DEMAND RESPONSE RESEARCH CENTER SCOPING STUDY ROUNDTABLE DRAFT REPORT

APPENDIX C.

SUMMARY OF PARTICIPANT HOMEWORK RESPONSES

Preparing for the Roundtable Session

(HOMEWORK ASSIGNMENT)

The PIER Demand Response Research Center (DRRC) was established by the California Energy Commission to conduct research that advances the near-term adoption of Demand Response technologies, policies, programs, strategies and practices. While the DRRC focus is on California needs, there is clear recognition that many of California's demand response problems and issues are universal within North America and other parts of the world.

The Roundtable sessions scheduled for December 2nd and 3rd will bring together the foremost demand response practitioners and experts from throughout the United States. The Roundtable sessions have been structured to encourage open discussion that takes advantage of your knowledge, experience and insight to identify research that will guide us in achieving demand response opportunities.

As a preliminary exercise to the actual Roundtable sessions, we would like you to review and provide a very brief response to the questions that follow. Responses from all of the Roundtable participants will be summarized and used to guide one portion of the agenda.

1. What is the single most significant problem or barrier preventing demand response from achieving its potential?

2. If funding and resources were not a problem, what three areas of research or projects would you pursue to advance the implementation of demand response?

   (1) ..
   (2) ..
   (3) ..

3. What is your vision of demand response. In other words, how significant should it be within the utility industry, how might it impact resource planning, system operations, customer choice, costs and customer service?

ROUNDTABLE PARTICIPANT RESPONSE

1. What is the single most significant problem or barrier preventing demand response from achieving its potential?

	Participant Response	Key Words / Key Topics
1	The inclusion of demand response into long term resource planning models puts demand response at an automatic disadvantage to other resource alternatives such supply. Until DR can be incorporated into long term resource planning on a level playing field it will always be viewed as an ancillary service which is severely discounted in long term planning. The other advantage of DR, which we do not adequately recognize, is the risk management benefit. DR is a natural hedge against transmission problems, loss of supply, weather related outages, fuel source availability and price volatility. (Malme)	❑ Include in long-term resource planning ❑ Value DR risk management benefits
2	The AB 1X 130% of baseline allowance rate cap is the most significant barrier preventing price demand response rate structures for retail residential customers. The State will never realize the full benefits of price demand response if the AB 1X baseline allowance is not modified or eliminated. (Fong)	❑ AB1X baseline limits price responsive DR
3	❑ (In CA) Lack of consistent and meaningful price signals and resulting low overall economic benefit to customers and ❑ Lack of cost-effective, DR-enabling technology and institutional capacity to utilitize the technology that is available. (Ruffo)	❑ Price signals mask economic benefits ❑ Valuing benefits to the customer ❑ Cost effective technology
4	The single most significant barrier to DR at present is that customers do not see participation as a top priority, or a strategic imperative. Underlying this are several conditions: (Kinert) 1. Low market price for supply and a perceived lack of eminent shortages -- customers do not have a sense of urgency regarding the need for DR from a market price perspective and the connection price-based programs have with reliability is not always easily recognized. 2. DR is near the beginning of its product life cycle – it isn't yet institutionalized like energy efficiency. 3. The industry's ability to evaluate opportunities and provide new technology to enable participation is just developing.	❑ Customer don't see need to participate
5	Buildings are THE largest demand response resource currently untapped. The biggest barrier for large and small building owners/operators is a lack of tools to: (Kintner) 1. assess the time-varying and mostly temperature-dependent resource availability 2. automate load management strategies to execute them according to the resource availability	❑ Lack of tools to assess DR opportunity ❑ Inability to automate response

