DEMAND RESPONSE RESEARCH CENTER SCOPING STUDY ROUNDTABLE DRAFT REPORT

APPENDIX D.

Recommended Research Target Areas

SCOPING STUDY ROUNDTABLE – RESEARCH TARGET AREAS

(Draft – Subject to Revision and Approval)

Establishing the Value of Demand Response:
Develop an Integrated Efficiency / Demand Response Framework

<u>Introduction:</u>

The value of demand response (DR) can be established by two separate and distinct factors: (1) the benchmarks or metrics against which DR is compared and (2) the methodology employed to combine these metrics into a decision-oriented, actionable value.

The value of DR in California and elsewhere is currently determined by a Standard Practice Methodology (SPM) originally developed in the late 1970's and early 1980's[1]. The SPM was originally designed to establish a generation equivalence for DR, not to evaluate DR in its entirety. Then and now, DR value is pegged to a present value analysis using the unit cost of a gas-fired peaking plant to assign value to the expected kilowatt (kW) load impacts, regardless of the supply needs of the particular utility service area.

There is general consensus that neither the present value analysis methodology nor the peaking unit proxy properly capture or reflect the appropriate DR value. The SPM falls short on both the benchmarks and the methodology used to value DR. The SPM only addresses static quantifiable utility costs and benefits. Customer, environmental, societal, risk, opportunity and other difficult to quantify costs and benefits are excluded entirely.

Consequently, there is a need to establish a new, more comprehensive definition of DR and a more inclusive DR valuation methodology. Conceptually, there is recognition that DR can represent a range of customer actions that increase in responsiveness (magnitude of curtailment or sacrifice of service) with real or perceived increases in price or loss of service. Figure 1 depicts this conceptual range of customer response as five distinct sets of actions or impacts from a customer perspective. The adjoining "Valuing DR" column highlights how each level of response reflects a different valuation component, something the SPM does not capture.

A revised, more comprehensive DR valuation model must address several concerns, including:

1. Should DR value be evaluated and continue to reflect a utility supply-oriented perspective or should it also account for a broad envelop of quantifiable and qualitative customer and system wide costs and benefits?
2. Does DR exist as a population of independent reliability and price responsive programs or are DR actions part of a hierarchy of customer actions that actually link energy efficiency and DR response in a value continuum?

[1] Citation forthcoming.

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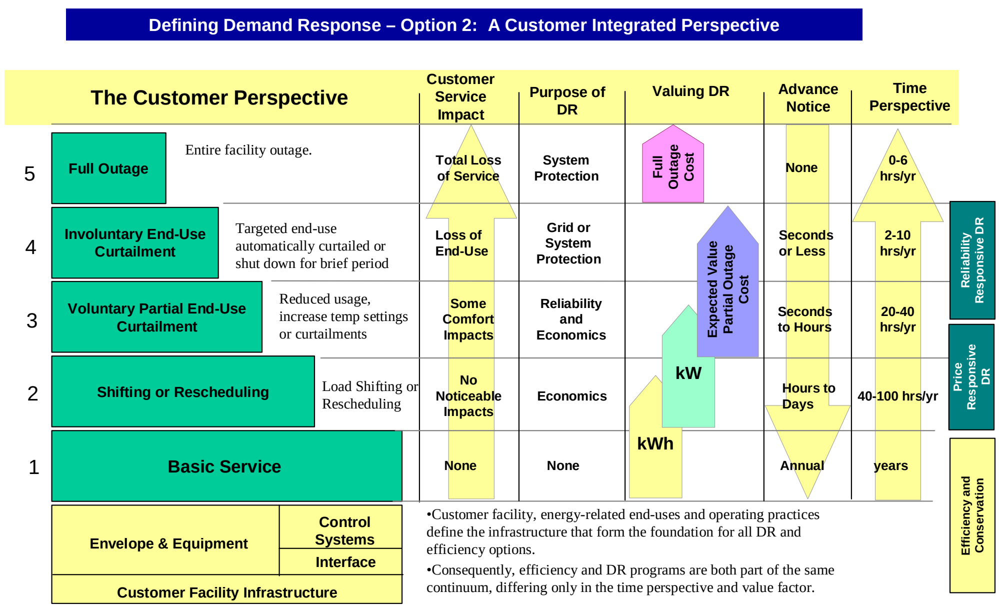
3. What form of analytical model or set of models can be used to properly capture the quantitative and qualitative metrics that comprise DR value?

