



Demand Response (DR) Enabling Technology Development (ETD) Project

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Agenda

8:30am	Introduction and Discussion of the DR ETD Project <i>Gaymond Yee and Ron Hofmann</i>
9:00am	Research Opportunity Notices and How to Submit Proposals <i>Gaymond Yee</i>
9:45am	Morning Break
10:00am	DR ETD Commercialization Plan <i>Ron Hofmann</i>
10:30am	“New Thermostat, New Temperature Node, and New Meter” <i>UC Berkeley Research Team</i>



Agenda

Noon-1:45pm	Posters and demonstrations on display
12:30pm-1:45pm	Lunch (handouts with locations of nearby restaurants)
1:45pm	“California Demand Response Business Network” <i>Utility Integrated Solutions</i>
2:45pm	Afternoon Break
3:00 pm	“Network Security Architecture” <i>CyberKnowledge, UC Berkeley</i>
4:00pm	“Service Based Universal Application Interface” <i>Berkeley Wireless Research Center</i>
4:30pm	Adjourn



Purpose of This Workshop

- ◆ **Introduce DR ETD Project to researchers and private industry that are not familiar to the project**
- ◆ **Review Past Research Opportunity Notices**
- ◆ **Describe the proposal submittal and review process**
- ◆ **Present progress and results of the 4 funded research projects**
 1. **New Thermostat, New Temperature Node, and New Meter**
 2. **California Demand Response Business Network**
 3. **Network Security Architecture**
 4. **Service Based Universal Application Interface**



Background

- ◆ **CA energy crisis of 2000-2001**
 - ◆ Market power (Enron, et al)
 - ◆ Aging fossil fuel plants (pollution)
 - ◆ Flaws in deregulation (AB 1890)
 - ◆ Disconnect between wholesale and retail prices
- ◆ **Supply approach** (build more plants)
- ◆ **Demand approach** (load as a resource)



Electric Power Industry In California

- ◆ **Energy companies (Enron, Calpine)**
- ◆ **CAISO (California Independent System Operator) balances supply and demand**
- ◆ **UDCs (Utility Distribution Companies manage local distribution systems)**
 - ◆ IOUs (investor owned utilities, e.g., PG&E)
 - ◆ Munis (publicly owned utilities, e.g., SVP)
- ◆ **Regulators (e.g., FERC, CPUC, CEC)**



Regulatory Agencies

- ◆ **FERC <http://www.ferc.fed.us/>**
 - ◆ Regulates the transmission and wholesale sales of electricity in interstate commerce
- ◆ **CPUC <http://www.cpuc.ca.gov/>**
 - ◆ Regulates privately-owned utilities in CA
- ◆ **CEC <http://www.energy.ca.gov/>**
 - ◆ Created in 1975 for siting electric power plants
 - ◆ Responsible for standards & policy analysis



Brief History of Recent California Electric R&D



- ◆ **Investor Owned Utilities (until 1996)**
- ◆ **EPRI (created by utilities in 1973)**
- ◆ **CIEE (funded by utilities starting in 1989 to manage energy efficiency R&D)**
- ◆ **PIER (created in 1996 by deregulation [AB1890] and initially funded in 1998)**
- ◆ **PIER <http://www.energy.ca.gov/pier/>**
- ◆ **PIER has ~\$60 MM/year through 2012**



PIER R&D Areas

- ◆ **Environmentally-Preferred Advanced Generation (EPAG)**
- ◆ **Buildings End-Use Energy Efficiency**
- ◆ **Industrial/Agricultural/Water End-Use Energy Efficiency (IAW)**
- ◆ **Renewable Energy**
- ◆ **Energy Related Environmental Research**
- ◆ **Energy Systems Integration (ESI)**



ESI

- ◆ **Improved Efficiency and Reliability of the Transmission System (T&D)**
- ◆ **Distributed Energy Resources Systems Integration (DER)**
- ◆ **Strategic and Enabling Technologies (e.g., storage, seismic, tools for market analysis)**
- ◆ **Demand Response to Electricity Prices and System Contingencies (DR)**