ROUNDTABLE PARTICIPANT RESPONSE		
1. What is the single most significant problem or barrier preventing demand response from achieving its potential?		
	Participant Response	**Key Words / Key Topics**
6	Cost. To make DR widespread and universal, a communications infrastructure, advanced meters, smart DR-enabled appliance/devices, and back-end information systems must be built or produced. Technology for al of the above is available today, but it is not economical (or politically and societal) acceptable today or even in the near future. (Yee)	❑ Cost to provide metering, communication, information systems and controls
7	Pricing – Prices that do not provide appropriate incentives/credits/benefits to customers that are able to shift or curtail demand when electric prices are high, i.e., the characteristic of "flexibility" in customers' energy use is not accorded value in many pricing schemes. This customer characteristic is valued in other competitive industries. (Violette)	❑ Price signals mask economic benefits ❑ Price signals don't value DR risk management benefits
8	Market Structure -- Bifurcation of benefits such that no one entity has the incentive to seek the level investment in DR that is appropriate to attain market-wide benefits. (Violette)	❑ DR benefits split between utility and customer masks investment opportunity / need
9	Planning Methods -- Methods in resource planning/adequacy studies that do not appropriately value the benefits of DR in developing plans for future resource acquisition. (Violette)	❑ DR value not reflected in resource planning methods
10	Customer Education and Innovative Technology – A recent survey of large customers in California indicated that the majority of customers did not believe that they could shift or curtail loads (while the question did not reference any specific DR programs, these replies likely take into account the context of currently offered DR programs). However, additional analyses of these data showed that the subgroup of customers that understood the electric market (with its daily and hourly variation in electricity prices), and had technology that assisted in load shifting were much more likely to participate in DR programs. As a result one barrier could be characterized as the current customer understanding of markets and technology in the context of current DR offers. (Violette)	❑ Customer understanding of electric price and DR enabling technologies
11	For the IAW End User Community it is having the DR impact information, relevant decision tools and other items necessary to make a good business case to participate in a future DR program or Tariff. (Gravely)	❑ Business case to establish the economic value of DR
12	At the residential and small-commercial scale, it seems to me that energy conservation and crisis response should be both served by a continuum of real-time-pricing, and that owner/occupants should be able to respond to the price changes easily and flexibly through intelligent automated 'thermostat' systems. Neither of these exist at present.	❑

ROUNDTABLE PARTICIPANT RESPONSE		
2. What three areas of research, key research questions, or types of projects would you pursue to advance the knowledge of demand response?		
	Participant Response	**Key Words / Key Topics**
1	Methodology to value DR portfolio in long term resource planning[1] (Malme)	Valuing DR in resource planning
2	Methodology and technology infrastructure to allow for multiple buyers of demand response resources. ie how do we get the wholesale market to develop DR products? [2](Malme)	DR products for wholesale markets
3	Interconnectivity and operability of upstream (wholesale) and downstream (retail) systems. ie interoperability of utility and market operator systems with building controls and DG systems. [3] (Malme)	Interoperability of wholesale and retail utility systems with customer systems
4	Relationship between price demand response, reliability and wholesale price. Valuation of the reliability component of demand response and whether the retail critical peak price should or does capture the reliability value of demand response. [1] (Fong)	Valuing DR in resource planning
5	Effective demand response programs for small commercial customers. Small customer segmentation analysis and price elasticities. [2] (Fong)	Program designs for small commercial customers
6	Cost effectiveness of various demand response programs. [3] (Fong)	DR program cost effectiveness
7	Demand response programs and long-term price elasticity impacts. [4] (Fong)	DR long-term price elasticity impacts
8	Improved methods and industry agreement on how to value DR and translate that value into customer benefits [1] (Ruffo)	Valuing DR in resource planning
9	Developing cost-effective DR automation technology to reduce the time and hassle associated with manual DR actions. Related to this is improved understanding of what types of technical support customers need and would use to increase their DR capability (customers in our research tend to downplay their need for help but clearly show limited ability to develop comprehensive and effective DR implementation plans). [2] (Ruffo)	Cost effective DR automation technology
10	More defensible and statistically-reliable estimates of DR potential as a function of program prices and characteristics [3] (Ruffo)	❑ DR program cost effectiveness ❑ DR long-term price elasticity impacts
11	If I could throw in a fourth it would be improved methods of estimating baselines and program impacts for very large customers with highly variable loads [4] (Ruffo)	DR baseline / program impacts for large customers.

