B O N N E V I L L E P O W E R A D M I N I S T R A T I O N

Commercial & Industrial Demand Response Project Development & Management

Project Implementation Plan

DRAFT

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1. Background and Introduction

The Bonneville Power Administration (BPA) has, in the past, been able to meet peak capacity needs and address variations in daily electrical loads through the flexibility of its hydropower system. However, load growth, wind integration, and other operational constraints are reducing much of this traditional flexibility. BPA's power system is not alone in this regard. The Northwest Power and Conservation Council's Sixth Power Plan encourages all Northwest utilities to begin exploring the use of demand response (DR) to address increasing power system capacity constraints. In order to meet the needs of individual utilities and the Northwest power system as a whole, BPA is seeking to identify and develop DR strategies that work effectively with BPA customer utilities and the end-use commercial and industrial operations within their service territories.

Project Objective: The overarching objective of this project is to develop viable DR pilots in the commercial and industrial (C&I) sectors within BPA's power system. The vision is that experiences from these pilots will be used to broaden the base of DR knowledge in the Pacific Northwest and that findings from these pilots will ultimately be shared with regional stakeholders.

Definition of Demand Response: For the purposes of this project, DR is defined as changes in electric usage by end-use customers from their normal consumption patterns in response to utility or power system needs.[1]

Project Phases: BPA has retained Global Energy Partners (Global) to serve as the prime contractor for the development and management of the C&I pilots. The project consists of two phases:

- Phase 1 comprises the drafting of a Project Implementation Plan, gathering input from customer utilities through a series of stakeholder meetings (Portland, Seattle, and Spokane), the identification of potential pilot projects and the recruitment of potential pilot participants through a solicitation for utility proposals due to BPA on Sept. 30. Importantly, utilities will be able to draw on Global's technical expertise in the preparation of their proposals.
- Phase 2 encompasses the implementation and execution of selected pilot projects and the reporting of findings to BPA (and then to all regional stakeholders).

This Document: The Project Implementation Plan is designed as a plan for utilities intent on preparing a pilot proposal and can be used as a resource to provide details about the C&I DR Pilot Project process and provide information related to the potential pilot options. This document will reside on BPA's website and will be periodically updated with new information as the Phase 1 process unfolds.

Transparent Process: Finally, this project is part of a public process that is focused on transparency and open involvement of stakeholders. Key stakeholders include the Northwest utilities, their customers, and other interested parties. Several elements of this plan encourage active participation on the part of the stakeholders. The input of these stakeholders will make this document an evolving guide for the region's needs as they relate to this project.

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[1] DR, in this context, encompasses a variety of load management options that include load shifting strategies, direct load control of end-use equipment, load curtailment strategies, and pricing signals for managing load. DR, as defined here, differs from the conventional definition of DR which typically includes event-driven peak demand reduction strategies. The broader definition of DR conforms to the objectives set by BPA for addressing regional priorities through this project.

2. Goals and Objectives

2.1 Key Northwest Issues that Drive Need for Demand Response

Consideration of Demand Response (DR) related activities need to address the conditions faced by BPA's system over the past few years as well as regional priorities that drive the need for DR. The conditions under which DR has assumed significance regionally are:

- Fluctuations in the supply of renewable resources such as wind and solar- This necessitates load to respond to a ramp-down in renewable resource supply. Integrating growing wind generation, especially, poses challenges due to its variable availability.
- Weather-related conditions such as summer heat waves or winter cold spells- This leads to difficulties in managing system loads during prolonged summer heat waves when electrical demands are very high due to cooling and irrigation loads, and hydropower resources are most constrained. Also, during winter cold spells, managing system loads pose difficulties when electrical demands are very high due to heating loads.
- Need for shifting load from periods of peak demand to off-peak periods- Many utilities are working to shift load from peak demand times to periods when excess capacity exists. DR solutions of this type can begin as traditional, temporary shifts in consumption, but can lead to long-term, more-permanent shifts.
- System emergency conditions arising out of a sudden outage in a large supply unit.
- Difficulties related to managing the hydro system and matching supply with demand.
- Participation of loads in the ancillary services market in order to fulfill operating reserve requirements.

While keeping in mind these conditions, DR related activities will need to fulfill certain key objectives, which have been identified regionally as key focus areas. These areas are:

1. Integrating renewable into grid
2. Managing summer peaks
3. Managing winter peaks
4. Handling grid disruptions
5. Integrating energy efficiency and DR activities

The first four focus areas relate directly to the conditions being faced by BPA' system and the entire region, under which DR has assumed significance. The fifth focus area refers to innovative solutions under which utilities integrate energy efficiency and DR under a single offering to end-use customers. Utilities understand the strategic importance of energy efficiency both as a resource as well as a mechanism to provide customer service. By integrating DR into their energy efficiency efforts, they can have more flexible solutions available to address resource needs as well as to offer more and different types of solutions to meet specific customer requirements.

2.2 Pilot Project Objectives

The overarching objective of this project is to identify and implement viable DR pilots in the commercial and industrial (C&I) sectors within BPA's power system. The vision is that experiences from these pilots will be used to broaden the base of DR knowledge in the Pacific Northwest and that findings from these pilots will ultimately be shared in some form with regional participants. Specific priorities for reaching this objective include the following:

- Ensure stakeholder involvement and a transparent project implementation process
- Address key focus areas for the region (outlined earlier)
- Identify, prepare, and secure viable pilot participants
- Demonstrate the technical feasibility of DR pilots that have not been proven elsewhere
- Complement, when and where possible, Pacific Northwest Smart Grid Demonstration Project efforts
- Successfully demonstrate how DR can facilitate grid integration of intermittent renewable resources, especially wind, to address generation variability
- Demonstrate load shifting strategies in combination with load curtailment that result in shifting peak period loads to off-peak hours, along with load reduction during peak periods.
- Build customer success with DR
- Demonstrate solutions that can be scaled up and applied elsewhere

2.3 Pilot Concepts to Address BPA-Specific and Regional Priorities

There are a number of pilot concepts that can be designed to address BPA's requirements, as well as fulfill overall regional priorities. The four broad categories, into which these pilot concepts can be combined, are:

1. Integrated Load Management
2. Fast DR
3. Direct Load Control
4. Renewable Energy Integration

These categories include a number of different pilot ideas, which are described in Section 4 of this document. One of the underlying themes across multiple pilot ideas is automation of customer actions to curtail/shift load in response to DR events. The automation strategy is not specific to any particular pilot concept. For many of the pilot ideas presented, application of enabling technology has the possibility of automating load curtailment strategies that otherwise would be executed manually.

The incentives for end-use customer participation across multiple types of DR pilots may be in the form of fixed incentive structures or tied to electricity market prices through rate offerings to customers. For many of the load shifting and/or load curtailment strategies across multiple pilot ideas presented in this document, pricing mechanisms for load curtailment are likely to be effective. Although pricing mechanisms are not considered as a separate pilot concept for the purposes of this document, they are an underlying theme across many of the pilot ideas.

Broadly, the pilot concepts can be characterized along the following dimensions:

- Load management strategy
- Targeted customer types, sizes, and/or locations
- DR event notification and response time
- Duration and frequency of DR events
- Technology requirements

These and other characteristics are discussed in greater detail in Section 4, related to the specific pilot concepts being presented. Also Appendix A of this document discusses potential pilot options in greater detail.

Figure 2.1 represents the manner in which the DR pilot ideas can help address both BPA-specific and regional priorities.

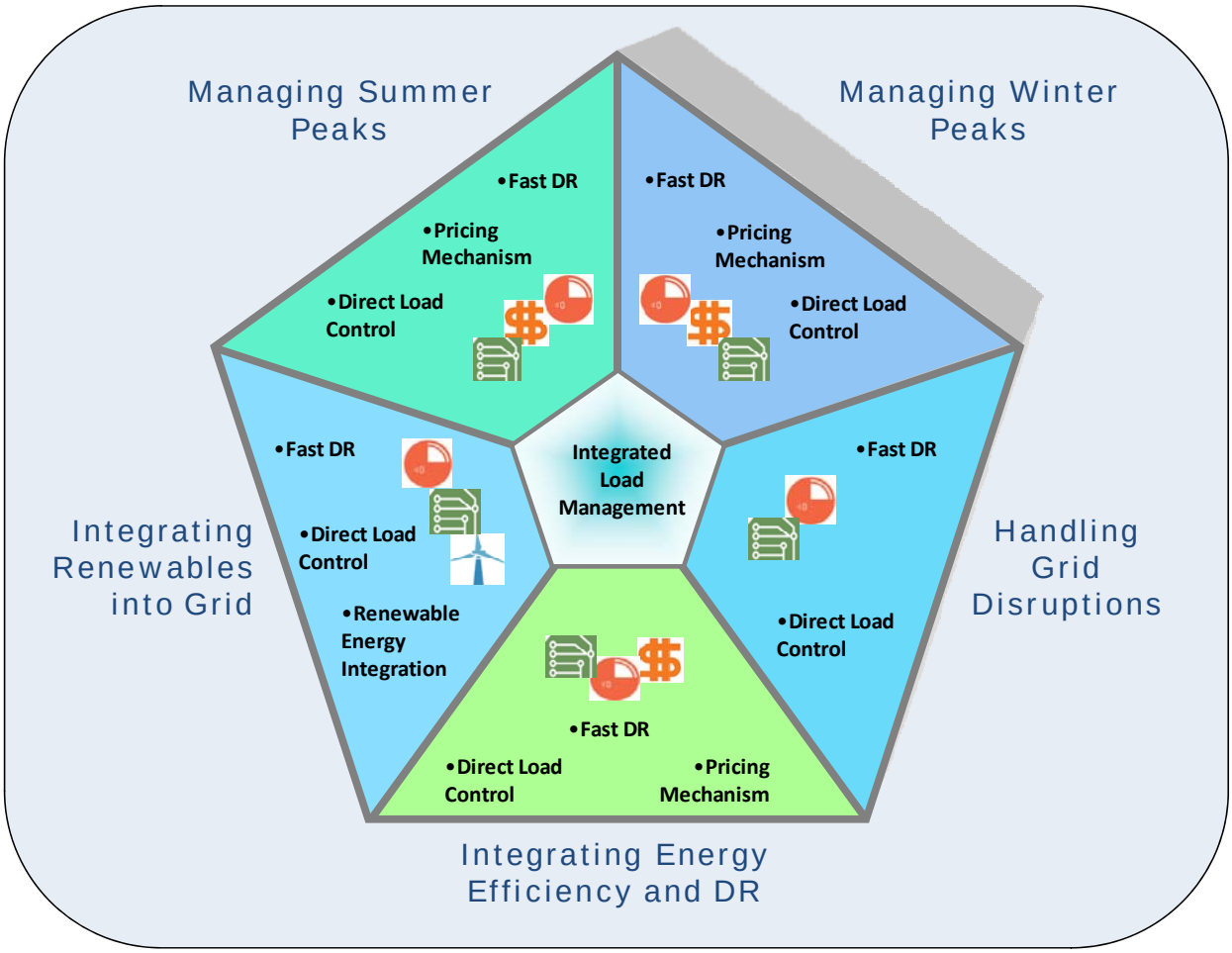


Figure 2.1 Pilot Concepts to address Regional Priorities

3. Pilot Development Process and Schedule

Pilots will be developed through a two-phased process.

- Phase 1 includes drafting a Project Implementation Plan, revising that plan with input from BPA customer utilities gathered through a series of stakeholder meetings (Portland, Seattle, and Spokane), the identification of potential pilot projects, and the recruitment of potential pilot project participants through a solicitation for utility proposals (due to BPA on Sept. 30, 2010).
    - Importantly, utilities will be able to draw on Global Energy Partners (Global is BPA's prime contractor for these pilots) for technical expertise in the preparation of pilot proposals. At the present time, BPA envisions each utility being able to receive two or three days of technical support from Global in the preparation of pilot proposals.
    - While portions of the three stakeholder meetings will be redundant, new information about the pilot projects will be shared as well. Utilities interested in submitting pilot proposals are encouraged to participate in all three meetings, if possible. A webcast and phone conference line has been established to help facilitate participation.
- Phase 2 will include the implementation and execution of selected pilot projects and the reporting of findings to BPA (and then to all regional stakeholders and utilities).

Schedule:

Energy Smart Awareness Brown Bag Phone Conference	June 10
Stakeholder Meetings (Phone: 877-278-8304, pin 3992)	
Webcast: See Appendix B for login details	
▪ Portland (10am – 12pm)	June 23
▪ Global Energy Partners	
▪ 625 SW Stark Ave, Suite 300, Portland 97204	
▪ Seattle (10am – 12pm)	July 20
▪ Seattle City Light	
▪ 901 5th Ave, 5th Floor, Seattle, 98164	
▪ Spokane (10am – 12pm)	Aug. 10
▪ Inland Power and Light	
▪ 10110 W. Hallett Rd., Training Room, Spokane, 99224	
Q&A Phone Conference for the DR pilot project proposals	Aug. 18
Proposal Deadline	Sept. 30
Pilot Project Implementation & Execution	Oct. 2010 - Aug. 2012

C&I Demand Response Pilot Project Outreach Materials:

BPA DR Website Link to Resources: http://www.bpa.gov/Energy/N/demand.cfm

For more information: contact Joshua Binus, BPA Project Manager, jdbinus@bpa.gov, 503-230-5298

4. Potential Pilot Ideas

As discussed earlier in Section 2, there are four broad categories into which the potential pilot concepts can be combined. These are:

1. **Integrated Load Management:** Combines load shifting, curtailment strategies, energy storage, and/or energy efficiency measures for an integrated DR solution
2. **Fast DR:** Has quick response times that allow DR to be considered an ancillary service
3. **Direct Load Control:** Curtails end-use loads directly during periods of system constraints
4. **Renewable Energy Integration:** Offers opportunities to augment grid resources or shift loads when renewable resources are available

For each of these pilot concepts, a number of pilot ideas are presented as examples. Figure 4.1 represents how the pilot concepts, along with examples of pilot ideas, map to the regional priorities that were discussed in Section 2. Please note that this list can be further modified by combining pilot ideas and tailoring them to meet individual utility requirements. The pilot ideas are listed merely for the purpose of providing a starting point for further developing pilot projects.

Further details related to the pilot ideas can be found in Appendix A of this document. In total, nineteen pilot ideas are presented as examples.