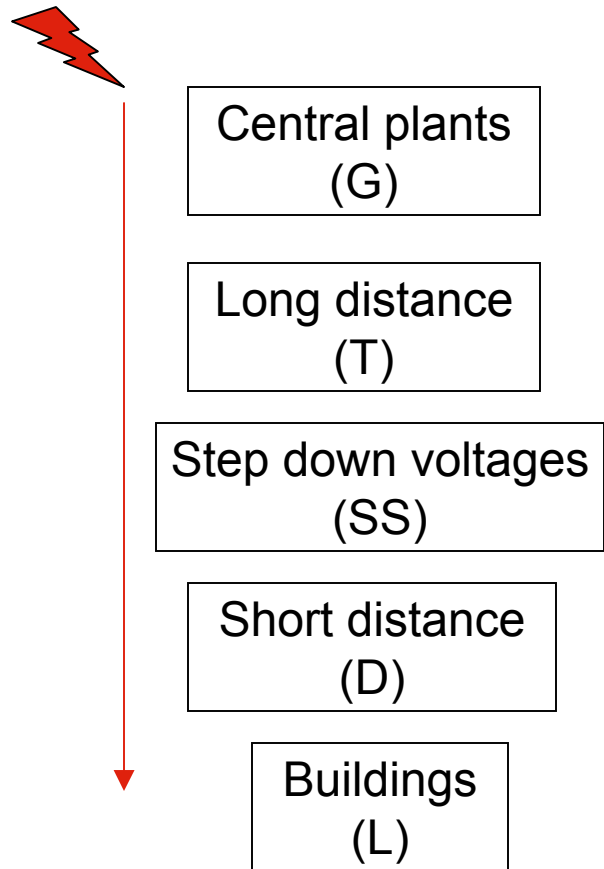


What Is DR?

- ◆ **Demand response (DR) for this project is the ability of electricity users to respond “automatically” to time- and location-dependent price and contingency signals (that have varying amplitude and duration) to reduce/shift loads.**
- ◆ **DR is different from energy efficiency (EE), e.g., transient vs. permanent**



DR Involves the Entire Power Delivery System



- ◆ **Generation (G)**
- ◆ **Transmission (T)**
- ◆ **Substations (SS_T)**
- ◆ **Sub-transmission**
- ◆ **Substations (SS_D)**
- ◆ **Distribution (D)**
- ◆ **Local transformers**
- ◆ **Loads (L)**



PIER DR Program

- ◆ **Is there DR potential in CA's existing large commercial/industrial facilities?**
- ◆ **What enabling technologies need to be developed to deploy DR statewide?**
- ◆ **Can we learn lessons from other states?**
- ◆ **Can the CAISO use DR to help manage future electricity imbalances?**



LC&I Potential

- ◆ **Large Commercial and Institutional (LC&I) DR Demonstrations and Case Studies (Mary Ann Piette, LBNL)**
 - ◆ Stake in the ground study to establish state-of-the-art DR capabilities and R&D needs
 - ◆ Send a dynamic tariff to LC&I buildings
 - ◆ Determine automatic DR capability
 - ◆ Report results in a form that will help make policy and R&D decisions possible



Enabling Technologies

- ◆ **Wireless communications**
- ◆ **MEMS sensors**
- ◆ **Network management**
- ◆ **Systems integration**
- ◆ **Low-cost packaging**
- ◆ **Energy scavenging and storage**
- ◆ **Real-time operating systems**



Lessons Learned

- ◆ **A Case Study of Niagara Mohawk's RTP Tariff (Chuck Goldman, LBNL)**
 - ◆ Characterize customer response to and satisfaction with a RTP tariff in a retail competition environment
 - ◆ Assess interactions between RTP and ISO/utility DR programs
 - ◆ Provide input to CA regulators/stakeholders developing DR and RTP options



CAISO Requirements

- ◆ **Develop a DR R&D agenda for the CAISO to identify**
 - ◆ **how responsive loads could increase power system reliability and adequacy**
 - ◆ **what behaviors are desirable**
 - ◆ **what reliability services (ancillary services) responsive loads could provide**



DR ETD Project

- ◆ **CEC PIER Funded Project**
 - ◆ Project approved June 2002
 - ◆ Present funding: \$5.5M to March 31, 2007
- ◆ **Purpose of funding is to develop enabling technologies for a state-wide demand responsive electric power delivery system with “10/10” objectives**
 - ◆ 10 times the capabilities and 1/10th the cost
 - ◆ Create disruptive technology
- ◆ **Leverage R&D spending by other institutions**
- ◆ **Multi-disciplinary and collaborative research**



Technical Advisory Committee (TAC)

- ◆ **Don Aumann** (CA Lighting Tech. Ctr, lighting, HVAC, and power supplies)
- ◆ **Charles Glorioso** (Davis Instruments, communications, thermostats, home automation)
- ◆ **Joe Hughes** (EPRI, industry standards)
- ◆ **Roger Levy** (DRRC, business processes)
- ◆ **Belvin Louie** (PG&E, meters)
- ◆ **Mark Martinez** (SCE, load control programs)
- ◆ **Terry Mohn** (Sempra, communications, industry standards)
- ◆ **Steve Phillips** (PG&E, IT systems and integration)
- ◆ **Mary Ann Piette** (DRRC/LBNL, buildings, energy monitoring)



California Institute for Energy and Environment (CIEE)

- ◆ **DR ETD Project: Technical coordination, project administration, and contract management of funded research**
- ◆ **Unit of the Office of Research, Academic Affairs Division of the Office of the President, University of California (UCOP)**
- ◆ **Located at 1333 Broadway, Suite 240 Downtown Oakland**