Figure 1. Conceptual Framework for Establishing Demand Response Value



Project Objectives:

Conduct one or more projects to establish a more comprehensive DR conceptual valuation framework and analytical methodology. The projects should address each of the following:

- How can a DR valuation method consider the hierarchy of customer actions that link energy efficiency, frequent time-of-use, and less frequent DR response in a value continuum as a demand side response strategy and a demand side resource? How can the value to the customer, to the utility, to the ISO, and to society be best expressed?
- How do you define DR? To what extent have recent advances such as appliance efficiency standards, improved digital controls, changes in consumer rights, the internet and other factors created a need to reexamine the basic definition of DR and the relevance of existing SPM methodologies and assumptions?
- What purpose should a DR evaluation methodology fulfill? Is the purpose to compare alternatives on a common basis, measure the relative efficiency of various alternatives, construct an optimum resource plan – or some other combination? Given a clearly defined purpose, how can results be interpreted and what are the limitations?

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- Establish a revised DR analytical framework for various DR stakeholders that identifies impacts of DR and how should they be valued? Any methodology must address two basic factors: (1) all material impacts must be identified and then (2) each of the impacts must be monitized or valued so that options can be compared on a common basis. The framework must address each of the following:
    - Short-term and long-term impacts –Are load and energy (kW and kWh) impacts reported by utilities short-term observations or are they sustainable in the long-term? How can persistence of savings be measured and quantified?
    - Quantitative and qualitative impacts – In addition to load and energy impacts, DR can provide customers with bill management opportunities, additional information services, and create system wide environmental impacts. Are these impacts significant? Is so, how can they be measured or monitized? Consider service and amenity level, duration and frequency of shed, and reliability versus price responsive programs.
    - Risk and Opportunity Costs –DR infrastructure can provide utilities with operating flexibility to adapt to rapidly changing market conditions. How much of this investment is needed? What is the value of the opportunity cost from not investing in DR? How can this value be captured with a business case methodology?
    - Utility versus Customer Infrastructure Ownership - DR program designs generally assume that the utility owns and operates the meters, communication and control equipment. What are the profit versus cost, operational, benefit/cost and other tradeoffs between utility, third-party and customer ownership? How can a methodology be designed to systematically examine these impacts in a DR evaluation? What methodologies can best support DR valuation and integration into current resource plans? What methodologies are used today? Design a DR value interview for the California ISO, IOUs, municipal utilities, and western market resource planners to evaluated current methodologies.
- Examine the implications of the obligation to serve and how it is potentially impacted by DR technology and a more comprehensive DR evaluation framework.

<u>Potential Products</u>:

- Research Reports
- Analytical Models
- Policy Recommendations

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Technology and Program Development and Assessment

Introduction:

Demand response (DR) is in a dynamic state of development and change. Advances in communication and control technologies, consumer electronics, utility research programs and regulatory activity at both the state and federal levels as well as international developments continually introduce potentially beneficial DR opportunities. This target area has two main themes. First is assessment of the feasibility and applicability of specific technologies and programs for use in California. Second is a systematic review of general DR technologies and programs around the US and abroad for applicability in California. Unlike more focused original research, applied research, demonstration projects and field trials don't often get put into proper context or disseminated to a broad audience. As a result, there is little knowledge advancement, some duplication of effort and little appreciation for what can and can't be done.

To maintain both the relevance and value of its research agenda, there is a need to continually balance conventional research with monitoring and evaluation of market developments in a variety of technical, regulatory and behavioral areas. Specific target areas of interest include:

- Hardware developments in advanced metering, controllable thermostats, customer information displays and lighting and building control systems.
- Information system developments in building automation and customer energy analysis tools and
- Regulatory initiatives in rate design, building and appliance standards, DR evaluation, pricing policy and marketing.