Table 4.1: Mapping of DR Pilot Options to Regional Priorities

Type of Pilot	Exmples of Pilot Options	Pilot Concepts	Summer Heat Wave	Winter Cold Spell	Fluctuating Wind Generation	Large Unit Outage	Difficulty Managing System
Integrated Load Management	Pilot 1	Load shifting in wastewater treatment facilties by integrating EMS with process and control technologies	x	x			x
	Pilot 5	Integrated distributed resources (combines an optiomal mix of renewable resources, storage technologies, and load shed opportunities)	x	x	x	x	x
	Pilot 6	Thermal energy storage coupled with demand reduction	x	x			x
	Pilot 7	OpenADR, along with integrated EE/DR strategies in energy intensive industries such as refrigerated warehouses	x	x	x	x	x
	Pilot 8	Pricing mechanism (super peak TOU type) for C&I customers	x	x			x
	Pilot 9	Interruptible/curtailable for large C&I customers	x	x			x
	Pilot 10	Demand/capacity bidding with or without aggregators using OpenADR	x	x			x
	Pilot 11	Load shifting with thermal mass in large commercial buildings	x	x			x
	Pilot 12	OpenADR strategies for data centers	x	x	x	x	x
	Pilot 13	Air-cooled chillers with thermal energy storage replace water-cooled chillers	x				x
	Pilot 14	Off-peak non-road electric vehicle charging (e.g., fork lifts, golf carts)	x	x			x
	Pilot 15	Off-peak water pumping to gravity storage	x	x	sometimes		x
	Pilot 19	Load aggregation by utility	x	x			x
Fast DR	Pilot 2	Fast DR for large C&I customers with Open ADR (events with response requirement less than 10 minutes)			x	x	
	Pilot 4	Fast DR with small and medium C&I customers, with response requirement less than 10 minutes			x	x	
Direct Load Control	Pilot 3	Direct load control for small and medium C&I customers using switch and PCT	x	x	x	x	x
Renewable energy integration	Pilot 16	Water pumping for reducing variability of renewable generation			x		
	Pilot 17	Wind/PV-powered pumped water storage for electric energy storage	x	x	x	possibly	x
	Pilot 18	Wind/PV-assisted municipal water pumping and building water systems	x	x			x

Note: EMS = Energy Management System; DR = Demand Response; C&I = Commercial and Industrial; OpenADR = Open Automated Demand Response; PCT = Programmable Communicating Thermostat; EE = Energy Efficiency; TOU = Time-Of-Use; and PV = Photovoltaic

4.1 Integrated Load Management

The Integrated Load Management Pilot concept, being presented, incorporates the following features:

- Combines load shifting from peak to off-peak periods with load curtailment during times of system requirement
- Leverages energy storage options such as building thermal mass, chilled water, ice storage systems, etc.
- Integrates energy efficiency measures with DR strategies

Examples of application include wastewater facilities, refrigerated warehouses, data centers, large commercial buildings, and for off-peak electric vehicle charging.

Table 4.2 shows examples of pilot ideas and their objectives. Further details on each of these ideas can be found in Appendix A.

Table 4.2 Integrated Load Management: Examples of Pilot Ideas

Pilot Concept	Examples of Pilot Ideas	Objective
Integrated Load Management	**Pilot 1: Integrated Load Management/ Energy Efficiency Strategies in Wastewater Treatment Facilities**	Test load shifting strategies from peak periods to off-peak periods in wastewater treatment facilities; use specific systems and analysis tools that shift process-related demand
	Pilot 5: Integrated Distributed Resources	Test the integration of a number of distributed energy options at the customer end for effective load management and energy reduction; use a real-time distributed resource dispatching system
	Pilot 6: Thermal Energy Storage Coupled with Demand Reduction and Energy Efficiency Strategies	Test a combination of load-shifting strategies from peak to off-peak hours; use thermal energy storage facilities, along with demand reduction strategies during times of system requirement
	Pilot 7: OpenADR with Integrated EE/DR in Energy Intensive Industries [a]	Test Auto-DR strategies using OpenADR platform, integrated with load shifting and energy efficiency measures in energy intensive industries such as refrigerated warehouses
	Pilot 8: Pricing mechanism (Super Peak Time-Of-Use Rates)	Test how customers respond to price signals that encourage reductions in peak demand through load shifting and/or load curtailment.
	Pilot 9: Interruptible/ Curtailable Pilot for C&I Customers [b]	Test load reductions realized from eligible C&I customers (typically large C&I customers with greater than 200 kW of maximum demand) during times DR events are called, triggered by system requirements
	Pilot 10: Demand/Capacity Bidding using Auto-DR with Load Aggregators [c]	Test load reductions realized from eligible C&I customers (typically large C&I customers with greater than 200 kW of maximum demand) during times DR events are called, triggered by system requirements
	Pilot 11: Load Shifting with Pre-Cooling, Integrated with Load Reduction and EE Strategies	Test a combination of load-shifting strategies from peak to off-peak hours by pre-cooling buildings; combine with demand reduction strategies during times of system requirement
	Pilot 12: Auto-DR Strategies for Data Centers	Test Auto-DR strategies for data centers
	Pilot 13: Chiller Replacement and Thermal Energy Storage Systems	Demonstrate the load shifting potential of thermal energy storage and the water saving potential of air-cooled chillers
	Pilot 14: Off-Peak Non-Road Electric Vehicle Charging	Shift loads associated with non-road vehicle charging to off-peak periods
	Pilot 15: Off-Peak Water Pumping to Gravity Storage	Shift electric pumping loads for municipal water utilities to off-peak periods through the use of elevated water storage and advanced pump scheduling controls
	Pilot 19: Load Aggregation by Utility	Test load reductions achieved through an aggregator program, where the utility itself acts as an aggregator of a number of customer loads, and delivers load reduction during times DR events are called.

[a] Auto-DR (Automated Demand Response) refers to automated enabling technologies that allow a customer's equipment or facilities to reduce electricity usage automatically in response to peak load conditions or any other type of system requirements/contingencies, without any kind of manual intervention. It is essentially a communication and technology platform designed to provide customers with automated, electronic price and reliability signals along with the capability to identify and automate site specific demand response strategies. OpenADR is a communications infrastructure that is designed to improve the reliability, repeatability, robustness, and cost-effectiveness of demand response (DR) in commercial and industrial buildings.

OpenADR is Fully-Automated Demand Response using open standard, platform-independent and transparent end-to-end technologies and/or software systems.

[b] Interruptible/Curtailable programs continue to be offered as a traditional load management program by a number of utilities around the country. Utilities enter into a contract, primarily with large-sized C&I customers, to reduce load by a certain firm amount whenever DR events are called. In return, customers get paid depending on the contracted capacity, and also according to the amount of load reduced during a DR event.

[c] In Demand Bidding programs, typically, utilities request load reduction bids from customers anytime a DR event is called. All participants are required to bid in a certain minimum amount of load reduction for a certain minimum specified duration, say 2 hours. The bid amount can vary every hour. Programs can be called either on a day-ahead or day-of basis. If a bid is accepted, participants receive a payment proportional to the bid amount and the hourly market price of energy during the event duration period. Utilities often contract this program out to independent third-parties, known as aggregators, who deliver a certain amount of load reduction in return for direct payments by the utility.

4.2 Fast DR

The Fast DR pilot concept incorporates the following features:

- Suitable for load participation in the Ancillary Services market (emphasized in the Sixth Power Plan), especially non-spinning reserves[2]
- Extremely fast response of load (less than 10 minutes) to address system requirements
- Requires advanced metering and communications technologies to enable fast response

Examples of application include air liquefaction industry, chemicals industries, offices, and retail stores.

Table 4.3 shows examples of pilot ideas and their objectives. More details on these ideas can be found in Appendix A.

Table 4.3 Fast DR- Examples of Pilot Ideas

Pilot Concept	Examples of Pilot Ideas	Objective
Fast DR	**Pilot 2: 'Fast DR' for Large C&I Customers with OpenADR (Open Automated Demand Response)**	Test 'fast DR' strategies with OpenADR architecture for large C&I customers
	Pilot 4: 'Fast DR' for Small and Medium C&I Customers	Test reduction strategies from small and medium sized C&I customers (with maximum demand, say, less than 200 kW), within 10 minutes or less of event notification.

[2] 'Ancillary services are an integral part of any well-functioning interconnected power system. Interest in how ancillary services are organized and procured has increased in the U.S. over the last decade, spurred by the Federal Energy Regulatory Commission's attempts to promote more competition in wholesale electricity markets (e.g. functional unbundling of generation and transmission services). In Order 888, FERC defined six generic types of ancillary services and indicated that customer loads should have opportunities to participate in these markets as part of its overall goal to facilitate more competitive markets. The ancillary services listed include: 1) Scheduling, system control and dispatch, 2) voltage control, 3) regulation and frequency response, 4) energy imbalance, 5) operating reserves-spinning reserves, 6) operating reserve-supplemental reserve.)'(Ref- 'Loads Providing Ancillary Service- Review of International Experience'. LBNL Report, May 2007)

4.3 Direct Load Control

The Direct Load Control pilot concept (shown below in Table 4.4) incorporates the following features: [3]

- Direct control of end-use equipment through controls such as switches and smart thermostats
- A variety of end-uses can be controlled such as air-conditioning, electric space heating, irrigation pumps, etc.
- Instantaneous shut-down of load during times of system requirement, with short notification time (day-ahead to hour-ahead) to customers
- Offers possibilities for addressing supply fluctuations in renewable resources, such as wind, through advanced technologies

More details on this pilot can be found in Appendix A.

Table 4.4 Direct Load Control- Example of Pilot Idea

Pilot Concept	Pilot Idea	Objective
Direct Load Control	**Pilot 3: Direct Load Control (DLC) for Small and Medium C&I Customers**	Test demand reduction strategies during times of transmission and/or distribution system constraint, by directly controlling the end-use equipment at the customer level

4.4 Renewable Energy Integration

The Renewable Energy Integration Pilot concept incorporates the following features:

- Utilizes renewable energy, when available, for energy storage
- Especially suitable for locations with gravity water storage, such as municipal water districts
- Stored energy can be used as a supply resource during times of capacity constraints or when wind is not available
- Fast DR strategies to provide additional operating reserves

Table 4.5 shows examples of pilot ideas and their objectives. More details on these ideas can be found in Appendix A.

[3] Direct Load Control (DLC) form of load management has been practiced by a large number of utilities over many years. In this form of load management program, utilities directly shut off end-use customer loads during times when peak demand reduction is necessary. Typically, the types of loads that are controlled include air-conditioners, water heaters, pool pumps, and irrigation motors. Traditionally, DLC programs have used a load control switch for controlling the load. However, some of these are transitioning to more advanced control methods using Programmable Communicating Thermostat (PCT).

Table 4.5 Renewable Energy Integration – Examples of Pilot Ideas

Pilot Concept	Examples of Pilot Options	Objective
Renewable Energy Integration	**Pilot 16: Water Pumping for Reducing Variability of Renewable Generation**	Test the integration of renewable energy resources with municipal water pumping systems
	Pilot 17: Wind/PV-Powered Pumped Water Storage for Electric Energy Storage	Test using renewable energy to pump water to elevated storage tanks for the purpose of energy storage
	Pilot Option 18: Wind/PV-Assisted Municipal Water Pumping and Building Water Systems	Test the use of an off-grid dedicated renewable-powered water pump to supplement utility grid energy for pumping water in municipal distribution systems and in high-rise buildings

5. Technical and Infrastructure Issues Associated with Pilots

In addition to pilot specific characteristics, which have been discussed earlier in Sections 2 and 4, there are a few technical and infrastructure issues that will need to be addressed at a broader level. At the time of proposal presentation, utilities will need to provide an idea on how these issues, related to each of the proposed pilot projects, are likely to be addressed. These are at times tied to a particular type of pilot, while in other cases can be considered as overarching issues that will need to be addressed for implementing several different types of pilot projects..

The technical issues, for example, relate to the following aspects:

- Specifications for the various technological components that would need to be integrated in a pilot project in order to ensure interoperability
- Triggers for calling DR events with specifications related to event duration, timing of events, and frequency of occurrence
- Requirements for monitoring load data in real-time that is a prerequisite for participation of loads in certain specific markets such as ancillary services
- Procedures and methods for establishing customer baselines against which load reduction impacts are measured

Similar to the technical issues, there are a number of infrastructure issues that need to be addressed at the pilot implementation phase, which encompass all pilots. These relate to aspects such as:

- Valuation methods and approaches for assessing cost-effectiveness of the pilots being considered
- Specific strategies for marketing DR options and recruitment of end-use customers
- Structures for offering incentives to customers participating in the pilots
- Validation procedures that include establishing Measurement and Verification (M&V) protocols for measuring load reduction impacts

While each of these issues will need to be carefully considered once the pilots are finalized and before actual implementation begins, we briefly touch upon each of these issues in this document.

5.1 Technical Issues

1. OpenADR specifications: For pilots demonstrating Auto-DR strategies with OpenADR architecture, it will be essential to ensure interoperability among technical components with open standard, platform-independent and transparent end-to-end technologies and/or software systems. The design of the pilot should consider the applicability of these technologies to specific industries or customer-segments, for which these types of pilots are being considered.
2. DR event definition and procedures: This issue encompasses all pilots. The DR service provider will need to specify the conditions under which DR events are likely to be called (trigger for the DR event), the number of times during the year events are likely to be called (frequency of events), the average duration of events, methods for notifying customers of DR events (telephone, pager, email, etc.), and the time period for responding to events once they are called (day-ahead or day-of with specification on the response time). Once the pilot ideas are finalized, each of these attributes will need to be defined for the relevant pilots.

3. Real-time load data feedback: This issue is especially important for Fast DR and for loads participating in the ancillary services market. In these situations, it is essential to obtain real-time feedback on load participation (for example at 4-second intervals). Pilots built on this concept will need to have appropriate metering and communications infrastructure available to meet such requirements.

4. Baseline measurement: This is an overarching issue that encompasses all pilots. Customer baselines, which measure customer loads in absence of DR events, will need to be established in order to measure the actual load reduction impact from DR events. There are currently a few different standard methodologies for baseline measurement. The adopted methodology for the pilot projects will be based on an assessment of what the most widely accepted and commonly applied methodology is currently in the industry.

5.2 Infrastructure Issues

1. Valuation methods and approaches: It is essential to establish a framework for defining benefits and costs associated with pilot projects in order to assess cost-effectiveness of pilots. Commonly used approaches will be adopted for the pilots, keeping in mind specific regional conditions and priorities.

2. Marketing and recruitment: Marketing and recruitment strategies associated with pilot projects will need to address specific characteristics of the customer segment targeted by a pilot. For example, marketing and recruitment methods for large industrial customers are likely to be different from what is considered for a group of smaller, aggregated customers such as restaurants. Once the pilot ideas have been decided upon, these strategies will need to be defined before going into the actual implementation phase.

3. Customer incentives: Each of the pilots will need to outline the structure and level of incentives offered to participants. For example, some DR options such as Direct Load Control (DLC) may offer a fixed monthly incentive to participants during the season of operation. Other options such as Curtailment, may offer a fixed payment ($/kW) for agreeing to supply a certain amount of load during times DR events are called, along with an energy payment ($/kWh) for the actual energy reduction during events.

4. Validation procedures: There are well-established validation procedures for measuring and verifying the actual amount of load reduction achieved during DR events and/or for measuring the amount of load shifted prior to DR events. Before going into the actual implementation phase, these procedures will need to be defined and established for each of the pilot options.

6. Selection of Pilot Projects

This section serves as an information guide related to pilot project selection and also lays out the criteria for pilot project selection.

6.1 Award Information

BPA estimates two to six awards resulting from the announcement of pilot project selection, with award size ranging potentially from $100,000 to $500,000.

6.2 Eligible Applications

6.2.1 Eligible Applicants

Eligibility under this funding opportunity is limited to public power customers that purchase Priority Firm power from BPA. These customers can be Slice or Load Following.

6.2.2 Cost Sharing

There is no minimum cost sharing requirement; however, applicants are expected to fully fund direct labor costs, fringe benefits, and indirect costs.

6.3 Proposal Submission Guide

6.3.1 Proposal Content and Form

The written proposal should address the following elements and be no more than 15 pages in length, excluding attachments relating to budget and resumes.

1. General Project Description- Provide a general overview of the proposed pilot and its scale. The summary should include:

    a. General description of the project

    b. Rationale for the project

    c. Goals and objectives. Describe what is hoped to be learned (hypotheses).

    d. End-user Impact. Identify how the participating end-user(s) will be impacted and/or interact with the technology.

    e. Incentive. Identify how participating end-user(s) will be incented (if applicable) to participate in the pilot.

    f. Persistence of Assets. Describe if project assets will be used after the study period and how the pilot might fit into longer term plans.

