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## **DEMAND RESPONSE RESEARCH CENTER SCOPING STUDY ROUNDTABLE DRAFT REPORT<sup>1</sup>**

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The PIER Demand Response Research Center (Center) was established in spring 2004 by the California Energy Commission (CEC) to conduct research that advances the near-term adoption of Demand Response (DR) technologies, policies, programs, strategies and practices. To attain this objective, the Center will focus on five tasks:

1. Create a roadmap to guide California DR research
2. Establish multi-institutional partnerships
3. Pursue outreach efforts to foster connections with customer, vendors, utility and other stakeholders
4. Sustain long-term attention to DR research
5. Conduct research, development, demonstrations and technology transfer.

In September 2004, the Center initiated activities to develop its first demand response research plan (Task 1). To gain the broadest perspective on current DR issues the Center structured a series of two Roundtable sessions, one with local and national experts recruited from multi-disciplinary scientific, research and other fields of study. The second workshop focused exclusively on DR related cross-departmental representatives from within the CEC. The report that follows summarizes the results of the roundtable process and presents the initial observations and a draft research roadmap, which will be incorporated into the Center research plan.

There are 4 appendices that accompany this main report:

Appendix A – Initial Issues Briefing Package presented to the Roundtable Participants

Appendix B – Participants list

Appendix C – Summary of Participant Homework Responses

Appendix D - Recommended Research Target Areas

### **INTRODUCTION**

Although utilities and other providers have been offering DR program and pricing options for over 30 years there is still little consensus regarding how to define, value or evaluate DR. To develop a research plan capable of resolving this uncertainty, the Center developed an expert panel approach. There were two elements to this approach: (1) a Center developed briefing package Issues Paper (Appendix A) that summarized the key

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<sup>1</sup> DRRC Deliverable 2.2.d

issues and major research questions and (2) two facilitated ‘roundtable’ sessions that would bring together the most experienced national DR experts and CEC staff (Appendix B) to discuss and offer guidance for resolving and prioritizing the issues. The product of these roundtable sessions would not only provide a way to quickly summarize the value of the past 30 years of industry activity, it would also provide an unprecedented opportunity to identify and target the most valuable and most productive research directions.

### DR Roundtable Briefing Package

Each roundtable participant received a briefing package that included a copy of the Demand Response Research Center Plan, a Scoping Study Issues Paper and a homework assignment (Appendix C) reflecting the objectives of the roundtable that asked each participant to respond to three questions:

1. What is the single most significant barrier limiting the potential of DR?
2. What three areas of research would you pursue to advance DR?
3. What is your long-run vision of DR?

The Scoping Study Issues Paper identified six fundamental issues (Table 1) that frame both the conceptual and practical problems facing DR. Designed to both guide and focus discussion, each issue attempted to identify a range of perspectives reflecting in many cases rather contrarian views of DR. The issues were further split into two basic categories. Two baseline issues addressed how DR is defined and assumptions regarding the market model, customers and overall role of DR in a utility system. Four remaining initiative specific issues addressed assumptions regarding DR policies, valuation, technology and customer behavior.

Table 1. Framing the Demand Response Research Issues

The Issue		Description
Baseline	<b>Defining Demand Response</b>	Demand Response can be defined from a customer or utility system perspective. Each perspective embodies a different set of problems and opportunities.
	<b>Market Model</b>	There are two fundamental market models that can be used to deliver DR products and services. The 'push' or typical regulated model seeks out participants for narrowly defined, mutually exclusive programs. The 'pull' or competitive model incents customers to seek out options tailored to their specific needs.
Initiative Specific	<b>Policies and Standards</b>	What are the priorities and expectations for DR? Policies establish priorities among competing options. Standards establish measurable or comparable expectations between existing and future visions. There are no state or federal policies or standards to guide DR.
	<b>Valuing Demand Response</b>	DR options are usually subject to cost effectiveness tests that value expected load and energy impacts. Are the value benchmarks for DR correct? Are they appropriate? How can difficult to quantify customer, environmental and societal costs and benefits be captured?
	<b>Technology and Operations</b>	What is the role of DR technology – to support utility or customer operating needs? Are energy efficiency and DR initiatives compatible? Should they integrated or maintained as separate options?
	<b>Customer Interface</b>	What role does information and the customer interface play in the effectiveness of efficiency and DR options? What types of information and what standards should be addressed?

#### Roundtable Panels – National DR Experts

On December 2<sup>nd</sup> and 3<sup>rd</sup>, 2004, the Center held a facilitated one and one-half day scoping study roundtable meeting at the Pacific Energy Center in San Francisco. While the roundtable's primary focus was on California needs, there was clear recognition that many of California's demand response problems and issues are universal within North America and other parts of the world.

Scoping study participants represented a broad range of occupations and perspectives. Participants were recruited because of their proven expertise in a variety of DR fields and their active involvement within the industry. The professional affiliations of the 25 participants are described in the following graphic and table (Figure 1).