One of the key research issues is system integration and related information systems. In order to provide comfortable and energy efficient indoor environments that minimize peak demand, a building should continuously adapt its operation in response to climate and internal activities. This requires innovative, adaptable systems such as ventilation systems that are responsive to occupancy loads and outdoor air quality. Lighting systems whose output varies with daylight availability, occupancy, and task requirements are needed. Emerging electro-chromic windows manage solar load and glare to minimize summer peak cooling loads and maximize the use of daylight to replace overhead electric light. Significant research is needed to develop HVAC control strategies and systems that are demand responsive and can optimally control thermal loads, maintain indoor environmental health, and ensure productivity. Supervisory control strategies such as pre-cooling and temperature resets need to be evaluated for practical application in buildings. Functional test methods for DR strategies are needed to help ensure that new control strategies operate as intended, providing robust electric demand reduction with minimal loss of HVAC services. To accomplish this, future whole-building energy analysis tools and information systems are needed to continuously re-optimize operations based on dynamically varying needs.

Project Objectives:

Activities in this research area will carefully target selected DR technology, projects, programs, and DR activities in California and elsewhere. Project abstracts, summaries, case studies or more complete evaluations will be completed based on both the potential significance of the activity and compatibility with DR Center research agenda. Activity summaries may also include more narrowly focused case studies, workshops, briefing sessions and joint ventures with other research organizations, utilities, vendors or business entities. All of the activities in this area will emphasize the timely collection and dissemination of information to a variety of California specific audiences, including the CEC, CPUC, municipal and investor-owned utilities, business associations and others as the need or opportunity arises.

Potential Products:

- Research Reports
- DRRC Stakeholder workshops
- Quarterly Newsletter Updates

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Demand Response Simulation and Policy Planning Model

Introduction:

Demand response (DR) is perceived by many practitioners as narrowly defined programs targeted at specific customer and end-use targets. The Scoping Study Roundtable sessions and several recent California regulatory proceedings in procurement and pricing in fact confirm that DR is often quite the opposite. DR is complex, with subtle but significant policy, load, system operating and customer impacts throughout the utility system value chain. It is difficult, to track of all of the implications that arise from DR programs, rate designs, and policy directions.

One solution to address this complexity is to develop the capability to systematically capture and model conceptual scenarios that incorporate a variety of DR options and impacts. Simulation models can map potential policy, load, cost, customer and benefit impacts across prototypical system topography. Templates can be created to then capture both the individual and interactive effects of various policies and/or program design choices. In an inverse approach, simulation models can be structured to suggest, rate or just rank order program design options necessary to achieve a particular policy objective.

Unlike conventional system expansion or resource planning models, what is being suggested for this research area is a broad based simulation that can support a variety of different user groups and interests, specifically:

- Utilities – Provide capability to model potential load, cost and benefit impacts for a specific inventory of DR options. The model should provide capability to track potential load impacts from typical the customer site, throughout the distribution system up to the generation level while also providing information on a variety of program design elements.
- Regulators – Provide the capability to model various pricing policy and rate design options, with corresponding information on potential resource, customer billing and utility revenue impacts.
- Customers – Provide capability to model pricing and bill impacts as well as potential reliability impacts.

The eventual purpose is to develop and demonstrate in real time, potential benefits of DR and the impacts of various policy, marketing choices. A corollary benefit will be the creation of explicit inventories of policy, planning, and value attributes that program planners and decision makers can use to guide future development and evaluation activities. Not only could a model of this design assist in the development of DR policies and programs, various modules of the model could eventually be extended and independently expanded to provide follow-up planning and evaluation functions.