2. Type of Technology Proposed- BPA seeks to know what kind of technology the proposed program will be using. Please provide details about the proposed technology, such as core capabilities of the technology, manufacturer (if known), size, etc. Depending on the project type, these technologies might include autonomous control, two-way communication AMI, programmable controllable thermostats, metering and the telemetry being used. Please also include a description of the communication system being used and its capabilities. The pilot may demonstrate or test at least one of the following technologies or objectives:

a. Open ADR communications infrastructure

b. Aggregation (by either utility or through the use of third party curtailment and load management services providers)

c. Integration of DR with C&I Energy Efficiency programs and measures

d. Using C&I DR to produce wind power integration benefits for BPA

e. Using C&I DR to produce off peak load building benefits for BPA

f. Using C&I DR to provide ancillary services (regulation, reserves, or balancing) benefits for BPA

3. Expected Megawatt or Kilowatt Impact- Please specify the known or expected megawatt or kilowatt impact the DR resource will deliver with the test. Also include an estimate of the potential impact if the pilot were expanded later on a broader scale (with more end-users).

4. Readiness- Identify what steps will need to be taken in order to initiate the pilot. These should include technical and organizational steps to proceed, for example: Are core technologies in place? What management/board commitment is in place? What internal resources has management made available?

5. Tasks- Proposals should identify the specific steps or activities to be accomplished under the proposed pilot and be described in sufficient detail. Tasks should be identified by project phase and any go/no-go decision points should be identified.

6. Project Timeline- Proposals should include a high-level timeline from start-to-finish including all test periods. The timeline should be broken out into key pilot phases such as:

   a. Planning and design
   b. Installation
   c. Tests/operation
   d. Evaluation of Results

7. Measurement and Verification- Address how the project will be evaluated for success and what data you will need to collect, recognizing that the DR event will result in a change in power (kW) used. As a part of this, please thoroughly explain the chosen baseline methodology. The baseline will be what the load would have been for that specific period of time in the absence of a DR event, knowing that the baseline is a hypothetical number that must be estimated. This section should address how the change in end-use power consumption will be calculated.

   If known, please address in what format test data will be available.

8. Challenges- Address the primary expected challenges in designing and conducting the proposed project.

9. Key Personnel- Provide the names, background and roles of key personnel (or vendors) expected to be involved in executing this project, and note relevant experience these individuals or vendors bring to the proposed project. If any vendors are anticipated to be used, explain the nature of the services. Relevant vendor qualifications, restricted to one

page each, should be provided as an attachment to the application. The attached resumes and qualification summaries do not count towards the page limitation.

10. Budget- Provide a proposed budget for the program and address any cost sharing that may be provided (cash or in-kind). The budget should include a breakdown across cost categories—personnel, equipment, contracted services, marketing, and other specified costs—being mindful of the costs associated across all phases of a project (e.g., marketing and outreach, design, installation, test, and evaluation). The budget must be accompanied by a budget justification narrative. The budget and budget justification narrative should be provided as separate attachments and will not count towards the page limitation. See provided templates in Appendices C and D.

6.3.2 Submission Date and Time

The Application is due by Sept. 30, 2010, not later than 4:30 pm Pacific Time.

6.3.3 Funding Restrictions

Cost Principles- Costs for educational institutions, nonprofit organizations and state, local and Indian tribal governments must be allowable in accordance with the applicable Federal cost principles. The cost principles for commercial organization are in located in the Bonneville Purchasing Instructions (BPI), Appendix 13A, and Contract Cost Principles for Commercial Organizations. The BPI is located at http://www.bpa.gov/corporate/business/bpi/.

Pre-Award Costs- BPA does not intend to authorize pre-award costs.

6.4 Proposal Evaluation Information

6.4.1 Criteria

1. Initial Evaluation Criteria

Prior to a comprehensive evaluation, BPA will perform an initial review to determine that (1) the Applicant is eligible for an award; (2) the information required by the announcement has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the funding opportunity announcement.

2. Comprehensive Evaluation Criteria

a. Technical

i. Project Approach

- Comprehensiveness and completeness of the proposed pilot in addressing key elements as described in Section 2.2 of this announcement- This includes the general project description (goals, rationale, linkages to BPA needs/priorities, and so forth), type of technology, and plan for measurement and verification of the achieved changes in load, and the degree to which the proposed approach meets the goals and objectives of the announcement as defined in Section 5 of this document.
- The pilot may demonstrate or test at least one of the following technologies or objectives:
    - Open ADR communications infrastructures

- Aggregation (e.g., use of third party curtailment and load management services providers)
- Integration of DR with C&I Energy Efficiency programs and measures
- Using C&I DR to produce wind power integration benefits for BPA
- Using C&I DR to produce off peak load building benefits for BPA
- Using C&I DR to provide ancillary services (regulation, reserves, or balancing) benefits for BPA

- Work plan - has the Utility and project team prepared a thoughtful, carefully considered, complete, and practical, realistic, work plan for the proposed project? Do they demonstrate an awareness of what it will take to successfully complete the proposed project, what challenges may need to be overcome, and what implementation risks may occur
- Focus on goals - does the Utility and project team display a clarity of setting project goals, does the work plan stay focused on those goals, is there cradle to grave consideration of all the steps that will get the goals accomplished, including the evaluation or M&V of results? Do they truly show that they know what they are trying to do?
- Has the Utility and project team effectively assessed the market for the project, the number and type of buildings or facilities that might be involved? Has the Utility and project team reasonably calculated the estimated kW load reduction or load shift potential?
- Uniqueness of the proposed project within the Northwest- What potential DR learning would be of value to BPA, including synergies with other regional DR projects or potential projects? This would include consideration of recent Northwest IOU and public utility C&I DR pilots and projects.

ii. Project Viability and Readiness

- The degree to which the proposed pilot has anticipated and addressed challenges, e.g. viability of technologies (including communication pathways), proposed impacts, etc.
- The degree to which the proposing utility is ready to begin the pilot. This would include expressed senior management/board support. In addition, foundational technologies should be in place at the utility to meet the needs of the pilot.
- For pilots where the end-use customer is expected to be identified at the pilot inception, the degree to which the proposed end-use customer participant is ready to begin the pilot. This would include expressed support by decision-makers at the end-use customer.
- The readiness of the Utility and project team to implement the proposed project

iii. Scalability of the Proposed Project

- If successful, can the project be broadened to more end-users within the utility's service territory or in the region?

- If successful, can the same concept be adopted by other utilities?
- How will the proposed project further regional learning around DR?

iv. Project Team

- The relevant experience of the proposed project team, particularly in regards to project management, installation of technology, marketing, and measurement & verification. Utility, project team, or vendor experience in the implementation of DR technologies in C&I, irrigation, or residential sectors, with specific focus in:
    - Projects that address summer peak loads
    - Projects that address winter peak loads
    - Open ADR communications
- Demonstrated success of the Utility and project team in completing pilot or demonstration projects similar in scope and complexity to the proposed project on time, within budget, and with success.
- Qualifications of the proposed individual team members as described in the proposal and attached resumes.

b. Non-Technical

i. Budget Plan and Cost Share

- Appropriateness of budget with regard to the proposed scale of the project.
- The amount or percentage of cost-share offered by the applicant.
- The budget plan should be well developed, reasonable and complete, with all budget plan categories filled out, with adequate explanation should be provided to support budget item rationale; this can be in the form of footnotes or other documentation.
- The budget plan should exhibit quality and provide a good cost value to BPA and BPA ratepayers.

3. Other Selection Factors

BPA may consider the following program policy factors in the selection process:

- It may be desirable to select for award a group of projects which represents a diversity of technical approaches and methods;
- It may be desirable to support complementary and/or duplicative efforts or projects, which, when taken together, will best achieve the pilot's goals and objectives;
- It may be desirable to select different kinds and sizes of organizations in order to provide a balanced programmatic effort and a variety of different technical perspectives;
- It may be desirable, because of the nature of the type of projects envisioned, to select a group of projects with a broad or specific geographic distribution;
- It may be desirable to select project(s) of less technical merit than other project(s) if such a selection will optimize use of available funds by allowing more projects to be supported and not be detrimental to the overall objectives of the program; and

- It may be desirable to select project(s) of less technical merit than other project(s) if such a selection is likely to present a significantly lower level of risk for successful execution due to the higher proposed level of cost share.

6.4.2 Review and Selection Process

- **Comprehensive Evaluation –** Applications that pass the initial evaluation will be subjected to a comprehensive review based on the evaluation criteria identified in this announcement.
- **Selection –** BPA's Contracting Officer will consider the comprehensive evaluation recommendation prepared by the BPA DR Team's evaluation committee, along with the amount of funds available for award.
- **Discussions and Award**

  BPA's contracting officer and/or any authorized representatives may enter into discussions with a selected Applicant for any reason deemed necessary, including but not limited to: (1) the budget is not appropriate or reasonable for the requirement; (2) only a portion of the application is selected for award; (3) the BPA needs additional information to determine the recipient's financial management capabilities; and/or (4) special terms and conditions are required. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the Applicant.

  This award is made at the sole discretion of BPA and is not subject to appeal or review.

6.4.3 Anticipated Notice of Selection and Award Dates

BPA anticipates notifying Applicants selected for award by end of October 2010 and making awards beginning in October and/or November 2010.

6.5 Questions and Contacts

6.5.1 Questions

Utilities are encouraged to field pose questions regarding this opportunity at the earliest opportunity. A series of stakeholder meetings have been planned during June, July, and Aug. to provide ample opportunity for BPA and Global to answer questions regarding this funding opportunity. Questions may be posed prior to, during, or after any of the meetings scheduled to date (see Section 3 of the Project Implementation Plan).

The last formal opportunity to pose questions to BPA regarding this funding opportunity will be at a pre-application teleconference scheduled for Aug. 18. At that time, any questions regarding this announcement must be submitted electronically to the contact identified below no later than Aug. 10, 2010. A summary of the question and answers will be provided to all interested applicants within one week of the teleconference.

6.5.2 Contact

Name: Theresa Hughes
Email: tchughes@bpa.gov
Telephone: 503-230-5341
Fax: 503-230-4508

6.5.3 Pre-application Teleconference

A pre-application teleconference will be conducted on Aug. 18, 2010 at 10:00 am. Applicants are encouraged to participate in this teleconference, as questions will be answered. Please refer to Section 3 for participation information details.

7. Pilot Implementation: Phase 2

Phase 2 will begin October 25, 2010. Details of the Phase 2 program plan will be more defined at the end of Phase 1 as a result of feedback and experience in the Stakeholder engagement and proposal process. As a result, the approaches described below are brief since details will be developed through Phase 1 activities.

7.1 Scoping

As Phase 1 comes to completion, the BPA DR Team will have a strong understanding of what pilots will be selected for this project, and the team will have had conversations with the customer utilities, the end-use customers, and the consultant/sub-contractors aligned with each of the pilot projects. At the onset of Phase 2, the BPA DR Team will prepare pilot project scope documents with close involvement of these groups, so that expectations and deliverables can be clear throughout the process.

These scope documents will include, but not limited to, the following:

- Specific pilot objectives
- Detailed project plans to be executed by the consultant/sub-contractor
- Detailed budgets, schedules

BPA will review and comment on the Statements of Work. The BPA DR Team will work closely with the BPA evaluation team to ensure a plan is in place to gather information that is useful to furthering regional DR knowledge.

7.2 Contracting Options

BPA will first enter into a Memorandum of Agreement (MOA) with participating utilities. To add flexibility for the pilot participant end-use customers, the BPA DR Team will provide the choice of two contracting options:

1. Contract with BPA
2. Contract with Global, general contractor for BPA

For certain end-use customers and in certain pilot scenarios, the ability to contract with a third party contractor may ease the contracting process and thus better meet the objectives of the pilots. For example, if a pilot project were targeting reduction of winter peak, having the ability to complete the contracting cycle faster may enable testing during the 2010/2011 winter season.

The contracting option will ultimately be chosen by the customer utility.

7.3 Pilot Implementation

The BPA DR team will work with Global and implement the selected pilot projects. Each pilot project will receive the necessary assistance with technical, marketing and program issues to support effective execution.

The specific sub-tasks associated with pilot implementation include:

- Obtain customer commitment
- Site assessment
- Equipment and technical infrastructure installation along with enablement
- System testing and validation

- Program operations

7.3.1 Obtain Pilot Project Commitment

Under this sub-task, BPA signs an MOA with each utility participating in the pilot. The utilities will have the option of contracting directly with the Program Partner (as an agent of BPA) or directly with BPA. The agreement will spell out the specific actions to be taken by the customer and the procedures for implementation. Also, these agreements will need to be multi-layered to include both utilities and end-use customers participating in the pilots.

7.3.2 Site Assessment

The next step in the process is to conduct site assessments for all customers that have signed a participation agreement. The BPA DR contractor team will conduct site surveys to better understand the end-use customer's existing conditions, equipment configurations, and load shed desires during events; identify all of the possible the DR measures that would bring about load reductions; and estimate the load shed amount. During this stage of the process the team members will also talk with the customer about potential energy efficiency opportunities that they may want to consider prior to implementing the DR equipment.

7.3.3 Equipment and Technical Infrastructure Installation/Enablement

The next step in the process is to complete equipment installation and enablement for load reduction during times DR events are called.

For some of the pilots, participating end-use customers may require technical infrastructure modifications to their existing system. The BPA DR contractor team will be available upon request to assist the end-use customer in undertaking those modifications. The specific solutions will vary depending on the customer size, the type of equipment that is currently in place, and the preferred DR measures to be taken.

For some of the pilots, the BPA DR contractor team may use the customer's existing metering system to communicate load management data. In some cases, modifications to the existing metering system may need to be undertaken. Should the end-use customer require interval metering, the contractor team will install a utility specified communicating meter or inexpensive shadow meter with communications capabilities so that the load data can be collected and stored in real time. The purpose of having the metering capability is two-fold. First, the contractor team will use the flow of data to monitor the participating loads in real-time before, during and after each DR event. Second, the contractor team will use the load data from the interval meter to potentially settle the load reductions following each DR event. These settlements may serve as the basis for compensating the customer for their participation in the load reduction event. Once the contractor team establishes a connection to obtain the load data for each site, we will tailor our load data monitoring and tracking systems to fit validation requirements. In addition, we will provide the load reduction performance data to the customer as part of the incentive settlement process.

7.3.4 System Testing and Validation

Once all of the DR communication and automation systems are in place, the BPA DR contractor team will conduct a series of functionality tests to validate that the systems are operational and are capable of producing load sheds during DR events. Further, the contractor team will use commonly accepted baseline methodologies for estimating load reduction during DR events.

7.3.5 Program Operations

The final step in the implementation process is to operate the DR pilot program, assess operations and tailor the approaches along the way, and make adjustments to the program design based on the lessons learned. Program operations may involve the following activities:

- Notifying customers of pending DR events and other DR system operations
- Resolving customer issues
- Monitoring DR event performance in near-real time and reporting back to BPA through web-monitoring systems
- Undertaking on-site customer training and communications/outreach activities through regular e-newsletters or other efficient media
- Supporting customers and troubleshooting through a toll-free telephone hotline and emailing.
- Monitoring, tracking and reporting usage and DR event load performance
- Making warranted adjustments to maximize performance
- Undertaking settlements and payment processing related activities
- Summarizing Pilot Results- Data will be collected and assessed from each of the pilot projects. The results (including the cost-effectiveness) and lessons learned will be summarized from each of the pilot projects. Regular status reports on pilots will be provided which describe test events and associated DR strategies during those events, along with impact measurement from the events.