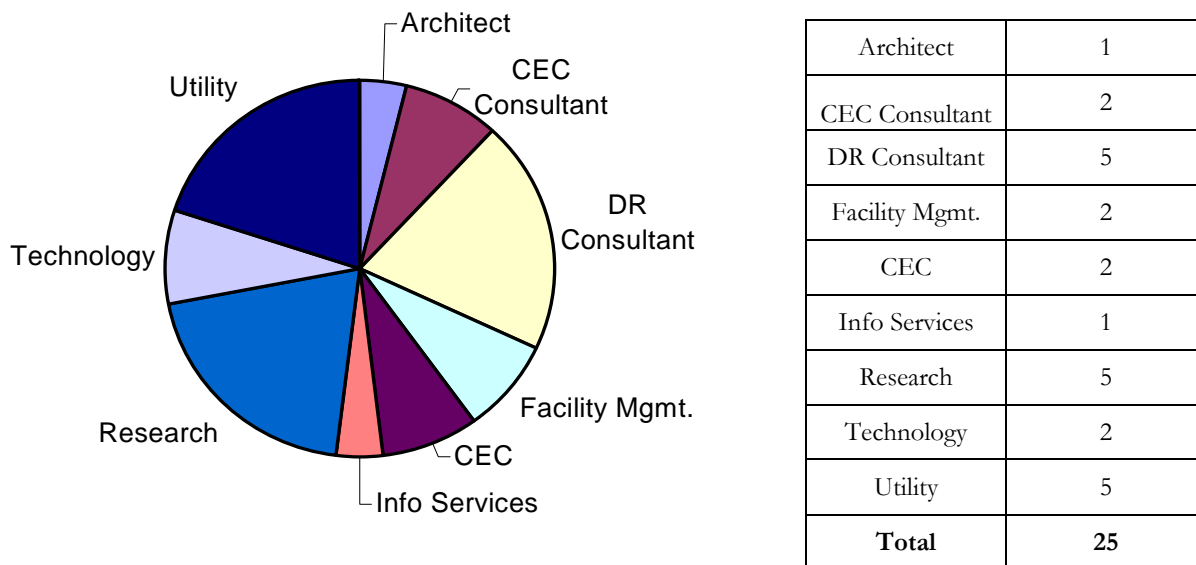


Figure 1. Expert Panel Profile – National DR Experts

#### Roundtable Panel – CEC DR Experts

On December 17<sup>th</sup>, 2004 the Center held a second half-day scoping study roundtable meeting at the California Energy Commission in Sacramento. Twelve individuals representing policy, program evaluation, pricing, building and appliance standards, and DR research participated in an open format discussion of the same issues reviewed with the expert panel.

Both roundtable sessions encouraged open discussion. The national expert session provided a professional facilitator and a format that shifted back and forth between small breakouts and discussions involving the entire group.

#### **Roundtable Summary Observations**

While the roundtable discussions and homework assignments produced some diverse opinions, there was a surprising consensus between both the expert and CEC panels regarding the DR barriers and long-run vision.

#### Challenges and Barriers to Advancing DR

Table 2 summarizes the most significant perceived challengers or barriers to DR. Overall, there was an agreement that customers are generally confused by and don't fully understand DR. Constantly changing programs, uncertain and inconsistent incentives and the lack of a firm technological foundation fail to create a solid value proposition. The statements in Table 2 represent individual participant points-of-view. While they may

influence potential Center research directions, they cannot and should not be interpreted as a consensus shared all members of the group.

Table 2. Key Challenges to Advancing Demand Response

Demand Response Area	Key Challenges to Advancing DR / Barriers
<ul style="list-style-type: none"> <li>Jointly Understood Terminology</li> </ul>	<ul style="list-style-type: none"> <li>Customer trust and understanding is lacking due to uncertain, constantly changing DR programs</li> <li>Customer generally do not understand their own energy use or energy pricing, as a consequence there is a high barrier to curtail or shift load</li> <li>Lack of customer engagement – there is little sense of urgency and little feedback regarding the value of DR – education needed.</li> </ul>
Value	<ul style="list-style-type: none"> <li>DR is generally undervalued - need to identify all value components along the supply chain and fully value DR</li> <li>DR has a weak value proposition because customers are unable to visualize the link between what they pay, what they get and reliability.</li> </ul>
Pricing	<ul style="list-style-type: none"> <li>A high priority should be to get the DR tariffs right</li> <li>Legislative efforts to cap pricing and protect various customer groups (California AB1X) add to both the uncertainty and confusion.</li> <li>Independent, inconsistent pricing creates a credibility gap between social resources value and value to customers</li> <li>There is a lack of strong price signals to reinforce the need for DR</li> </ul>
Political	<ul style="list-style-type: none"> <li>There is a lack of understanding at advocacy and political levels regarding DR valuation, pricing, technology and customer needs.</li> </ul>
Delivery / Marketing	<ul style="list-style-type: none"> <li>The regulatory and competitive market processes result in fragmented programs and gaps between planning for long term resources and DR.</li> </ul>
Technology	<ul style="list-style-type: none"> <li>There is a need for proven technological solutions to operating problems.</li> <li>Poor quality installation and commissioning of control in buildings undermines DR effectiveness and continuity.</li> <li>There are few ubiquitous applications of advanced metering</li> <li>There is little integration of the signaling, notification and customer information technologies necessary to support the DR infrastructure.</li> <li>There are too few enabling DR technologies.</li> </ul>

### A Vision for DR in California

Almost universally, roundtable participants believed that DR is an undervalued, essential resource that should play a critical and fundamental role within the utility industry. There is a consistent view that better pricing linked to market fluctuations, advanced metering and better customer access to information should all combine to improve the value function for DR. As a result, DR should provide ways to reduce utility resource costs and improve overall system reliability. For the customer, DR is expected to provide

ways to reduce customer energy bills, increase the penetration of efficiency options and also improve system reliability.