Project Objectives:

Evaluate the capabilities of current resource planning models used by the state, utilities, and consulting firms. Determine how a DR model could be built from existing systems. Develop a DR policy and real-time program design simulator and planning model that:

- Provides a scenario-based approach, with different user (utility, customer, regulatory) perspectives, fixed and customizable conventional DR and program / pricing options.
- Establishes the hierarchical DR impacts at distribution, feeder, substation and higher levels within a typical utility system.
- Examines voluntary versus mandated DR options, that addresses potential utility system, customer equity, cost, and other impacts from (a) smart appliances capable of responding to price signals, self-healing network options, ect. (b) conventional vs. mandated default participation.
- Customer Perspective – model customer response again relative to conventional vs. dynamic pricing with - curtailment, shifting and appliance replacement

Potential Products:

- Reports
- Computer models.

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Creating a 21st Century Vision of Demand Response

Introduction:

Present day versions of demand response (DR) began in the late 1970's as a series of voluntary rates and programs focused almost exclusively on load curtailment. Curtailable/interruptible rates provided Commercial and industrial (C/I) customers with rate discounts in exchange for agreements to curtail a percentage of their peak load. Air conditioner and water heater load control programs provided residential and small C/I customers with participation incentives and free equipment to automatically allow the utility to curtail their peak period appliance loads. In the last five years, utilities and wholesale providers have introduced limited real-time pricing, demand bidding, and several other related options.

However, there are incomplete and inconsistent visions of what DR is and what it can do. DR is still dominated by voluntary options, mutually exclusive programs, and participation payments unrelated to customer performance and marketing efforts that repeatedly target small segments of the largest C/I customers. For the most part, curtailable/interruptible rate and load control options have changed little over the last 30 years. Rate design, billing and end-use controls have failed to evolve or keep pace with changes in technology, business process requirements or customer service needs. Utility and regulatory communities are now engaged in arguments on several fronts that threaten to further constrain the development of effective, long-term DR strategies, for example.

- To some, DR is separated into distinct reliability and price responsive components. Others consider DR a continuum of customer responsive actions that embody both price responsiveness and reliability.
- Some view DR as separate voluntary program options to be developed and marketed only in critical times. An alternative view depicts DR as a condition of service for all customers that is available, when needed to quickly respond to a variety of system conditions.
- Finally, some consider DR a utility tool for controlling capacity, while others consider DR a customer tool for controlling their own energy costs?

How these arguments are resolved will substantially impact both the design and success of DR. How each of these 'definitions' or 'perceptions' of DR progress will also determine the corresponding evaluation and planning methodologies.

Project Objectives:

Conduct a comprehensive conceptual and technical review of DR strengths and weaknesses from a utility, regulatory and customer perspective and develop comprehensive scenarios to depict

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how DR technology, policy and changes in operating practices might create a new vision of 'customer electric and gas service' in the 21st century. Specifically, this research area should attempt to address each of the following:

- Examine and redefine how 21st Century electronics, communication and control technologies might/should redefine the role of DR and the basic customer service concepts embodied in the obligation to serve.
- Create an inventory of customer service and DR attributes that can be used to establish a value proposition for DR.
- Create a range of scenarios to depict utility, customer and regulatory perspectives that in turn can be used to demonstrate DR applications.
- Use the range of scenarios to identify potential opportunities, research needs, policy issues, legal/legislative (state and federal) problems and areas that are impacted and need to be resolved to realize a new vision of DR. At a minimum, the following issues must be addressed:
    - Are DR reliability and price responsive capabilities mutually exclusive, separate and distinct options or are they compatible responses differentiated only by how and when customers respond?
    - Should DR become a condition of service for all customers or should it be maintained as a voluntary option targeted only at a few select groups of customers?
    - What role do building and appliance standards play in the development of effective DR options? Should control continue to be retrofitted into targeted building systems and appliances or would it be more effective to design control circuitry into the appliance electronics?
- How can DR be incorporated into utility dispatch, outage management and other system management practices? How might these applications impact DR valuation, resource planning, rate design, regulatory and legislative policy, technology options, customer service expectations and other utility system and business practices?

<u>Potential Products:</u>

- Reports
- Computer models.

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Incentives and Rate Design for Efficiency and Demand Response

Introduction:

Rate designs are a mechanism for pricing energy to the customer and correspondingly for collecting the revenue due to the utility. DR incentives provide a corollary function by inciting customers to change energy usage patterns and behavior that in turn lower total system costs for all customers.