8. Roles and Responsibilities

8.1 BPA

As the leader of this project, BPA is responsible for the high-level strategy, vision and direction of the effort. Across the phases and activities of the project, the responsibilities are broken down as follows:

Stakeholder Engagement: BPA is responsible for leading outreach to stakeholders, and making final decisions as to changes in project scope and direction as an outcome of the stakeholder engagement process.[4]

Proposal Preparation & Submission: Because BPA is responsible for evaluating pilot proposals received and then selecting any and all winning proposals, BPA seeks to maintain separation from the proposal process to ensure objectivity. With that, BPA will not be specifically involved in the preparation and submission of proposals by the utilities.

Pilot Implementation and Execution: Once the selection of pilots has been made, BPA will work with utilities and Global to ensure all project contracts are executed in a reasonable timeframe.

Throughout Phase 1 of this project, BPA will also:

- Work with Global to establish acceptable protocols for communication with BPA staff, customer utilities (on behalf of BPA), and other BPA contractors engaged in agency-driven efforts.
- Post relevant documents, links, schedules, and other information intended to facilitate the preparation of pilot proposals by customer utilities

8.2 Global

As the prime contractor for this project, Global is responsible for the delivery of all identified objectives to BPA. This includes:

Stakeholder Engagement: Global will support BPA in the outreach and education to utilities and their end use customers.

Proposal Preparation & Submission: Global will assisting utilities in determining best pilot scenarios given their distinct goals and objectives*. Where needed by utilities, Global will assist in proposal preparation*. During the Proposal Preparation activities, Global will be responsible for working on behalf of BPA, providing project management and oversight.

Pilot Implementation and Execution: During project implementation, Global will provide local transfer of knowledge.

* In order to avoid the development of any unintentional prejudice on the part of BPA toward any prospective utility proposals, Global will maintain a communication firewall with BPA concerning data and information pertaining to developing pilot scenarios and proposal preparation until after selections have already been made by BPA. During the proposal development phase, Global will limit reported content to information such as:

- The number of utilities engaged in *cursory* dialogue regarding the development of pilot proposals

[4] Outreach materials are presented in Appendix B of this document.

- The number of utilities engaged in *in-depth* dialogue regarding the development of pilot proposals
- The number of utilities requesting Global to conduct on-site walkthroughs
- The number of utilities actively writing up pilot proposals
- The number of utilities engaging executives and boards of directors in the development of pilot proposals
- The number and types of different pilot strategies being developed by utilities and the

8.3 Utilities

Throughout this project, interested utilities will progressively increase their responsibilities, as follows:

Stakeholder Engagement: Interested utilities are encouraged to participate in stakeholder meetings or to proactively reach out to BPA and Global to gather information on the project and its applicability to their end-use customers.

Proposal Preparation & Submission: Interested utilities are strongly encouraged to enlist the support of Global in the preparation of proposals. BPA also requests that utilities demonstrate management and board engagement in regard to their proposed pilot project.

Pilot Implementation and Execution: Utilities who are awarded pilot funds by BPA will enter into a Memorandum of Agreement (MOA) with BPA and will sign a contract with either BPA or Global prior to the start of pilot implementation. During the course of the pilot execution, utilities will make all best efforts to work with Global, BPA, and any other parties to overcome any challenges in a timely and professional manner. Ultimately, utilities will provide data to Global and BPA on pilot performance so that BPA can share findings with all customer utilities and regional stakeholders.

8.4 End-users/Consumers

The success of this DR project has a foundation based on the individual successes of the participating end-use customers. Their responsibilities are as follows:

Stakeholder Engagement: Though end-use customers will not be specifically targeted during the stakeholder engagement activities, they are welcome to participate. In addition, it is important to know that end-use customers that do have interest must engage with their utilities, as their utilities will submit the proposal to BPA.

Proposal Preparation & Submission: During the proposal preparation phase, interested end-use customers will endorse their potential participation in the pilot and articulate what, if any, resources they will commit to the pilot if they are selected.

Pilot Implementation and Execution: Once selected as a pilot participant, end-use customers will be required to sign a commitment letter or contract with agreed terms and conditions for the pilot implementation. These end-use customers will provide pertinent non-proprietary data to utilities, Global, and BPA on pilot performance so that BPA can share findings with all customer utilities and regional stakeholders.

8.5 Consultants/Sub-contractors

Due to this DR project (utilizing a variety of pilot approaches) various consultants and/or sub-contractors can, and likely will, be engaged. Their responsibilities are as follows:

Stakeholder Engagement: Though consultants/sub-contractors are not specifically targeted during the stakeholder engagement activities, they are welcome to participate. In addition, it is important to know that consultants/sub-contractors that do have interest must engage with the utilities of their end-use customers, as their utilities will submit the proposal to BPA.

Proposal Preparation & Submission: During the pilot proposal preparation phase, consultants/sub-contractors will be engaged as determined by utilities, Global, and/or BPA to provide appropriate proposal information and guidance pertinent to their areas of expertise.

Pilot Implementation and Execution: During the pilot implementation phase, consultants/sub-contractors will provide contracted services and support for utilities, end-use customers, and the Global-BPA team and will work with all relevant project partners to overcome any challenges in a timely and professional manner.

Ultimately, consultants/sub-contractors will provide data to utilities and/or the Global-BPA team on pilot performance so that BPA can share findings with all customer utilities and regional stakeholders.

9. Communication Protocols

The BPA DR team understands the importance of proactive, consistent and solutions-oriented engagement with interested utilities and their end-use customers. While there is no intent to impose wide-ranging communication protocols over all aspects concerning the C&I Pilot Projects, there are a couple areas where some basic protocols will be useful, particularly in regard to recruitment efforts in the industrial sector and during the course of pilot proposal preparation.

9.1 Industrial Sector

In order to maximize operational efficiency for all parties with resources engaged by BPA in the industrial sector, BPA will use the following communication protocol as a guide:

1. Global: Articulate, in writing, any and all potential industrial DR strategies and communicate these to the C&I DR Project Manager (Joshua Binus);
2. C&I DR Project Manager; Communicate the potential industrial DR strategies to the BPA-Cascade Energy Smart Industrial Team Program leads (Jennifer Eskil and Marcus Wilcox);
3. Energy Smart Industrial Team Program leads: Communicate the potential industrial DR strategies to all Energy Smart Industrial Partners (ESIPs) with a request that they consider the applicability of the strategies to any industrial end-users within their territories of operation.
4. ESIPs: If any industrial facilities are determined to be potential partners in a DR project, based on the strategies articulated above, communicate those potential opportunities to the Energy Smart Industrial Team Program leads:
5. Energy Smart Industrial Team Program leads: Coordinate with the C&I DR Project Manager and Global to prioritize leading opportunities and contact appropriate utilities prior to engaging the industrial end-user in any dialogue concerning participation in a DR pilot project.
6. C&I DR Project Manager Global, and Energy Smart Industrial Team: Coordinate any and all communication with utilities and industrial end-users in order to limit contact points and confusion.

9.2 Pilot Proposal Preparation

In order to avoid the development of any unintentional prejudice on the part of the BPA DR team's proposal evaluation committee, BPA and Global are endeavoring to maintain a communication "firewall" regarding the sharing of granular information about any and all potential pilot proposals as they are being developed. The intent is for the BPA proposal evaluation committee to approach each proposal without any foreknowledge of the details that went into its crafting. We believe this will allow for a more objective environment for the evaluation of all the submitted proposals.

In order to maintain this "firewall" utilities (and any agents employed on their behalf) are encouraged to adhere to the following protocols:

- For questions regarding the overall C&I DR Pilot Projects (e.g., stakeholder meetings, Q&A conference call, etc.) the process for proposal preparation, and or the availability of technical support from Global, contact:

  Joshua Binus, C&I DR Project Manager

  Bonneville Power Administration

  503-230-5298

  jdbinus@bpa.gov

- For questions regarding the preparation of specific pilot proposals (e.g. prioritization of strategies, technical feasibility, budgets, timeline, scope, etc.) contact:

  Chad Gilless

  Global Energy Partners

  503-803-7283

  cgilless@gepllc.com

9.3 Data Gathering and Reporting

Future DR programs may be supported by data collected on:

- Recruitment Process
- Implementation Process
- Programmatic Issues
- Technology Issues
- Utility and End-use Customer Satisfaction
- Lessons Learned
- Cost-effectiveness
- Event Impact Measurement

Appendix A – Examples of Pilot Ideas

The contents of this appendix provide two-page descriptions of each of the following 19 pilot ideas:

- Pilot Idea 1: Integrated Load Management/Energy Efficiency Strategies in Wastewater Treatment Facilities
- Pilot Idea 2: 'Fast DR' for Large C&I Customers with OpenADR (Open Automated Demand Response)
- Pilot Idea 3: Direct Load Control (DLC) for Small and Medium C&I Customers
- Pilot Idea 4: 'Fast DR' for Small and Medium C&I Customers
- Pilot Option 5: Integrated Distributed Resources
- Pilot Option 6: Thermal Energy Storage Coupled with Demand Reduction and Energy Efficiency Strategies
- Pilot Option 7: OpenADR with Integrated EE/DR in Energy Intensive Industries
- Pilot Option 8: Super Peak TOU Tariffs for C&I Customers
- Pilot Option 9: Interruptible/Curtailable Option for C&I Customers
- Pilot Option 10: Demand/Capacity Bidding using Auto-DR with Load Aggregators
- Pilot Option 11: Load Shifting with Pre-Cooling, Integrated with Load Reduction and EE Strategies
- Pilot Option 12: Auto-DR Strategies for Data Centers
- Pilot Option 13: Chiller Replacement and Thermal Energy Storage Systems
- Pilot Option 14: Off-Peak Non-Road Electric Vehicle Charging
- Pilot Option 15: Off-Peak Water Pumping to Gravity Storage
- Pilot Option 16: Water Pumping for Reducing Variability of Renewable Generation
- Pilot Option 17: Wind/PV-Powered Pumped Water Storage for Electric Energy Storage
- Pilot Option 18: Wind/PV-Assisted Municipal Water Pumping and Building Water Systems
- Pilot Option 19: Load Aggregation by Utility

Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Integrated Load Management and Energy Efficiency Strategies in Wastewater Treatment Facilities

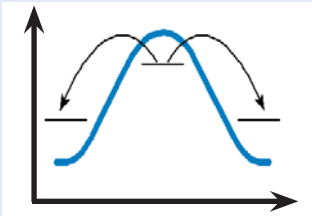
Objective of Pilot

The objective of this pilot is to determine the feasibility of applying demand response (DR) solutions at wastewater treatment facilities in the Pacific Northwest. The pilot concept integrates load shifting, peak demand reduction, and energy efficiency:

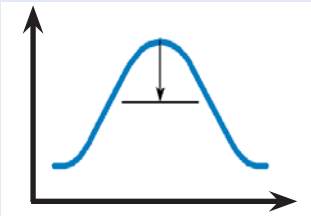
- Load shifting strategies shift process-related loads from peak periods to off-peak periods using specific systems and analysis tools
- Demand reduction is realized during peak periods or during times when DR events are called
- Energy efficiency is accomplished by coupling water and energy efficiency measures with an energy management and control system. Energy efficiency yields energy savings as well as permanent peak demand reductions.

Demand Response Strategy

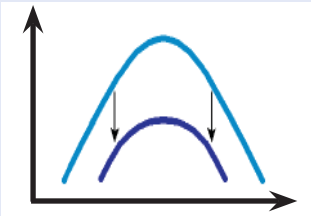
Integrated Load Management. The strategy involves regulation of aerator and aspirator operation for building dissolved oxygen (DO) at wastewater treatment facilities using Enterprise Energy Management (EEM)[1] systems coupled with process and control technologies. This approach can lead to load shifting from peak to off-peak as well as provide additional demand reduction during times when a DR event is called. The process can be fine-tuned using variable frequency drives (VFDs) on aerator and aspirator motors. Energy savings can be realized from retrofitting existing motors to premium efficiency ones.



Load Shifting



Peak Demand Reduction



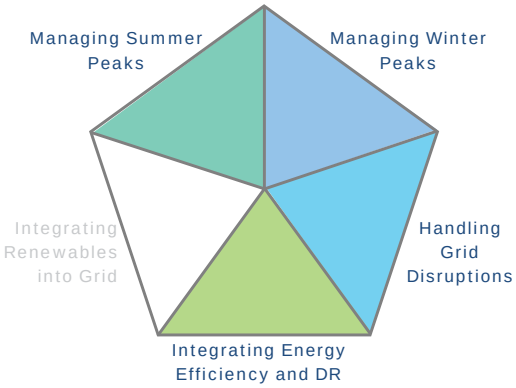
Energy Efficiency

[1] *EEM systems use software tools to help large enterprises manage energy and water usage. There are several vendors of this product currently in the industry.*

Key Regional Issues Addressed

This DR strategy can be used to help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions
- Integrate EE and DR



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	Especially relevant for the food processing industry, but could also be applied to other industries with sizeable wastewater treatment requirements
Area/Locational Specifications	No limitations
Notification/Response Time Related to DR Events	Day-ahead or hour-ahead basis
Examples of Technology Components	▪ EEM system to measure and report data on demand, energy use, and DO ▪ VFD on motors ▪ DO monitoring system that integrates with EEM ▪ Pulse flow meters ▪ DO sensors ▪ Suspended solids and salinity probes that integrate with EEM ▪ Weather data integration with EEM
Developmental Status	Demonstration phase; has been demonstrated in an olive processing plant in California[2]

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

Contacts

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503-230-5298

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[2] *California Food Processing Industry: Wastewater Demonstration Project: Phase I Final Report*, Lawrence Berkeley National Laboratory, Berkeley, CA: September 2009. LBNL-2585E.

Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

"Fast DR" with OpenADR for Large C&I Customers

Objective of Pilot

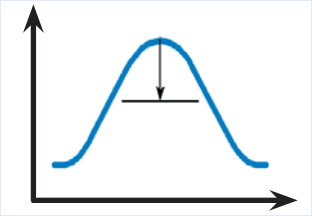
The objective of this pilot is to determine the feasibility of Fast DR with Open Automated Demand Response (OpenADR)[1] architecture. It is most applicable to C&I customers with maximum demand of greater than about 200 kW, but this is not a rigid specification. Participating sites will need to achieve a predetermined minimum level of load shed for a specified duration of time (e.g., 2 hours). Attributes of Fast DR include the following:

- Load reduction with a response time of less than 10 minutes once a DR event is called
- Ability to fulfill the need for establishing contingency reserves and regulation and load following resources in the ancillary services market[2]
- Ability to integrate with variable renewable resources such as wind, which require loads to respond very rapidly (by ramping up or down) in response to supply fluctuations

Demand Response Strategy

Fast DR. The general strategy involves quickly and automatically achieving peak demand reductions in response to DR events. Methods for shedding loads are pre-programmed and automated with end use controls. Specific methods for temporary load reductions include the following:

- Shut-off of roof-top heating, ventilating, and air conditioning (HVAC) units
- Shut-off of remote terminal units (RTUs)
- Cycling of variable air volume (VAV) boxes and corresponding air handling units
- Increase of thermostat set points during the summer and decrease of thermostat set-points during the winter
- Shut-off of non-critical process-related loads
- Lighting system switching/dimming



Peak Demand Reduction

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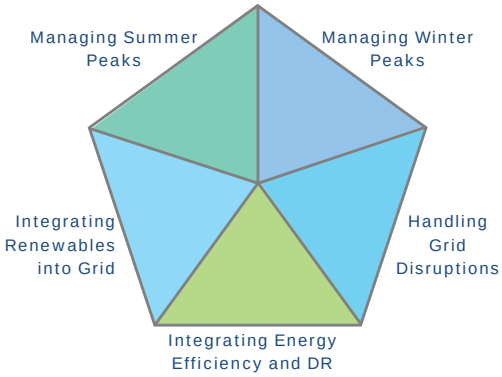
[1] *Automated Demand Response (Auto-DR) refers to automated enabling technologies that allow a customer's equipment or facilities to reduce electricity usage automatically in response to peak load conditions or any other type of system requirement/contingency without manual intervention. It is essentially a communication and technology platform designed to provide customers with automated, electronic price and reliability signals along with the capability to identify and automate site specific DR strategies. OpenADR is fully automated DR that uses open standard, platform-independent and transparent end-to-end technologies and/or software systems. The OpenADR communications infrastructure is designed to improve the reliability, repeatability, robustness, and cost-effectiveness of DR in C&I buildings.*

[2] *Historically, ancillary services have not been considered a problem in the Northwest, but as loads have grown and wind generating resources have increased, power system planners and operators have become more interested in using ancillary services (see Sixth Power Plan, page 5-12).*

Key Regional Issues Addressed

This DR strategy can be used to address all five of the key regional issues; yet, because of its quick response time, it is particularly well suited to help

- Handle grid limitations or disruptions
- Integrate renewables into the grid



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Fast DR
Targeted Customer Segments	Large C&I customers with flexible operation and automated controls, e.g., large offices, retail stores, manufacturing industries, and water and gas pumping
Area/Locational Specifications	Sites with low load variability and consistent load shed capability are preferred; sites near wind generation desired to test integration of renewables
Notification/Response Time Related to DR Events	Less than 10 minutes
Examples of Technology Components	▪ Auto-DR infrastructure with OpenADR specifications ▪ Two-way open communications infrastructure for communicating real-time data ▪ Facility energy management and control system ▪ Telemetry meter and associated communications for transmitting four-second real-time energy data ▪ 15-minute interval meter for settlement
Developmental Status	Demonstration phase; recently demonstrated in Pacific Gas & Electric's Participating Load Pilot; a number of ancillary services options offered by independent service operators (ISOs) such as PJM, ISO New England, and Electric Reliability Council of Texas; OpenADR strategies without the fast component demonstrated through recent Seattle City Light pilot.

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Direct Load Control for Small and Medium C&I Customers

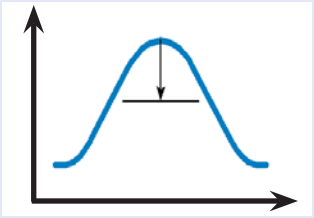
Objective of Pilot

The objective of this pilot is to determine the feasibility of direct load control (DLC) of customer end-use equipment during times of transmission and/or distribution system constraints in the Pacific Northwest. Controllable loads include air conditioners, heat pumps, electric space heaters, water heating systems, irrigation pumps, and other end-use equipment. For example, in the case of air conditioning, participants can have their equipment cycled off for the full duration of an event or for various fractions of an hour. A common duty cycle is 15 minutes off during an hour. DLC is a relatively established demand response (DR) strategy, but is continuing to evolve:

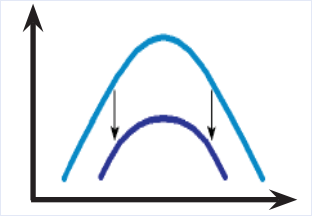
- In traditional DLC, a remotely controlled switch typically controls end-uses
- More modern forms of DLC use enabling technologies such as programmable communicating thermostats (PCTs) that allow for remote control of various end-use loads
- With Smart Grid activities gaining momentum, in the future it will be possible to integrate DLC with building automation and communication technologies within a broader set of energy efficiency (EE) and DR options

Demand Response Strategy

Direct Load Control. The general strategy is to achieve peak demand reductions by directly controlling end-use loads. DLC can also be coupled with EE efforts. In DLC, a one-way remote switch is connected to the end-use equipment being controlled. The operation of the switch is controlled through radio or powerline carrier signals or through digital paging. Most switches also contain multiple relays so that multiple end-uses can be controlled by the same switch with independent control strategies for each relay. More recent DLC programs involve installation of enabling technology. For example, PCTs or *smart thermostats* allow remote adjustment of temperature settings on space conditioning systems. This control enables the utility to adjust the temperature upward or downward remotely to reduce demand. After an event, the temperature setting is readjusted to the pre-event, customer-selected level.



Peak Demand Reduction

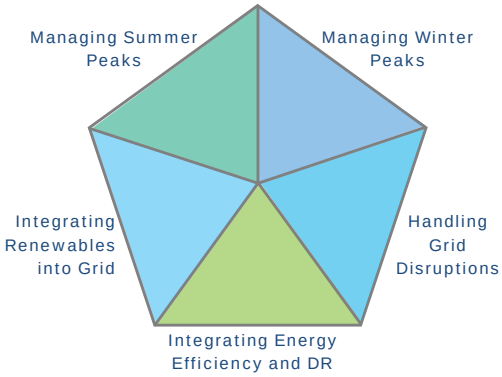


Energy Efficiency

Key Regional Issues Addressed

Depending on the specific pilot program design, this DR strategy can potentially be used to help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions
- Integrate EE and DR activities
- Integrate renewables into the grid



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Direct Load Control
Targeted Customer Segments	Small and medium C&I customers with major electric end-use equipment (e.g., electric space conditioning, water heating, and pumping systems) and maximum demands of less than about 200 kW. Applicable segments include small office buildings, restaurants, retail buildings, agricultural sites with irrigation pumping loads, and the municipal water supply.
Area/Locational Specifications	No limitations; areas with significant electricity loads are preferred
Notification/Response Time Related to DR Events	Instantaneous response
Examples of Technology Components	▪ Load control switch ▪ Enabling technologies such as PCTs
Developmental Status	Established in various regions; has been widely deployed over several years by a number of entities around the country (100s of utilities, involving millions of customers), including several pilot demonstrations sponsored by BPA over the past several years

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

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- Technology innovation
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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

"Fast DR" for Small and Medium C&I Customers

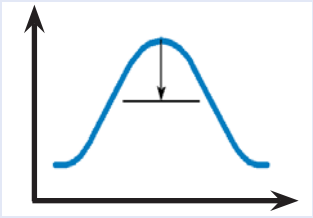
Objective of Pilot

The objective of this pilot is to determine the feasibility of Fast DR for small and medium sized C&I customers (e.g., with maximum demand of less than about 200 kW) within 10 minutes or less of event notification. Similar to the Fast DR pilot option for large C&I customers, this pilot option is designed to supply loads for participation in the ancillary services market.[1] It is also intended to respond to fluctuations in supply of renewable power resources such as wind and solar. Participants in the Direct Load Control (DLC) pilot option would also be able to participate in this pilot option with appropriate technical enhancements related to the metering and communications technologies that are required for participation in the ancillary services market. Essentially, a sample of customers from the DLC pilot option could be placed in this Fast DR pilot by setting up the proper infrastructure. Therefore, the two pilots share several common characteristics.

Demand Response Strategy

Fast DR. The general strategy involves quickly achieving peak demand reductions in response to DR events. Specific methods for temporary load reductions include the following:

- A one-way remote switch is connected to the condensing unit of an air conditioner or to the immersion element in a water heater. The operation of the switch is controlled through radio or powerline carrier signals or through digital paging. Most switches also contain multiple relays so that air conditioners and water heaters can be controlled by the same switch with independent control strategies for each relay.
- As a substitute for switches, Programmable Communicating Thermostats (PCTs) can be used for remote adjustment of temperature settings so that the utility can adjust the temperature upward or downward to reduce demand. After an event, the temperature setting is readjusted to the pre-event, customer-selected level.



Peak Demand Reduction

[1] *Historically, ancillary services have not been considered a problem in the Northwest, but as loads have grown and wind generating resources have increased, power system planners and operators have become more interested in using ancillary services (see Sixth Power Plan, page 5-12).*

Key Regional Issues Addressed

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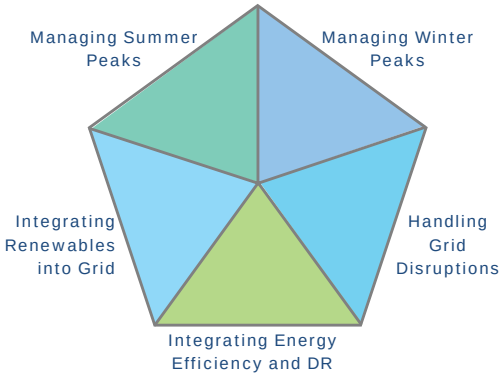
- Handle grid limitations or disruptions
- Integrate renewables into the grid



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Fast DR
Targeted Customer Segments	Small and medium C&I customers with major electric end-use equipment and maximum demands of less than about 200 kW; applicable segments include small office buildings, restaurants, and retail buildings
Area/Locational Specifications	Sites with low load variability and high electricity saturation are preferred; sites near wind generation desired to test integration of renewables
Notification/Response Time Related to DR Events	Less than 10 minutes
Examples of Technology Components	▪ Switch or PCT to control end-use equipment ▪ Proxy telemetry and metering requirements for small disaggregated load, since telemetry devices are mainly available for larger loads; proxy telemetry hardware using wireless mesh network ▪ Existing utility SCADA system to collect data measurements at one minute intervals ▪ Data loggers to provide real time usage information during the load control period ▪ Existence of an Advanced Metering Infrastructure (AMI) is likely to facilitate wider-scale deployment
Developmental Status	Demonstration phase; technical feasibility demonstrated through Southern California Edison's Participating Load Pilot and Pacific Gas and Electric's Smart AC Ancillary Services Pilot

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Integrated Distributed Resources

Objective of Pilot

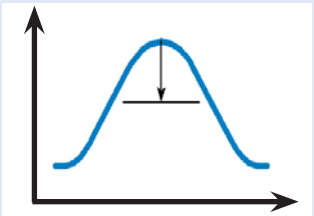
The objective of this pilot is to determine the feasibility of integrating a number of distributed energy options at the customer-end for demand response (DR) by using a real-time distributed resource dispatching system. This pilot concept combines an optimal mix of renewable resources, energy storage options such as batteries and flywheels, and load shed opportunities that can effectively micro-dispatch demand-side resources in place of supply-side resources.

Demand Response Strategy

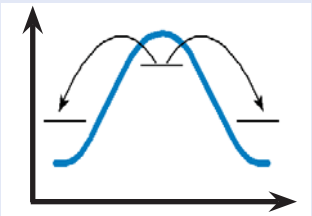
Renewable Energy Integration and Direct Load Control. The strategy consists of integrating several elements:

- Renewable energy resources such as solar photovoltaics and micro-wind systems at the substation level
- Energy storage systems such as batteries and flywheels at the substation level
- Load control devices at the customer-end
- Sophisticated energy management systems at the end-user level

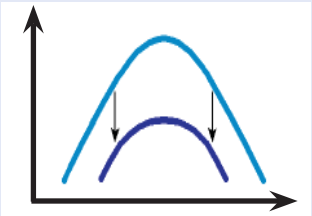
This combination reduces demand on grid electricity by providing distributed renewable generation, energy storage and recovery, and control of end-use loads in participating sites during times of system requirements. With appropriate enabling technology, pilot participants could also respond to rapid fluctuations in centralized supply of grid-tied renewable resources. Moreover, the energy management system would help participants integrate end-use energy efficiency (EE) with DR.



Peak Demand Reduction



Load Shifting

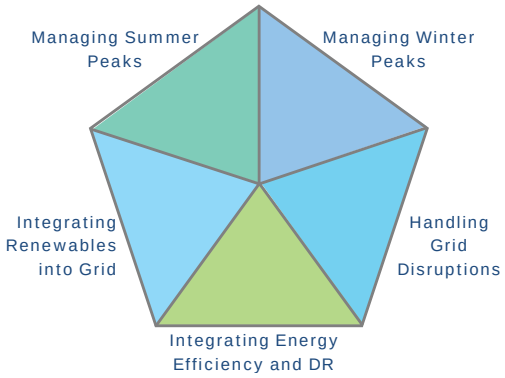


Energy Efficiency

Key Regional Issues Addressed

Depending on the specific pilot program design, this DR strategy can potentially be used to help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions
- Integrate EE and DR activities
- Integrate renewables into the grid



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Renewable energy integration and direct load control
Targeted Customer Segments	Small and medium C&I customers with major electric end-use equipment (e.g., electric space conditioning and water heating); existing distributed energy resources would be advantageous
Area/Locational Specifications	Sites with low load variability and high electricity saturation are preferred; sites near wind generation desired to test integration of renewables
Notification/Response Time Related to DR Events	Instantaneous response
Examples of Technology Components	▪ Distributed Resources Dispatching system with real-time feedback at the utility or system-operator level for the substation being tested ▪ Customer energy management system ▪ Advanced metering with two-way communications infrastructure ▪ Energy storage devices installed at the substation level
Developmental Status	Early demonstration phase; Duke Energy's McAlpine Smart Grid program is an example; flywheel storage integrated with wind resources is currently being demonstrated by New York Independent Service Operator (ISO)

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Thermal Energy Storage Coupled with Demand Reduction and Energy Efficiency Strategies

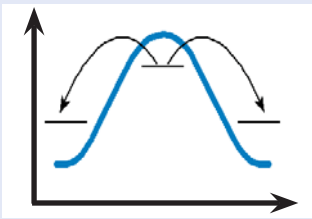
Objective of Pilot

The objective of this pilot is to determine the feasibility of a combination of load shifting strategies from peak to off-peak hours using thermal energy storage (TES) along with demand reduction strategies during times of demand response (DR) events. These strategies can be integrated with energy efficiency measures, which would combine permanent load reduction along with effective peak load management options. An ice storage or chilled water TES system could be charged during off-peak periods and utilized for load reduction in facilities during peak periods. Coupled with this, pre-programmed load reduction strategies along with energy efficiency (EE) measures could be deployed to manage energy and load.