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2. What three areas of research, key research questions, or types of projects would you pursue to advance the knowledge of demand response?		
	Participant Response	**Key Words / Key Topics**
12	Help to create higher value for the customer through Integrated DSM [1] (Kinert) 1. Identify and evaluate opportunities for integrating demand response, energy efficiency and other DSM elements, with an eye toward opportunities for achieving multiple benefit streams from individual investments. 2. Conduct Integrated DSM demonstration projects to showcase emerging technologies for demand response, operating in conjunction with other DSM elements.	Valuing DR and Energy Efficiency integration
13	Develop and provide technical, operational and financial assessment tools to assist customers with analysis and evaluation of DR participation opportunities. [2] (Kinert)	Integrated tools to assist customer DR assessment
14	Develop increased understanding of demand response cost effectiveness and price elasticity. [3] (Kinert)	❑ DR program cost effectiveness ❑ DR long-term price elasticity impacts
15	..long term energy policy setting where industry can make investment in development of new controls and communication technology need to enhance demand responsiveness. This is a national and state policy issue. [1] (Kintner)	Energy policy to stabilize DR investments
16	On the technical side, we need technology that addressed the problems mentioned above. [2] (Kintner)	Technology to support DR
17	.. standardization of communication and controls technologies [3] (Kintner)	Communication / controls standards
18	Research into the possibility of using the public digital cellular network. How would a DR communications infrastructure built over the cellular network affect the system (bandwidth, voice quality)? How reliable and secure is such a network? How would data be concentrated if there are multiple providers in a metropolitan area? [1] (Yee)	Technology assessment – DR options with existing communication networks.
19	Whirlpool has been looking into appliances self-coordinating themselves such that power demand do not occur all at the same time. It would be good to do more research in this area. What demand spreading algorithms are used during normal price periods and during peak price periods? [2] (Yee)	Technology assessment – appliance standards to enable / enhance price response
20	Research that will lead to a universal advanced meter reference design. There may be several designs for residential, C&I, etc. But each reference design will have a common standard set of features and products from different vendors are interchangeable (completely plug compatible). However, the reference designs will allow for vendors to add vendor-specific options to differentiate their product. [3] (Yee)	Technology assessment – Advanced meter reference design

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	Participant Response	**Key Words / Key Topics**
21	Incorporation of demand response in resource planning such that the value and attributes of demand response are appropriately incorporated. [1] (Violette)	Valuing DR in resource planning
22	Develop a plan/path that, over time, will lead to better pricing along with appropriate customer education and the development of technology value propositions that will allow demand to respond appropriately to electric prices. [2] (Violette)	❑ Principles for pricing / rate design ❑ Customer education ❑ Establishing technology value propositions
23	Work with customers to better understand what flexibility in demand they do have, given currently available methods and technology. [3] (Violette)	Assess DR opportunities.
24	Case studies and examples of successful DR program participation from example IAW end users. Summarizing the results of these case studies into homogeneous activities or actions that future IAW end users can consider when determining how they can shed load or meet the requirements of a new DR program or tariff with acceptable impacts on their business operations. [1] (Gravely)	❑ Customer educational materials ❑ Customer DR evaluation tools
25	Develop new DR business decision tools that can be used by the End User and the Utility Account Manager to evaluate new DR programs or tariffs to determine the economic impact and risk of participating in the new DR program or tariff. [2] (Gravely)	❑ Business decision tools
26	Encourage the development of new DR technologies that will allow IAW end user to apply their existing EMS/EIS or other business management systems (or purchase cost effective new systems) to provide automated DR response capabilities that can provide a real value to the business and a method of estimating accurately the economic and other impacts on the business operations. [3] (Gravely)	❑ Technologies to link existing EMS/EIS into a DR application
27	How to make such thermostat systems inexpensive, long-lived, simple to install and maintain, and effective at modulating electricity demand. [1] (Arens)	❑ Improved technology cost effectivness and functionality.
28	User interaction: how to give the occupants information, insight, and influence over how the system balances their electricity cost against comfort objectives. [2] (Arens)	❑ Resolving the customer interface – what information to present and how to present it.
29	Design of real-time pricing structures that optimize demand response and energy efficiency in a diverse region such as California. [3] (Arens)	❑ More effective rate design.