Early demand response incentives were developed in the 1950's to encourage the use of more electricity. Declining block rates rewarded customers by providing lower unit costs the more electricity they consumed, which at the time reflected the declining costs and economies of scale arising from the implementation of large central generating stations. The incentives to consume more were included in a rate that was easy to understand. These incentive rates were effective in accomplishing their objective.

In the mid to late 1970's the demand response objectives changed from load building to targeted peak load reduction. However, at the same time utilities separated DR incentives from the rate, preferring instead to pay for participation rather than tie the incentive to actual customer performance. There were practical reasons for this approach. Incorporating DR incentives into new programs that were not widely accepted or proven could be costly, requiring revised rate designs regulatory proceedings and public hearings. Performance based rates would also necessitate advanced metering and communication systems, which were expensive.

These original reasons for integrating rates and DR incentives are now a major cause for concern, specifically:

- Separate DR incentives create equity issues by rewarding customers regardless of their peak load contributions and build in annual utility incentive expense, whether the program is used or not. While participation incentives may have some value in short-term pilots, it is not clear that they provide an effective long-term or lower cost option than performance based incentives.
- Default inverted tier and TOU rates are mistakenly perceived as 'conservation oriented'.
- Rates no longer have any relationship to actual energy costs or system conditions, because they do not reflect either the time-varying fluctuations in utility resource costs nor do they reflect reliability impacts of localized congestion in the distribution system.
- Rates have become too complex for any customer to understand[2]

[2] Residential Customer Understanding of Electricity Usage and Billing, Momentum Market Intelligence, California Energy Commission and California Public Utility Commission Working Group 3 Report, January 29, 2004, p16.

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- Rates have been increasingly engineered to preserve and stabilize the utility revenue requirement, which in turn penalizes and creates a disincentive for customer demand response.

As a result, there are two fundamental problems with existing rate and incentive options that this research areas intends to address:

1. Examination of the impacts of existing rates and incentive. There is much misunderstanding regarding existing rate design and the impacts on customer usage in general and DR in particular. For example, there is a general perception that the current inverted tier rates actually encourage conservation and investment in efficiency better than other time-of-use or dynamic critical peak pricing rate options. Results from the recently completed Statewide Pricing Project show the exact opposite .
2. Development of new, innovative and more equitable rate and incentive designs. There are fundamental conceptual and regulatory problems with existing rate design practices that perpetuate these problems. For example, one principal of rate design is the maintenance of revenue neutrality. Under this principal, savings that result from demand reductions or conservation by one group of customers within a class are collected from all remaining customers in that class – maintaining revenue neutrality. Unfortunately, this approach not only limits the actual savings and incentives available to customers it just shifts revenues and creates two classes of customers – winners and loser. There is no reason why all customers in a class can't be winners.

Project Objectives

Objective 1: Examination of the impacts of existing rates and incentive.

- Identify incentive/rate forms used to support energy efficiency and DR and provide examples from existing research and/or targeted evaluations to examine the actual customer bill, utility and DR impacts.
- Identify alternative incentives and rate forms to support DR and energy efficiency as well as the potential costs and benefits, policy, procedural and development needs and opportunities with each alternative.
- Summarize customer, utility, and societal issues linked to current rate and incentive designs. Address related issues including but not limited to utility revenue requirements, principles of welfare economics, reliability, total costs (environmental) and other factors.

Objective 2: Development of new, innovative and more equitable rate and incentive designs.

- Develop conceptual frameworks for rate designs to support the integration of energy efficiency and DR. Address key issues including fixed versus floating revenue requirement and rates designed to stabilize utility profit. Also address customer simplicity and billing needs / requirements. Provide case studies and/or simulations to illustrate tradeoffs and impacts.

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- Identify the policy, equity and other implementation issues associated with preferred rate design options.

Potential Products:

- Research Report
- Handbook of rate design options.