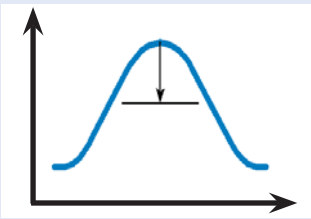
Demand Response Strategy

Integrated Load Management. The strategy integrates load shifting, peak demand reduction, and energy efficiency:

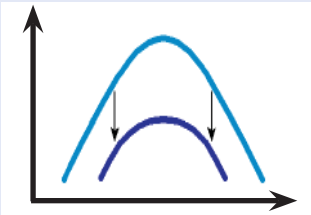
- Load shifting would be accomplished with TES systems
- Peak demand reduction could be achieved by several methods such as preprogrammed thermostat controls, shut-down of lighting and other equipment, and turning off plug loads
- Energy efficiency could be improved by combining DR measures with EE measures (e.g., efficient space conditioning equipment, lighting, motors)



Load Shifting



Peak Demand Reduction

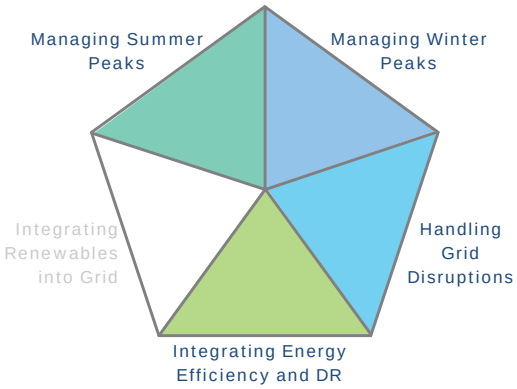


Energy Efficiency

Key Regional Issues Addressed

This DR strategy can be used to help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions
- Integrate EE and DR



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	Specific customer segments include university campuses and large office buildings; establishments with existing TES facilities would be particularly desirable
Area/Locational Specifications	No limitations
Notification/Response Time Related to DR Events	Day-ahead or hour-ahead basis
Examples of Technology Components	▪ Energy management and control system ▪ Interval meter ▪ Advanced controls for end-use equipment (e.g., lighting, heating, ventilating, and air conditioning systems)
Developmental Status	Demonstration phase; has been demonstrated in a university campus in California and several other locations in the USA

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
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- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

OpenADR with Integrated Energy Efficiency/Demand Response in Energy Intensive Industries

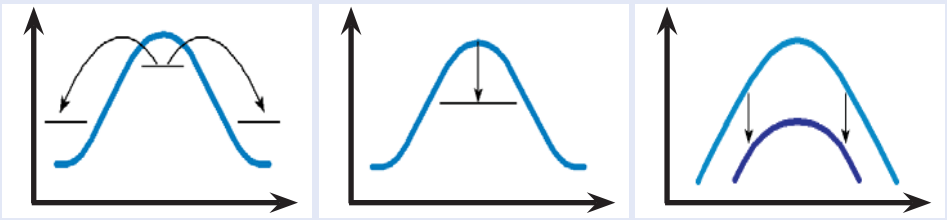
Objective of Pilot

The objective of this pilot is to demonstrate the feasibility of automated demand response (Auto-DR) strategies using Open Automated Demand Response (OpenADR) platform integrated with load shifting and energy efficiency (EE) measures in energy intensive industries.[1] Industries that are likely to be good candidates are those that have electricity as a large proportion of their operating costs, such as manufacturing facilities and refrigerated warehouses. For example, pre-cooling strategies using the thermal mass in refrigerated warehouses could enable load shifting from peak to off-peak periods. In combination with pre-cooling, Auto-DR strategies could be deployed during times DR events are called to reduce load. These load management strategies could be coupled with EE measures that reduce cooling loads (such as insulation, fast-acting doors, and high efficiency lighting).

Demand Response Strategy

Integrated Load Management. The strategy integrates load shifting, peak demand reduction, and energy efficiency:

- Load shifting could be accomplished by shifting operation of batch processes, conveyors, pump systems, space conditioning, motors, process cooling, and/or cold storage; e.g., pre-cooling spaces with large thermal mass would enable shifting of cooling and refrigeration loads
- Peak demand reduction could be achieved by temporarily shutting down process equipment, turning off air-handlers serving freezers, increasing set points on space conditioning systems, shutting off battery chargers during peak periods, etc.
- Energy efficiency could be improved by combining DR measures with EE measures (e.g., efficient refrigeration equipment, space conditioning, lighting, motors)



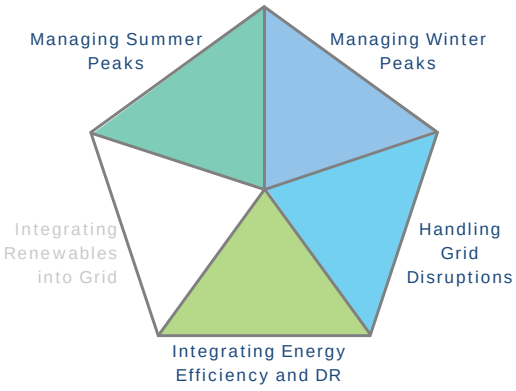
Load Shifting | Peak Demand Reduction | Energy Efficiency

[1] *Automated Demand Response (Auto-DR) refers to automated enabling technologies that allow a customer's equipment or facilities to reduce electricity usage automatically in response to peak load conditions or any other type of system requirement/contingency without manual intervention. It is essentially a communication and technology platform designed to provide customers with automated, electronic price and reliability signals along with the capability to identify and automate site specific DR strategies. OpenADR is fully automated DR that uses open standard, platform-independent and transparent end-to-end technologies and/or software systems. The OpenADR communications infrastructure is designed to improve the reliability, repeatability, robustness, and cost-effectiveness of DR in C&I buildings.*

Key Regional Issues Addressed

This DR strategy can be used to help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions
- Integrate EE and DR



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	▪ Variety of manufacturing industries ▪ Industries with batch processing ▪ Refrigerated warehouses are especially good candidates because they use standardized technology with uniform loads and refrigeration controls can easily be configured for OpenADR
Area/Locational Specifications	Sites with low load variability and/or high electricity saturation are preferred; sites near wind generation desired to test integration of renewables
Notification/Response Time Related to DR Events	Day-ahead or hour-ahead basis
Examples of Technology Components	▪ System level network controls ▪ Energy management and control system with preprogrammed load reduction strategies that respond to signals from Demand Response Automation Server (DRAS)
Developmental Status	Demonstration phase; successfully demonstrated through the California Investor Owned Utilities' Auto-DR program

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Super Peak Time of Use Tariffs for C&I Customers

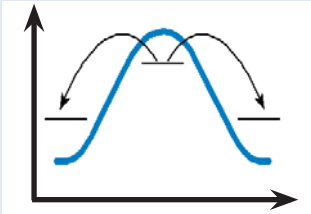
Objective of Pilot

The objective of this pilot is to demonstrate how customers respond to price signals that encourage reductions in peak demand through load shifting or load curtailment. In doing so, customers have the opportunity to reduce their electricity bills. The Super Peak Time of Use (TOU) tariff is a rate design that provides customers with the incentive to reduce peak demand by charging a higher price for electricity during certain peak periods during the day. It is applicable during both summer and winter seasons. The higher peak price is offset by a lower price during all remaining hours.

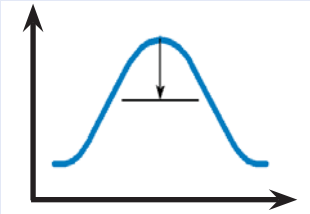
Demand Response Strategy

Pricing Mechanism. When enrolled in this rate, customers can reduce their electricity bills by shifting consumption from peak hours to off-peak hours, or by simply reducing demand during peak hours. The ratio of the peak rate to the off-peak rate could be roughly 4-to-1, although this is subject to revision and could be higher or lower upon implementation.[1]

The difference between a Super Peak TOU rate and a traditional TOU rate is that the peak period in the Super Peak TOU rate is shorter in duration. This allows for the provision of a higher peak period price and a lower off-peak period price, while still maintaining revenue neutrality. The result is a stronger price signal that is sent to customers and, in return, greater peak demand reductions for the utility and larger bill savings for the customer as compared to a traditional TOU rate.



Load Shifting



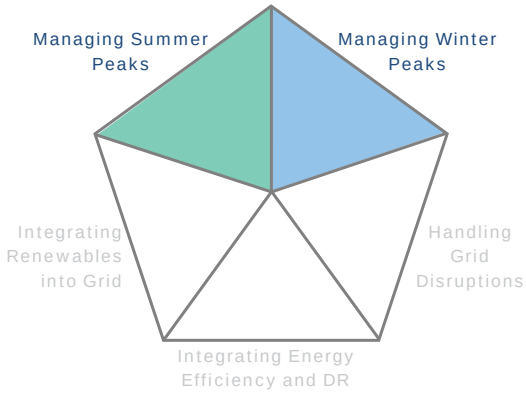
Peak Demand Reduction

[1]The ratio proposed is based on Salt River Project's EZ-3 pricing plan, http://www.srpnet.com/prices/home/ez3faq.aspx#1.

Key Regional Issues Addressed

This DR strategy can be used to help

- Manage summer peaks
- Manage winter peaks



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Pricing mechanism
Targeted Customer Segments	No limitations
Area/Locational Specifications	No limitations
Notification/Response Time Related to DR Events	Does not apply since this is a rate offering
Examples of Technology Components	▪ Existing metering system, with updates to the billing system to account for the new time-based nature of these rates ▪ In addition, automated demand response (Auto-DR) strategies could be deployed. Several studies have indicated that customer response to price signals is significantly enhanced through the implementation of enabling technology such as programmable communicating thermostats and Auto-DR strategies.
Developmental Status	In development; some utilities have tested Super Peak TOU rates in other regions of the nation

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Interruptible/Curtailable Option for Large C&I Customers

Objective of Pilot

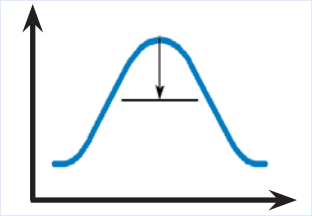
The objective of this pilot is to investigate the load reductions realized from eligible C&I customers during times demand response (DR) events triggered by system requirements are called. Typically, eligible customers would be large C&I customers with a maximum demand of greater than 200 kW. End-use customers could be notified of an upcoming DR event either on the day of the event or during the day before. For day-of events, the notification time would typically be greater than 30 minutes to provide sufficient time for customer response.

Demand Response Strategy

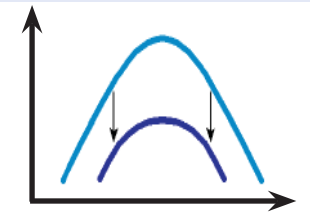
Integrated Load Management. In this option, customers would enter into contracts with the utility, agreeing to curtail load by a pre-specified amount (firm level) whenever a DR event is called. Customers would receive a fixed monthly capacity payment ($/kW) for agreeing to curtail their load at any time a DR event is called, plus an energy payment ($/kWh) for the amount of energy consumption reduced during an event. The fixed monthly payment could depend on the load commitment level.

Participants would need to commit to a minimum load curtailment amount. Participation in this program would be mandatory and a penalty would be applied for non-participation in an event when called, or for failing to reduce load by the contracted amount.

This strategy could readily integrate energy efficiency (EE) measures with a variety of load shedding methods to reduce peak demand.



Peak Demand Reduction

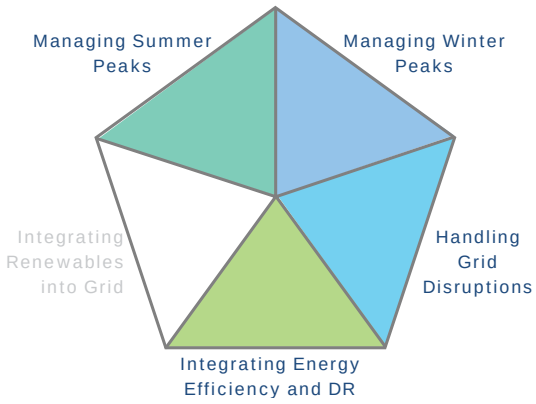


Energy Efficiency

Key Regional Issues Addressed

This DR strategy can be used to help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions
- Integrate EE and DR



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	C&I customers with loads greater than 200 kW
Area/Locational Specifications	No limitations
Notification/Response Time Related to DR Events	Day-ahead or day-of (30 minutes or more in advance)
Examples of Technology Components	▪ Interval meter required ▪ Enabling technology such as automated demand response (Auto-DR) can enhance customer response to DR events
Developmental Status	Established in various regions; there are several programs offered by utilities around the country (e.g., the Base Interruptible Program (BIP) in California)

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Demand/Capacity Bidding using Automated Demand Response with Load Aggregators

Objective of Pilot

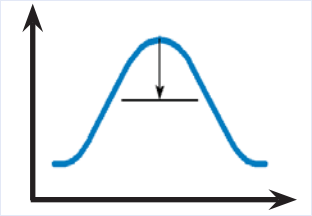
The objective of this pilot is to investigate the load reductions realized from eligible C&I customers during times demand response (DR) events triggered by system requirements are called. Typically, eligible customers would be large C&I customers with a maximum demand of greater than 200 kW. End-use customers could be notified of an upcoming DR event either on the day of the event or during the day before.

Demand Response Strategy

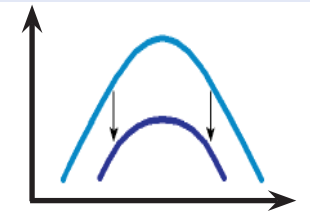
Integrated Load Management. In this option, the utility or the DR service provider would request load reduction bids from participants enrolled in the program anytime a DR event is called. All participants would be required to bid in a minimum amount of load reduction for a minimum specified duration, say two hours. The bid amount could vary every hour.

For day-ahead programs, participants could be notified of the bid acceptance on the same day as the bid is placed, which is a day before the event. For day-of programs, participants could be given an hour to submit bids after event notification. If a bid is accepted, participants would receive a payment proportional to the bid amount and the hourly market price of energy during the event duration period. This option could be managed by aggregator firms.

The focus of this strategy is peak demand reduction accomplished with a variety of load shedding methods, but it has the potential to integrate energy efficiency (EE) measures as well.



Peak Demand Reduction

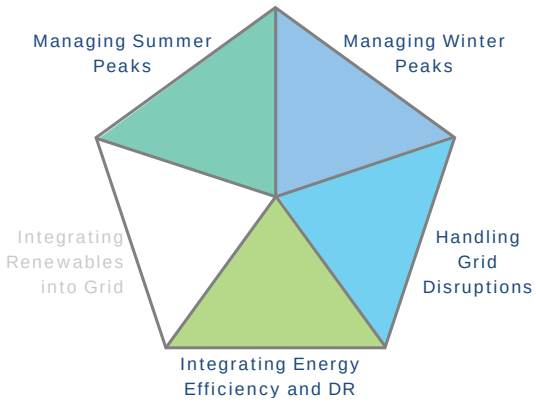


Energy Efficiency

Key Regional Issues Addressed

This DR strategy can be used to help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions
- Integrate EE and DR



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	C&I customers with loads greater than 200 kW
Area/Locational Specifications	No limitations
Notification/Response Time Related to DR Events	Day-ahead or day-of
Examples of Technology Components	▪ Interval meter required ▪ Enabling technology such as automated demand response (Auto-DR) can enhance customer response to DR events
Developmental Status	Established in various regions; several states offer programs (e.g., there is a Capacity Bidding program in California)

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Load Shifting with Pre-Cooling, Integrated with Load Reduction and Energy Efficiency Strategies

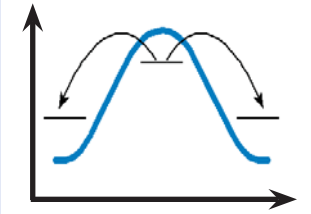
Objective of Pilot

The objective of this pilot is to demonstrate a combination of load shifting, demand response (DR), and energy efficiency methods. The combined strategy would yield temporary peak demand reductions, permanent load reductions, and energy savings. Customers that are likely to be good candidates include medium and large commercial establishments such as office buildings.