ROUNDTABLE PARTICIPANT RESPONSE		
3. What is your vision of demand response. In other words, how significant should it be within the utility industry, how might it impact resource planning, system operations, customer choice, costs and customer service?		
	Participant Response	**Key Words / Key Topics**
1	Demand side resources can be the silver bullet for the US electric industry for the the next two decades while we look to develop alternative energy sources to replace our hydrocarbon based supply portfolio. We are expected to need another 400 GW of capacity in this country over the next 15 years on top of our current 800GW system. How do we site 400 GW of new generation? How do you fuel it? If it is with natural gas how do we build the necessary pipeline infrastructure to deliver the supply? Finally, once we have it build how do we deliver it over our antiquated transmission system? DR is not a nice to have, it is a necessity to ensure system reliability and effective and efficient electricity markets. (Malme)	DR a necessity for system reliability and market efficiency.
2	Demand response integrated with an advanced metering infrastructure (AMI) implementation may be the most significant transformation initiatives for the electric utility industry. Transformation of utility operations and business processes, new rate and pricing structures, long-term changes in customer behavior and resource planning process will result from a wide scale adoption of price demand response rates and AMI. (Fong)	Price responsive DR and advanced metering will transform utility operations, resource planning and customer behavior
3	Demand Response deserves a place high in the long-term resource pecking order, just below energy efficiency and above supply-side options. In theory, as a short-term needle-peak resource, it should be at the top of the list. However, to be taken seriously by resource planners and system operators it must show that it is predictible, dispatchable, and reliable. At some point though, there may need to be a reckoning between voluntary programs (e.g., bidding) and mandatory critical-peak or real-time pricing tariffs. The latter, if mandatory, would seem to be more efficient, effective, and easy to administer than the former. Opting out of mandatory programs should require paying premiums that can be used to procure other resources for these non-responsive peak loads. Regardless of the approach, the value of peak capacity must be factored into the value equation in order for benefits and costs to be adequate to more than niche portions of the market. A dilemma with DR seems to be that as customers identify wasteful or otherwise marginal uses of energy during critical peak periods, they often begin to adopt those changes permanently, which is fine for efficiency and long-term load shape optimization but reduces the amount of highly-valued, short-term dispatchable load. Many customers in our CA large C&I market survey indicated they had already worked down their on-peak load to the bone in response to facing steep TOU prices signals for 10 years or more (and this is easily confirmed in some of their "U" load shapes). (Ruffo)	❑ DR is a potentially significant resource. ❑ Voluntary program versus mandatory pricing needs to be reconciled.

