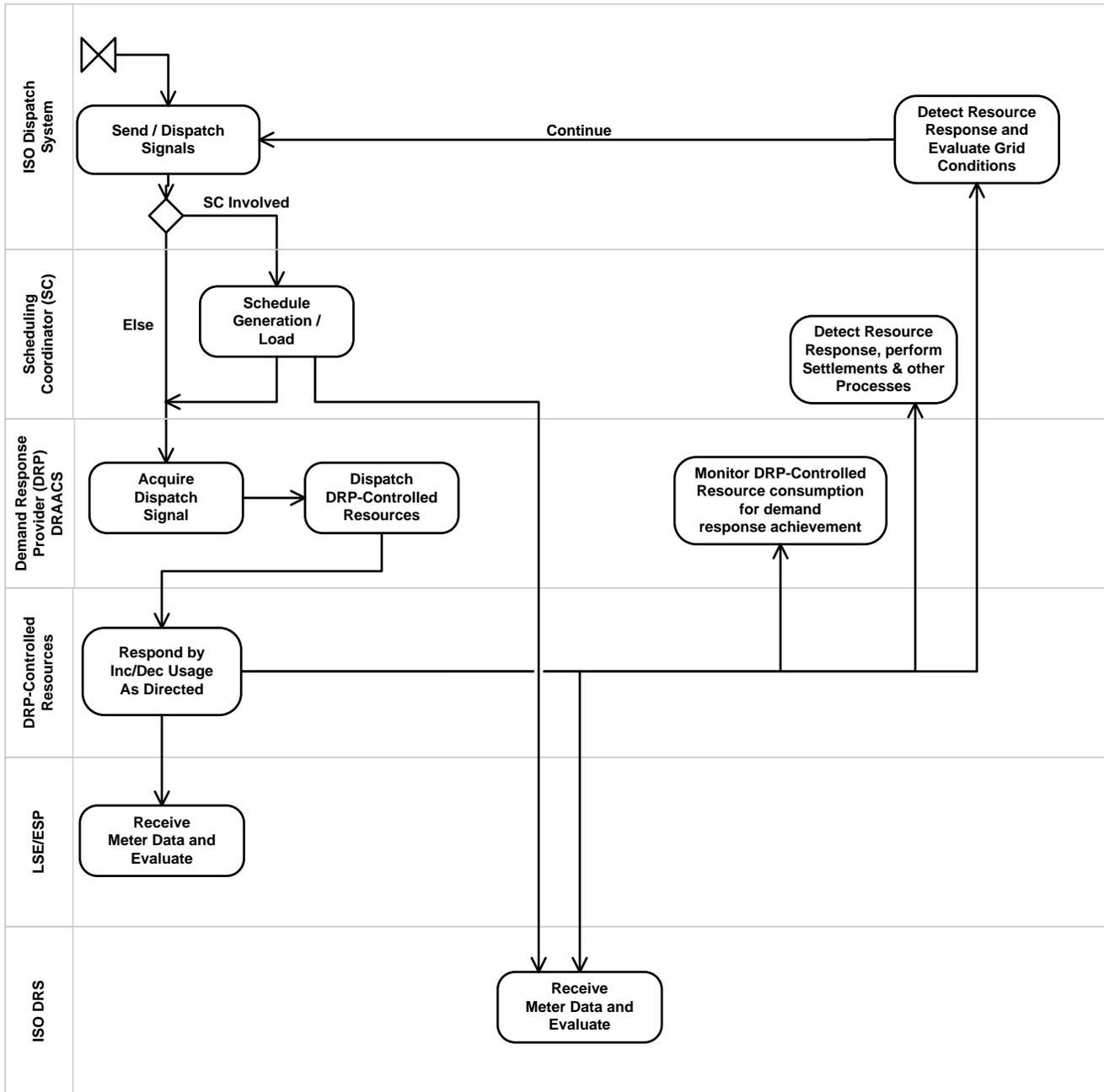
#	Non- Functional Requirements	Associated Scenario #	Associate Step #
NFR-001	The ISO's dispatch system shall be available 24X7X365 with an overall service availability of 99.995% according to the currently defined service level agreements	7.1 7.2	2,7 2
NFR-002	The ISO's dispatch system shall be scalable to handle potential significant increase (TBD) in resources as a result of demand response.	7.1 7.2	2,7 2
NFR-003	Communication with the ISO for market awards, dispatch, and telemetry data, must meet the specific FERC approved ISO/WECC/NERC technical requirements (example: ISO dispatch system uses the public internet and 128-bit SSL).	7.1 7.2	2,3,7,8 2,3
NFR-004	The ISO's dispatch system shall provide dispatch instructions to the DRP with a minimal degree of latency (specifics are TBD)	7.1 7.2	2,7 2
NFR-005	The ISO's dispatch system shall record access, data creation/modification as well data receipt/publication by identity for audit purposes	7.1 7.2	2,7 2
NFR-006	Audit data shall be available electronically to the ISO in predetermined formats within predetermined timeframes	7.1 7.2	2,7 2
NFR-007	Data exchanged between the ISO's systems and third party systems shall maintain its authenticity and integrity between the established source and destination	7.1 7.2	2,3 2,3\

#	Business Rules	Associated Scenario #	Associate Step #
BRL-001	The criteria for eligibility of resources participating in demand response is similar to generators in terms of agreements, SC representation, metering, telemetry, security, etc	7.1 7.2	2,7 2
BRL-002	Real time dispatches are binding and must be followed.	7.1 7.2	2,5 2
BRL-003	Settlement charges shall apply to the SC associated with a DRP/PL for: <ul style="list-style-type: none"> • Uninstructed imbalance energy charge • Reduction in ancillary service capacity payment 	7.2	6

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9. Activity Diagrams

9.1 Activity Diagram for DRP/PL controls end user demand in response to ISO dispatch instructions



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10. Glossary

See [California ISO BPM for Acronyms and Definitions](#)