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Building and Appliance Standards to Support Demand Response

Introduction:

Demand response (DR) options for most residential and small commercial and industrial customers, are structured as direct control or pricing options that are often linked with a control switch or controllable thermostat. Control switches or controllable thermostats can provide a way for the customer to pre-program and automate their response. Conversely, control switches provide utilities with more certain load reduction and emergency load shedding capability.

Almost all control switches are designed as retrofits to existing appliances. For water heaters and pool pumps, controllable time clocks perform this function. For air conditioners, this is accomplished by wiring a control relay into the HVAC thermostat.

Retrofits are expensive to install, usually requiring a licensed electrician and building permit. Retrofits also create potential warranty problems with appliance manufacturers.

An alternative to retrofits is to design the load management and or price response capability into the circuitry of target classes of building systems and appliances. Building control circuitry into the new building systems and existing appliance control panels could reduce all component, installation and service costs, improve cost effectiveness, eliminate many standalone device reliability problems and create opportunities for expansion of DR and system reliability options.

Project Objectives:

Identify how DR can be accommodated in building and appliance standards.[3]

- Identify and inventory opportunities for incorporating DR in both existing and new building and appliance standards for residential and commercial buildings. For example, develop pre-defined building low power modes as a default requirement incorporated into construction and commissioning, with the controls and communication equipment necessary to support emergency response. Both lighting and HVAC loads should be considered.
- Create preliminary technical engineering design profiles for the most promising of each building and appliance option. Options should consider alternatives to existing commercially available or conventional approaches. For example, instead of or in addition to supplemental timers for water heaters, incorporate time clock functions into the default water heater controls and instead of dispatchable /controllable thermostats, incorporate sensing and other functions in the native control circuitry for the appliance.

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[3] This proposed research target area should be coordinated with the current PIER Buildings Program project concerning building codes and standards led by Southern California Edison.

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- o Identify demonstrations, economic and engineering research and collaborative industry projects necessary to go forward. Analysis issues should include firsts costs, operating costs, and life-cycle costs, peak savings by building type and climate, technology performance under current and potential future DR programs.

Potential Products:

- Research Reports

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Customer Information Needs and User Interface Requirements

Introduction:

Customer access to information is essential to support improved energy efficiency and DR educational and operating practices. Industry practice today relies on generalized bill stuffers for mass-market customers and expensive web-based systems for larger commercial and industrial customers. Detailed usage data is not readily accessible, not easily customizable and is not provided in either the form or with timeliness to effect usage decisions.

Customer information needs exist on at least three fundamental levels:

1. Baseline and/or historical information – necessary to educate the customer regarding how they use energy
2. Performance based information – necessary to provide customers with timely feedback regarding how their changes in applications and operating practices are working and
3. Notification information – to alert or provide customers with information regarding impending emergency or exception conditions.

The form, content and delivery requirements differ for each type of information. While behavioral research in consumer goods, education, and other fields reinforce the need and value of information to support behavioral change, there has been little research to examine either the value of information or how information should be presented to the consumer.

Important issues regarding residential customers include determining the format and information content of various demand response signals including both price and demand response reliability or emergency program elements. Better understanding of information needs for various market segments and demographic groups, such as education level, income level, geographic location, and house size, is needed to improve the relevancy of information and user interface design. What are effective ways to communicate the advantages and consequences to residential customers of demand response? How can customer education support demand response programs? Similar business-oriented market behavioral issues exist in evaluating information needs for commercial and industrial customers. Again the format and information content of various DR signals should be evaluated within the context of commercial and industrial operations. Facility managers have a more sophisticated cost-benefit perspective to evaluate potential technology investments to improve demand response capability, which needs to be considered in information needs and user interface design for large facilities. Facility engineers need better information systems and tools to understand their demand response objectives within the context of current energy management principles. How, for example, can a building operator know if they are doing a good job in managing electric loads to meet new demand response objectives? What training and education is needed to support demand response programs?

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For all sectors there is also a need to ensure clear messaging that combines energy efficiency and demand response concepts.