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4	Development of robust demand response capability is crucial to the electric industry and fits hand in glove with the benefits of real-time-pricing. Creating customer awareness of time differentiated, cost-to-serve based pricing and providing customers with the opportunity to choose how and when they want to use electricity based on its price helps to move the decision on what value to place on electricity from the industry into the consumer's hands. In the long run, with effective mitigation of the "needle peak", cost effective demand response can create favorable cost impacts through reduced average cost of commodity, reduced capacity infrastructure investment, environmental gains through reduced emissions, and reduced costs associated with loss of syste reliability. Including demand response in the procurement portfolio has obvious benefits. As acknowledged in the California Energy Plan, demand response is a priority resource and is considered one of the key building blocks of the state's electric supply portfolio. One of the key challenges facing utilities in terms of resource planning is determining how to forecast the impact of demand response on supply needs. The best solution to this problem is experience. By offering and adequately operating customer friendly, easy to participate in programs with adequate incentives a track record can be established that will provide a sound basis for what our industry can expect from participants – just as we know today what to expect from established programs such as PG&E's non-firm program. (Kinert)	DR crucial to utility industry.
5	1. Electric markets must allow for demand to respond to changes in electric prices. As a result, developing market structures that allow those customers that are able to be flexible in their use of electricity to receive the benefits this flexibility offers the market is important. 2. Callable demand response that can be used as an emergency resource that to reduce the costs of low probability high-consequence events is a different DR concept, but is also important in developing cost-effective resource plans. DR can augment supply-side options that can be used in situations where there are unexpected generation or transmission outages to reduce the costs of dealing with the unexpected emergency situation. (Violette)	DR a valuable tool for mitigating market price.

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6	Demand Response should be managed so that the energy response provided by DR can be used for utility system reliability and to allow price responsive decisions to be made by the end users. The ISO maintained network should provide real economic value to DR just the same as other types energy response assets (such as generation). DR has a quick response capability not match by other energy resources, the ISO and other management agencies should provide a real value for DR that is equal to its system response characteristics. (Gravely)	DR provide customers with bill management and system reliability options.

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7	I use the analogy of the computer industry to make my point. 20 years ago, mainframe computing was prevalent. Mainframe gave way to PC; first stand-alone and then networked. Now we adopted a fairly distributed network-based computing system with a lot of intelligence in the network operations. From an operational point of view, the mainframe computer user sat on a terminal. No maintenance, no installation of any software/hardware. Then in the PC area (80s and 90s) computer users would install hardware and software themselves, which required significant understanding of the inner works of a PC. Today we are all using network-based application program environment in which the user is placed back into a situation similar to that during the mainframe era – no maintenance – I just use the computer. I see a similarity in the development of the distributed energy resources of which demand response is one manifestation. We are already seeing stand-alone systems (CHP and thermal energy storage, direct load control, demand response program participants) out in the field as early adopters. Most of the installations are part of pilot projects and as a consequence expensive. Eventually, we will transition into a more flexible and adaptive energy infrastructure with ubiquitous communications down to the end-use appliance. In such a world, appliance would be able to response to system emergencies and modulate load to enhance system reliability. The analogy to the computer industry is weak in one respect. The time constant for the computer industry is much shorter. The life-time of a computer is about 3 years. The turn-over rate of electrical appliance and HVAC equipment is about 15 years. So, we need to be patient. Impacts to the utility industry will be significant. Resource planning for distribution systems will be affected first. Resource planner will need to adjust to less deterministic and more statistical analysis considering the stochastic behavior to the load and their resources. We already seeing some softening in the electric reliability councils to entertain ideas in which load provide reserve and ancillary services. These are early indicators of a slow transition from a CONTROL AND COMMAND business model to a more collaborative paradigm in which customers (small and large) contribute to the reliability of the power system. (Kintner)	DR technology, communication networks and information system inevitable component of future utility system.

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8	My sense is hat DR will be inevitable and should be universal because the savings from DR perhaps will have a relatively higher impact on lower income groups. If DR is a given, then if I take a utopian view that a real-time 2-way DR communications infrastructure is in place, then utilities should have more accurate and up-to-date information on operations and customers which should lead to more accurate and targeted resource planning, more efficient and less error-prone systems operations, more customer choice and better customer service. All of which leads to a more efficient utility and lower energy cost to the end-user. (Yee)	DR technology, communication networks and information system inevitable component of future utility system.
9	I think demand response should be central to electricity marketing, if it is conceived as broadly as above—it should beneficially affect both the building's energy efficiency and the building's demand on the electricity supply system during shortages.	Integration of energy efficiency and DR is central to electric service.