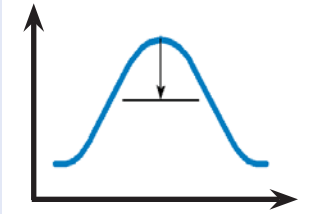
Demand Response Strategy

Integrated Load Management. The strategy integrates load shifting, peak demand reduction, and energy efficiency:

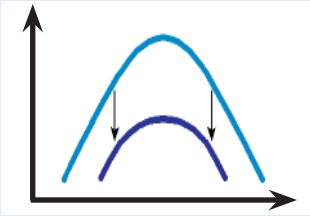
- Load shifting from peak to off-peak hours would be accomplished by pre-cooling buildings. It is possible to pre-cool buildings at night or in the morning during off-peak hours and then store the cooling in the building thermal mass in order to reduce demand during peak periods. Under this strategy, zone temperatures would be maintained at the lower end of the comfort range during the occupied hours before a peak period. The zone temperature would then be floated up to the high end of the comfort range during the peak period.
- Temporary peak demand reduction could be achieved by several methods such as preprogrammed HVAC (heating, ventilating, and air conditioning) controls, shut-down of lighting and other equipment, and turning off of plug loads in response to DR events
- Energy efficiency (EE) measures (e.g., efficient space conditioning equipment, lighting, motors) could also be incorporated to achieve permanent demand reductions



Load Shifting



Peak Demand Reduction

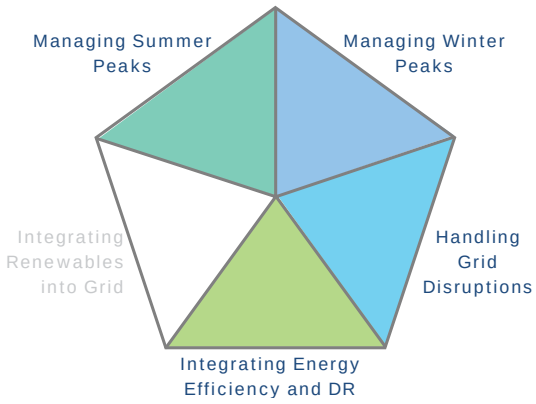


Energy Efficiency

Key Regional Issues Addressed

This DR strategy can be used to help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions
- Integrate EE and DR



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	Medium and large-sized commercial establishments such as office buildings
Area/Locational Specifications	No limitations
Notification/Response Time Related to DR Events	Day-ahead or day-of
Examples of Technology Components	▪ Energy management and control system ▪ Interval meter ▪ Advanced controls for end-use equipment such as lighting and HVAC
Developmental Status	Demonstration phase; has been successfully demonstrated in office buildings in California

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Automated Demand Response for Data Centers

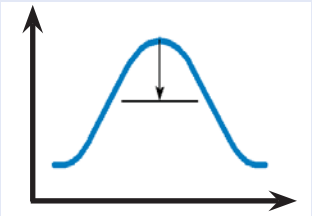
Objective of Pilot

The objective of this pilot is to demonstrate the feasibility of automated demand response (Auto-DR) strategies for data centers. Specific DR strategies would be needed for data centers due to their sophisticated controls of environmental conditions, high level of technology implementation, and users' technical knowledge. These characteristics make data centers' participation in DR unique, especially in implementing strategies for Auto-DR. The control strategies employed at data centers would depend on the type of controls present in the data center, especially the automation capabilities of the data center's energy management and control system (EMCS).

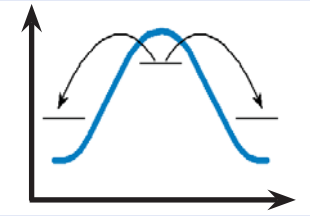
Demand Response Strategy

Integrated Load Management. The strategy integrates peak demand reduction and load shifting methods. The methods could be implemented at the IT department/infrastructure level or at the facility level. Examples of methods include the following:

- Tasks prioritization using software algorithms
- Server consolidation and virtualization
- Cooling set point increase
- Load shifting with backup reserves such as ice storage or chilled water storage



Peak Demand Reduction

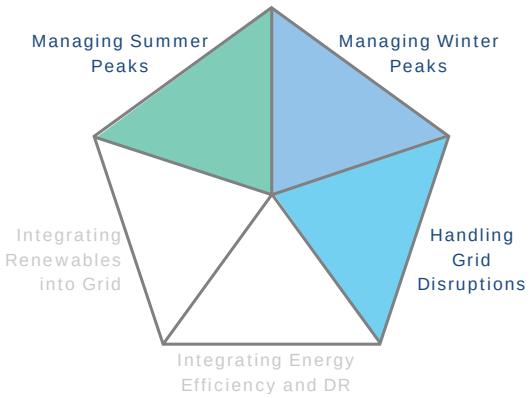


Load Shifting

Key Regional Issues Addressed

This DR strategy would primarily help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	Data centers
Area/Locational Specifications	No limitations
Notification/Response Time Related to DR Events	Day-ahead or day-of
Examples of Technology Components	Synchronization of data center software and EMCS with demand response automation server (DRAS)
Developmental Status	Demonstration phase; has been successfully demonstrated in Auto-DR program in California

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Chiller Replacement and Thermal Energy Storage

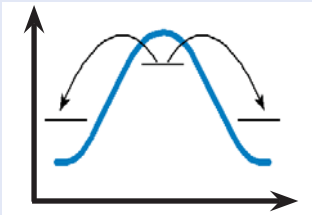
Objective of Pilot

The objective of this pilot is to demonstrate the load shifting potential of thermal energy storage (TES) and the water saving potential of air-cooled chillers. Specifically, it targets large commercial buildings that currently use water-cooled chillers. These chillers would be replaced with air-cooled chillers and TES systems to allow chiller loads to be shifted to off-peak hours. Though air-cooled chillers are less efficient than water-cooled chillers, this approach would reduce peak demand and build off-peak loads. The evening hours would also increase the efficiency of the air-cooled chillers because of the lower air temperatures relative to daytime operation.

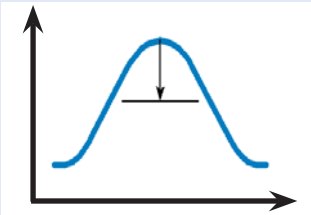
Demand Response Strategy

Integrated Load Management. The pilot concept integrates load shifting, peak demand reduction, and valley filling, while reducing water use:

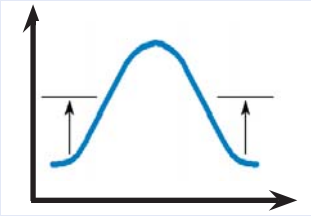
- Thermal energy storage allows for shifting of chiller loads from on- to off-peak periods, which in turn builds loads during the evening and early morning hours
- The magnitude of load shifting is dependent on the level of storage (e.g., full storage versus partial storage)
- Permanent peak demand reduction is realized if the chiller/TES system is designed for every-day use; event-based DR is also possible depending on the system configuration
- Replacing water-cooled chillers with air-cooled chillers reduces water requirements, which is advantageous for water-constrained regions



Load Shifting



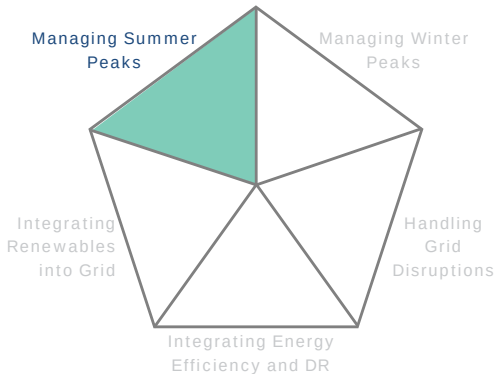
Peak Demand Reduction



Valley Filling

Key Regional Issues Addressed

This DR strategy is primarily designed to help address the regional issue of managing summer peaks



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	Large commercial customers with central chillers
Area/Locational Specifications	Most cost-effective in hot, water-constrained areas
Notification/Response Time Related to DR Events	Not applicable; it would most likely be used as a permanent strategy
Examples of Technology Components	▪ Air-cooled chiller ▪ TES system ▪ Controls
Developmental Status	Demonstration phase. Using TES to shift chiller loads to off-peak hours is a well-established concept. However, replacing water-cooled chillers with air-cooled chillers for the additional benefit of water savings is less proven and there is considerable room for greater adoption. [1]

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Off-peak load building
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs (water savings and peak demand reductions)
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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[1] Global assessed the energy and cost impacts of this type of project in the following report: *Comparison of Water-Cooled and Air-Cooled Chillers: Impacts of Thermal Energy Storage*, Global Energy Partners, LLC, Lafayette, CA: 2003. 1085-3-2-02.

Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Off-Peak Non-Road Electric Vehicle Charging

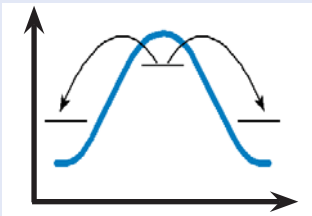
Objective of Pilot

The objective of this pilot is to shift loads associated with non-road vehicle charging to off-peak periods. Many commercial and industrial customers have non-road electric vehicles. Specific vehicles include forklifts, tow tractors, airport ground support, and golf carts. In this pilot, customers would be encouraged to install an energy management systems (EMS) and automatic load shifting controls to avoid on-peak vehicle charging. Depending on how the pilot is designed, it could result in permanent peak demand reductions, or it could simply yield reductions during capacity constrained months or peak days. This concept is not new, but there is still room for greater adoption.

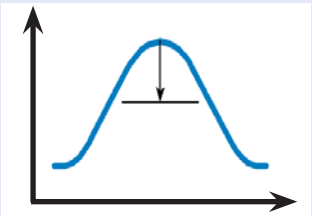
Demand Response Strategy

Integrated Load Management. The pilot concept integrates load shifting, peak demand reduction, and valley filling:

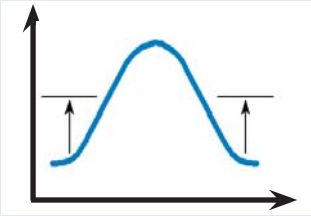
- Battery storage associated with the electric vehicles allows for shifting charging loads from on- to off-peak periods, which in turn builds loads during the evening and early morning hours
- The pilot would most likely be designed for event-based DR as a means to temporarily manage system constraints
- Permanent peak demand reductions could also be realized if the charging strategy was used on a regular basis



Load Shifting



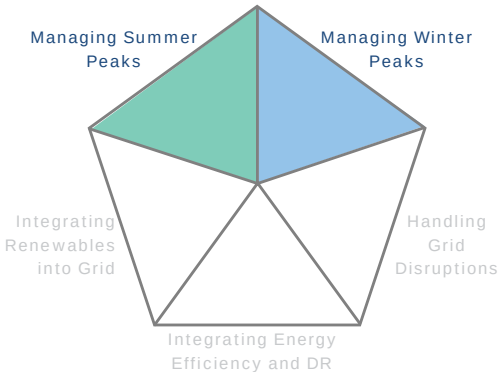
Peak Demand Reduction



Valley Filling

Key Regional Issues Addressed

This DR strategy is primarily designed to help address the regional issues of managing summer and winter peaks



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	Customers with non-road electric vehicles (e.g., airports, warehouses, manufacturing facilities, food processing, golf courses)
Area/Locational Specifications	No limitations
Notification/Response Time Related to DR Events	At least 24 hours so charging can occur the night before; however, this can also be a seasonal strategy (e.g., peak summer months) or a permanent strategy
Examples of Technology Components	Energy management system with automatic load shifting technology
Developmental Status	Established in some areas; successfully implemented by Southern California Edison between 2002 and 2004 in the Peak Load Reduction Program for Non-Road Electric Vehicles[1]

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Off-peak load building
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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[1] *Peak Load Reduction Program for Non-Road Electric Vehicles, Case Study, Electric Transportation Program*, EPRI, Palo Alto, CA: December 2004. 1008772.

Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Off-Peak Water Pumping to Gravity Storage

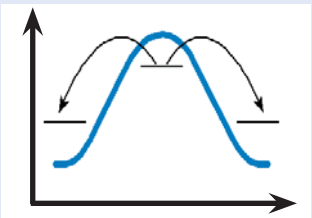
Objective of Pilot

The objective of this pilot is to shift electric pumping loads for municipal water utilities to off-peak periods through the use of elevated water storage and advanced pump scheduling controls. Pump scheduling with advanced controls is currently being used to some extent by water utilities. However, newer methods involving SCADA (Supervisory Control and Data Acquisition) are being developed to establish dynamic pump-scheduling processes to optimize the scheduling of pump run times. Water utilities are in an advantageous position to maximize pumping to storage during off-peak hours when energy rates are low and then draw on water in the storage tanks when energy rates are high.

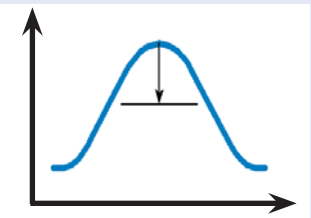
Demand Response Strategy

Integrated Load Management. The pilot concept integrates load shifting, peak demand reduction, valley filling, and energy efficiency:

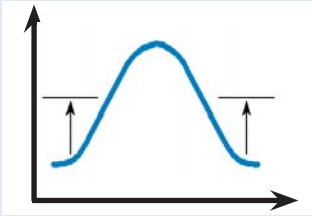
- Elevated water storage and advanced pump scheduling controls allow for shifting pumping loads from on- to off-peak periods, which in turn builds loads during the evening and early morning hours
- Permanent peak demand reduction is realized if off-peak pumping and storage occurs on a daily basis
- Depending on the system configuration, event-based DR is also possible if the notice is sufficient
- Energy efficiency measures such as high efficiency pump/motor systems and variable frequency drives (VFDs) can also be integrated to deliver permanent demand reductions and energy savings



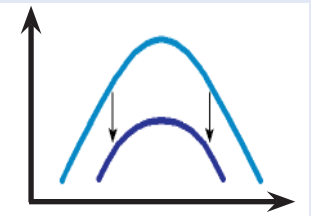
Load Shifting



Peak Demand Reduction



Valley Filling

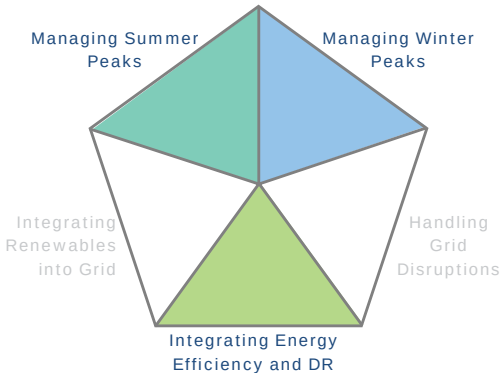


Energy Efficiency

Key Regional Issues Addressed

This DR strategy is primarily designed to help

- Manage summer peaks
- Manage winter peaks
- Integrate EE and DR



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	Municipal water districts
Area/Locational Specifications	Locations with gravity water storage
Notification/Response Time Related to DR Events	At least 24 hours so pumping can occur the night before; however, this can also be a seasonal strategy (e.g., peak summer months) or a permanent strategy
Examples of Technology Components	Energy management and control system for pump scheduling, such as SCADA system
Developmental Status	Established in some areas, but room for greater adoption; Humboldt Bay Municipal Water District has made considerable gains in shifting pumping loads to off-peak electric demand periods. [1] As of 2005, the district increased off-peak energy use to 94%.

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Off-peak load building
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness
- Improved water management

Contacts

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[1] Carol Rische, Blaine Reely, *Humboldt Bay Municipal Water District Demand Response Study*, Presentation, ACWA Energy Committee, May 2008.

Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

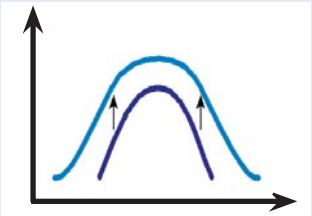
Water Pumping for Reducing the Variability of Renewable Generation

Objective of Pilot

The objective of this pilot is to demonstrate the feasibility of integrating renewable energy resources into the power system with the help of municipal water pumping and storage systems. Municipal water utilities that currently pump to elevated storage during off-peak periods could absorb extra renewable power (generated by themselves or others) whenever it is available by turning on their pumps and pumping to storage, as long as there is sufficient water storage capacity. This would provide useful work and would in effect reduce the amount of pumping that had to be done the following evening. It would also provide an avenue for addressing the variability of renewable generation.