Project Objectives:

- Survey current utility and comparable industry practices to identify potential impacts, costs and benefits.
- Identify potential information sets and the accompanying attributes to support each classification of customer information need.
- Identify the potential value functions within each set to provide a basis for allowing customers to evaluate 'willingness to pay' to receive and use information.
- Evaluate utility energy information systems in relation to customer developed and managed energy information systems.
- Identify data models for capturing and delivering each type of information set. Develop new metrics to improve quantification of DR objectives and operating performance of a home, building, or industrial facility.
- Finally complete a survey within the utility and other related industries of information interfaces and devices appropriate for commercial and industrial and residential customers, suitable for supporting the notification function. Identify functional requirements to support a low cost, mass market type of device and
- Identify potential case studies, demonstration projects and other research opportunities

Potential Products:

- Research Report
- Recommendations regarding product design and demand response program information systems

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Customer Education Resource Library

Introduction:

Over the last 30 years substantial numbers of customers have successfully participated in and responded to a variety of demand response (DR) program options. Customer response often includes process, equipment and behavioral changes that might be transferable to other similar types of customers. While some of this knowledge has been periodically captured in case studies, handbooks and other guides, there is no central repository or easily accessible resource that customers or others can access to guide future activities.

Establishing a resource pool of past customer case studies can provide valuable benefits in several areas, specifically:

- Provide customers, DR implementers and planners with easily accessible information to guide the implementation of new DR options
- Provide DR implementers and planners with fundamental information necessary to strengthen the design and operation of future DR options
- Provide vendors, manufacturers and equipment suppliers with information for refining and developing more responsive DR products and services
- Provide baseline information for identifying research projects to address potential program design and other problems.

A Web-based library of standardized case studies could be developed to examine and support a variety of customer and building types. The initial efforts should first identify any other like efforts previously undertaken within the industry. Prototypical and narrowly focused efforts using existing material could be used to better examine and refine for the design and value of a potential application. Similar interests by research organizations, state commissions and other user organizations nationally should also be examined.

Project Objectives:

Provide a reference source for customers and utilities to address implementation successes and barriers. Link the case studies to rate evaluation, facility modeling, and cost effectiveness tools to support implementation. Case studies should feed development of ongoing research needs in all areas. Projects could be supported by consultants, utilities, customers, etc. anyone with experience / worthwhile material.

Potential Products:

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Research Areas / Project Description		Demand Response Research Center - Research Target Areas			
		Program, Policies and Tariffs	Information Management	Utility Markets, Technologies and Systems	Consumer and Institutional Behavior
1	**Establishing the Value of Demand Response: Develop an Integrated Efficiency / Demand Response Framework**	▪ Market Assessment ▪ Measurement and Evaluation ▪ Policies	▪ Energy Analysis Tools	▪ Markets and Pricing	▪ Information Needs
2	**Technology and Program Development and Assessment**	▪ Program Development ▪ Societal Issues	▪ Information Management	▪ Control Systems and Technology ▪ Interaction of DR and Utility Communication	▪ Information Needs
3	**Demand Response Simulation and Policy Planning Model**	▪ Policies ▪ Program Development	▪ Energy Analysis Tools	▪ Grid Reliability	▪
4	**Creating a 21st Century Vision of Demand Response**	▪ Market Assessment	▪ Information Management	▪ Markets and Pricing	▪ Incentives ▪ Information Needs
5	**Incentives and Rate Design for Efficiency and Demand Response**	▪ Tariffs ▪ Policies	▪ Energy Analysis Tools	▪ Markets and Pricing ▪ Interaction of DR and Utility Communication	▪ Incentives ▪ Information Needs
6	**Building and Appliance Standards to Support Demand Response**	▪ Standards	▪ Information Management	▪ Grid Reliability ▪ Control Systems and Technology	▪
7	**Customer Information Needs and User Interface Requirements**	▪ Policies ▪ Program Development	▪ Energy Analysis Tools	▪ System-wide Information & Control ▪ Interaction of DR and Utility Communication	▪ Incentives ▪ Information Needs
8	**Consumer Education Resource Library**	▪ Program Development	▪ Information Management	▪	▪

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