Although both the expert and CEC panels were in general agreement that DR can provide customers with better control over their energy costs, the CEC expressed an even stronger opinion with its view that DR should be mandated by state policy within a default pricing and rate structure and become a condition of service for all customers. Using default pricing and rate structures to support DR, which is the existing model for energy efficiency, would expand the potential for DR, provide more consistent and equitable value and integrate DR and efficiency capital decisions. The value of DR could be extended even further by including control functions in building and appliance standards and modifying utility outage management plans to include mandated control over certain end-uses during system emergencies. Exceptionally strong customer support, and better than expected demand reduction from the recently completed CEC two-year residential and small commercial pricing pilot strongly contribute to this position. Additionally, the CEC believes that the advanced metering and information technologies necessary to support their expanded vision of DR will create many additional synergistic benefits in utility operations, customer service and overall utility system performance. Demand response is an important element for providing least cost energy services to California.

#### DR Research and Development Priorities.

Several major themes emerged from the collective group discussions on California DR research needs. Topics addressed valuation, evaluation, technology, information needs and customer education. However, one topic stood out as a clear priority for all participants – establishing the value of DR.

Participants believe that DR is generally misunderstood and substantially undervalued. For example, is DR air conditioner load control or does it include a wider range of customer actions that may go beyond simple curtailment and a reduction in service? Can DR also be integrated with energy efficiency through changes in appliance and building standards that build the capability to shift or defer load without adversely impacting customer service? More fundamentally, what is the relationship between customer price response and customer reliability response relative to the role of DR?

More significantly, while standard practice evaluation methodologies for energy efficiency programs are in widespread use by regulators and utility planners, whole classes of DR benefits such as are systematically excluded from consideration. Existing evaluation models assign no value to customer, environmental or system wide service improvements that do not change the utility revenue requirement. DR valuation is usually driven almost exclusively by utility costs rather than the value customers assign or derive from their service. Which valuation methods should be used to guide DR policy and program designs?

Because of both the definitional and valuation uncertainties, the roundtable participants believe there is a pressing need to establish a more robust framework to value DR as a system resource.

Within this discussion, it became clear that there is a difference between how to value DR and how to evaluate DR. Assigning a value to DR is a critical necessity for program and system resource planning and evaluation purposes. However, valuation by itself is also necessary to guide basic policy and process design decisions, independent of any specific DR evaluation. For example, there may not be a definitive or single answer for determining how much DR is enough for any given utility system. System weather, population and economic conditions are in a constant state of change. DR may be a more practical and economically efficient way to accommodate this change than with conventional hard system resources. While a range estimate of DR potential is essential for system planning purposes, the answer to this question may be better left to the development of policies and processes that build in a self-balancing equilibrium, where DR increases during times of need and decreases or lays dormant when there is no need. Valuation of DR will be key to this development.

The panel participants raised several other major research needs, including:

- There is a need to understand the impact of different program design and tariff characteristics on DR participation rates, load response, and cost effectiveness.
- There is a need to understand the role that new enabling technology can provide for both homeowners and commercial building operators.
- There is need to better understand what information should be provided to customers and how that information should be provided to ensure they are aware of both the opportunities and consequences of DR actions and behavior on their service and energy costs.
- There is a need for better, more accessible DR cases studies, technical guides and other resources to support customer implementation, planning and program development. Resources may also include planning, investment, rate analysis and other modeling tools.

### **Scoping Study – Recommended DR Research Target Areas**

The objective of the Scoping study is to identify prospective research areas that can advance near-term DR in California. Following the two roundtable sessions, the DR Center worked with a select group of advisors to identify a target set of eight research areas. The eight target areas map information from the background research underlying the Issues Paper (Appendix A) with results from the roundtable discussions and participant homework. Table 3 provides an index and brief description of each research target. Appendix D provides a more detailed description of the problems and objectives that comprise each target areas.

Each of the research targets is purposefully defined to represent a broad topical area, which will then be redefined into one or more linked projects. In some cases individual objectives within a research target will translate into individual research projects. In other cases, a research project will include one or more of the target objectives.

Table 3. Scoping Study Recommended DR Research Target Areas

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 21 <sup>st</sup> 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		

**Note:**

Each Research Target will include an outreach or additional research task. This task will make sure that other relevant or similar research projects being conducted by other organizations throughout the US are identified and recognized or accounted for in the project deliverables.



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