Demand Response Strategy

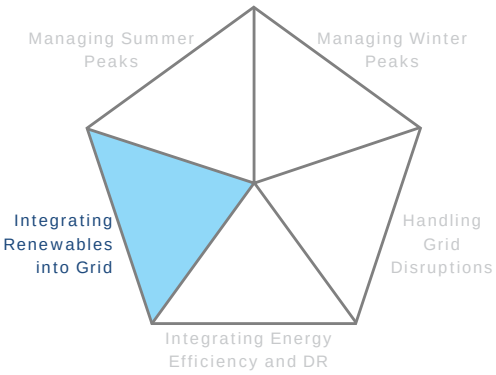
Renewable Energy Integration. The concept for this pilot is essentially the opposite of the conventional concept of DR; instead of reducing loads during capacity shortfalls, it calls for increasing loads during times of excess renewable capacity. It can be considered a "strategic load growth" alternative since it grows loads only when the capacity is available.



Strategic Load Growth

Key Regional Issues Addressed

This DR strategy is primarily designed to help integrate renewables into the grid



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Renewable energy integration
Targeted Customer Segments	Municipal water districts
Area/Locational Specifications	Locations with gravity water storage; locations in the wind corridor would be especially applicable
Notification/Response Time Related to DR Events	As immediate as technically viable so that available power can be used effectively
Examples of Technology Components	Some type of control system to turn on pumps when there is an excess of renewable generation
Developmental Status	This is a new idea being conceptually explored by Global and EPRI.[1]

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Off-peak load building, in some cases
- Leveraging of renewable resources
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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[1] *Integration of Photovoltaics with Water Storage Systems,* White Paper, Global Energy Partners, Walnut Creek, CA and EPRI, Palo Alto, CA: in progress.

Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

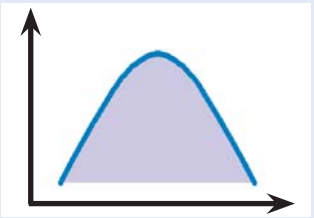
Renewable Energy-Powered Pumped Water Storage for Electric Energy Storage

Objective of Pilot

The objective of this pilot is to demonstrate the feasibility of using renewable energy to pump water to elevated storage tanks for the purpose of energy storage. This could include dedicated elevated storage tanks and receivers that would enable water to flow as needed to generate power during capacity constrained periods; thus the stored water would act as a "miniature" pumped hydroelectric power system. Alternatively, it could integrate with the existing water storage infrastructure and a portion of the storage could be for energy storage while the remainder is used in the traditional water storage manner for meeting consumer water demand. However, in the second scenario, the available capacity for energy storage would be limited by the water flow rates dictated by water consumers.

Demand Response Strategy

Renewable Energy Integration. The strategy involves utilizing renewable energy (e.g., wind or solar resources) when available for pumping finished water to elevated storage tanks or reservoirs for the purpose of electric energy storage. The stored energy would then be used to generate power during periods of capacity constraints in the electricity infrastructure. The load shape effects of this strategy can be best described as "flexible load shape." In the context of this pilot this means that though the load does not necessarily change, there is greater flexibility in the resources called upon to meet the load.

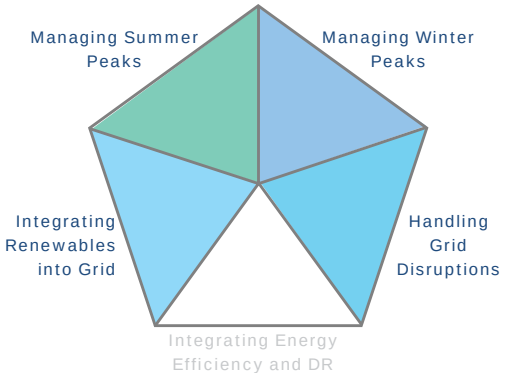


Flexible Load Shape

Key Regional Issues Addressed

This DR strategy is primarily designed to help

- Manage summer peaks
- Manage winter peaks
- Handle grid disruptions
- Integrate renewables into the grid



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Renewable energy integration
Targeted Customer Segments	Municipal water districts
Area/Locational Specifications	Locations with gravity water storage; locations in the wind corridor would be especially applicable
Notification/Response Time Related to DR Events	As immediate as technically viable so that 1) available renewable power can be used effectively for pumping to storage, and 2) capacity constraints can be met quickly with stored energy
Examples of Technology Components	▪ Dedicated elevated storage capacity ▪ Water-to-wire turbine system ▪ Some type of control system to turn on pumps when renewable generation is available ▪ Controls to switch on turbine to generate electricity during capacity constrained periods
Developmental Status	This is a new idea being conceptually explored by Global and EPRI.[1]

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Off-peak load building, in some cases
- Leveraging of renewable resources
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Renewable Energy-Assisted Municipal Water Pumping and Building Water Systems

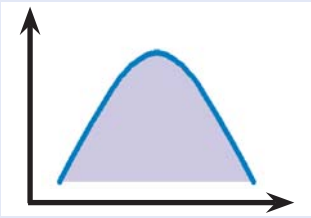
Objective of Pilot

The objective of this pilot is to demonstrate the feasibility of using an off-grid dedicated renewable-powered water pump to supplement utility grid energy for pumping water in municipal distribution systems and in high-rise buildings. In this type of system, a small pump would be powered with its own dedicated motor drive unit by renewable power systems such as solar photovoltaics (PV) or small wind units while the pumping station's main motor would continue to be powered using conventional utility sources. The presence of water storage would increase the flexibility of pumping, making it relatively easy for water utilities to incorporate the variability of off-grid renewables. When coupled with water storage, off-grid renewables could find a special application in remote, hard-to-reach areas as a back-up energy source for the water utility during power disruptions. An off-grid PV system would offer more flexibility than a wind generator, but either type of system could be applied.

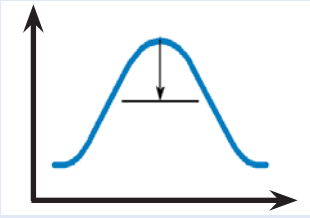
Demand Response Strategy

Renewable Energy Integration (Off-Grid). The strategy involves utilizing off-grid renewable energy (e.g., wind or solar resources) when available for supplementing grid energy for water pumping and distribution and/or for elevated water storage. Depending on the storage capacity and system configuration, a portion of the stored energy in elevated water storage tanks could also be used to generate electricity during power disruptions in the electricity infrastructure.

The load shape effects of this strategy can be best described as "flexible load shape." In the context of this pilot this means that though the load does not necessarily change, there is greater flexibility in the resources called upon to meet the load. In addition, since off-grid renewables assist in providing power, there is an effective peak demand reduction on grid-tied resources.



Flexible Load Shape

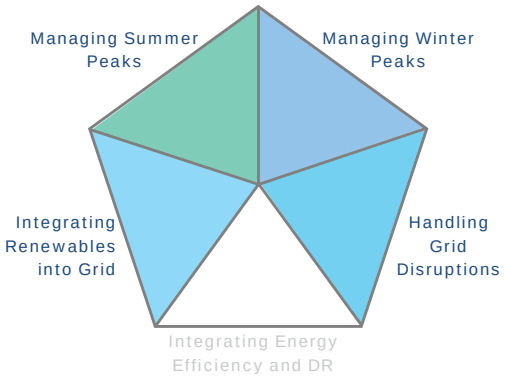


Peak Demand Reduction

Key Regional Issues Addressed

This DR strategy is primarily designed to help

- Manage summer peaks
- Manage winter peaks
- Handle grid disruptions
- Integrate renewables into the grid



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Renewable energy integration (off-grid)
Targeted Customer Segments	Municipal water districts; high-rise buildings that pump to rooftop storage tanks
Area/Locational Specifications	Locations with gravity water storage; locations in the wind corridor might be especially applicable; cities with high-rise buildings with rooftop storage units
Notification/Response Time Related to DR Events	If stored energy is used to meet capacity constraints, notification should be as immediate as technically viable
Examples of Technology Components	▪ Off-grid renewable energy system (PV, wind turbine) ▪ Separate motor drive and supplemental pump ▪ Interface to drive pump directly with renewable resources ▪ Water-to-wire turbine system ▪ Controls to switch on turbine to generate electricity during capacity constrained periods
Developmental Status	This is a new idea being conceptually explored by Global and EPRI.[1] In addition, EPRI is currently developing an interface device for PV-integrated VFDs, which will directly supply DC power from the PV panel to the VFD.[2]

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Leveraging of renewable resources
- Environmental stewardship

Customer benefits include

- Lower operating costs/financial incentives
- Technology innovation
- Improved reliability
- Degree of grid-independence
- Environmental conscientiousness

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[1] *Integration of Photovoltaics with Water Storage Systems,* White Paper, Global Energy Partners, Walnut Creek, CA and EPRI, Palo Alto, CA: in progress.
[2] *Enhancing Grid-Connected PV Systems with Advanced Interface Device,* White Paper, EPRI, Palo Alto, CA: July 2008.

Commercial & Industrial Demand Response Pilot Projects

Pilot Idea

Load Aggregation by Utility

Objective of Pilot

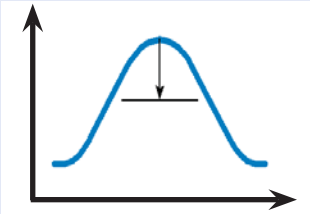
The objective of this pilot is to investigate the load reductions achieved through an aggregator program. The utility itself would act as an aggregator of customer loads and would deliver load reductions during times demand response (DR) events were called. End-use customers could be notified of an upcoming DR event either on the day of the event or during the day before.

Demand Response Strategy

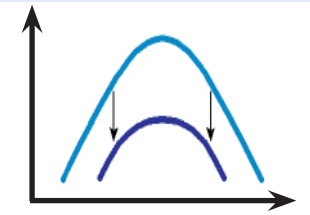
Integrated Load Management. In this option, the utility would request load reduction bids from participants enrolled in the program any time a DR event is called. All participants would be required to bid in a minimum amount of load reduction for a minimum specified duration, say 2 hours. The bid amount could vary every hour.

For day-ahead programs, participants could be notified of the bid acceptance on the same day as the bid is placed, which is a day before the event. For day-of programs, participants could be given an hour to submit bids after event notification. If a bid is accepted, participants would receive a payment proportional to the bid amount and the hourly market price of energy during the event duration period.

The focus of this strategy is peak demand reduction accomplished with a variety of load shedding methods, but it has the potential to integrate energy efficiency (EE) measures as well.



Peak Demand Reduction

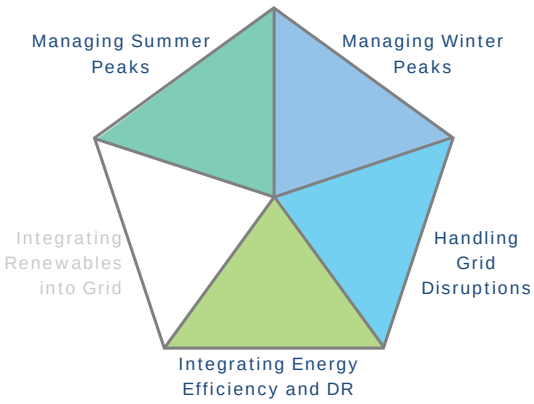


Energy Efficiency

Key Regional Issues Addressed

This DR strategy can be used to help

- Manage summer peaks
- Manage winter peaks
- Handle grid limitations or disruptions
- Integrate EE and DR



Summary of Pilot Idea Characteristics

Pilot Idea Characteristics	Description
DR Strategy	Integrated load management
Targeted Customer Segments	C&I customers with interval data recorder (IDR) and Internet access
Area/Locational Specifications	No limitations
Notification/Response Time Related to DR Events	Day-ahead or day-of
Examples of Technology Components	▪ Inteval meter ▪ Enabling technology such as automated demand response (Auto-DR) can enhance customer response to DR events
Developmental Status	Load aggregation by third party aggregators is already established in some regions, but load aggregation by the utility itself is still in the developmental stage

Utility and Customer Benefits

Utility benefits include

- Lower costs to provide electricity
- Increased system reliability
- Environmental stewardship

Customer benefits include

- Lower operating costs
- Technology innovation
- Financial incentives
- Improved reliability
- Environmental conscientiousness

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Appendix B – Stakeholder Meeting Details

Stakeholder meeting locations, LiveMeeting links and dial-number

- 6/23 Meeting :

  Portland: 10-noon

  Global Northwest Office

  625 SW Stark Street, 3rd Floor

  Portland, OR 97204

  Dial In #877-278-8304 pin 3992

  Participant URL-
  https://www.livemeeting.com/cc/eventbuilderpro/join?id=P2ZCHZ&role=attend&pw=B%40FDf%5D7

- 7/20 Meeting:

  Seattle: July 20, 10 AM – noon

  Seattle City Light

  901 5th Ave, 5th Floor, Seattle, 98164

  Dial In #877-278-8304 pin 3992

  Participant URL
  https://www.livemeeting.com/cc/eventbuilderpro/join?id=637RP4&role=attend&pw=B%40FDf%5D7

- 8/10 Meeting:

  Spokane: August 10, 10 AM – noon

  Inland Power and Light

  10110 W. Hallett Rd., Training Room, Spokane, 99224

  Dial In #877-278-8304 pin 3992

  Participant URL
  https://www.livemeeting.com/cc/eventbuilderpro/join?id=QS4475&role=attend&pw=B%40FDf%5D7

- 8/18 Q&A Conference Call: 10-noon

  Dial In #877-278-8304 pin 3992

Appendix C – Proposed Budget Template

There is no prescribed format for submitting the application budget; however, the following categories and columns are required as a minimum. Please consider costs incurred across the envisioned stages of the proposed pilot, e.g. design, marketing, training, installation, test, on-going project management, data collection, and support. It may be necessary to add additional cost categories. In the column titled proposed "BPA Cost Share (%)," please indicate the percentage of the total costs you propose BPA to fund. The Proposed BPA Costs column should be a factor of Total Project Costs ($) and the Proposed BPA Cost Share (%). It is BPA's expectation that applicant's personnel costs (A), fringe benefits (B), and indirect costs (H) will be fully absorbed by the applicant. Please use the accompanying Budget Justification Narrative Template to provide supporting information on each budget category, and how the budget was calculated.

Cost Category	Total Project Costs ($)	Proposed BPA Cost Share (%)	Proposed BPA Costs ($)
A. Personnel			
B. Fringe Benefits			
C. Travel			
D. Equipment			
E. Supplies (non-durable goods)			
F. Contractual Services			
G. Evaluation, Measurement, and Verification (EM&V)			
H. Other Direct Costs (permits as applicable, marketing materials, and other direct costs not noted elsewhere)			
Total Direct Costs			
I. Indirect Costs (e.g. administrative costs/overhead)			
Total Indirect Costs			
Total Costs			

Appendix D – Budget Justification Narrative Template

Provide information that supports the high level budget numbers by cost category, e.g., key line items in each cost category. For example, under "Equipment," identify types of equipment, number of units, and cost per unit. Under contracted services, identify type of service and vendor if known. The narrative should address any relevant information and assumptions used in developing the proposed budget.

A. Personnel

<content here>

B. Fringe Benefits

<content here>

C. Travel

<content here>

D. Equipment

<content here>

E. Supplies

<content here>

F. Contractual Services

<content here>

G. Evaluation, Measurement, and Verification (EM&V)

<content here>

H. Other Direct Costs

<content here>

I. Indirect Costs

<content here>