

UC Berkeley

Energy Use in Buildings Enabling Technologies

Title

Automated Demand Response and Demand Response Research Center

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Automated Demand Response and the DR Research Center

Mary Ann Piette

**Workshop: Demand Response Enabling Technology
Development Project**

June 10, 2004

Sponsored by the California Energy Commission



Presentation Overview

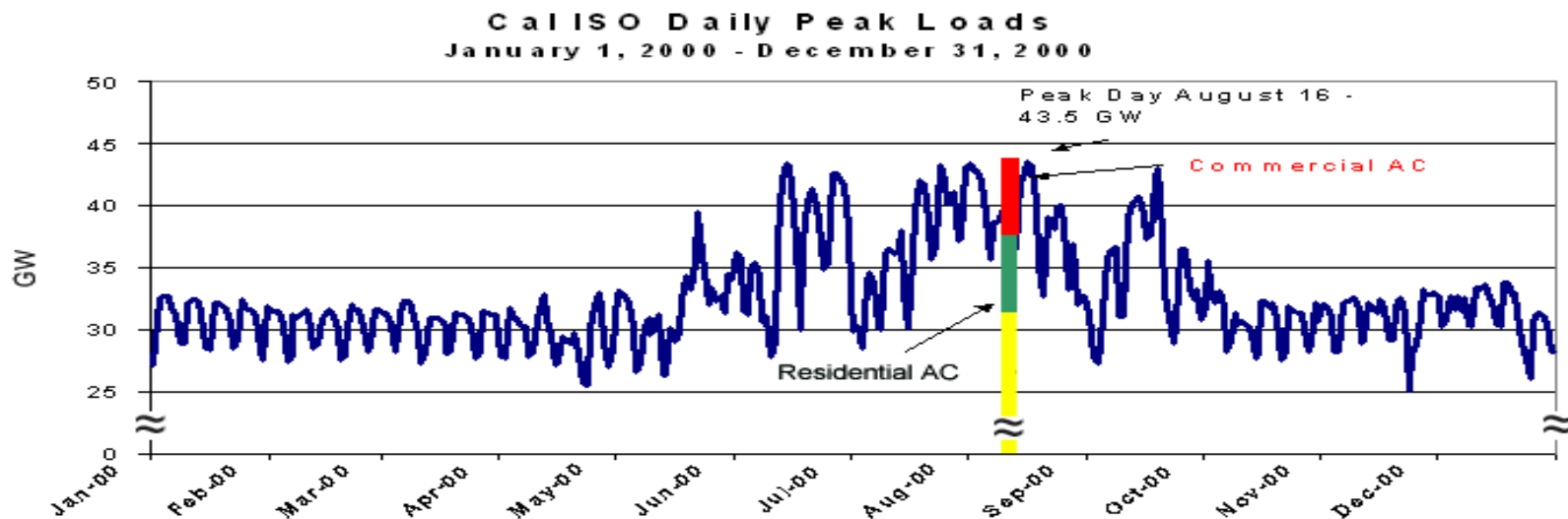


- **Demand Response Concepts**
- **Energy Information Systems**
- **Automated Demand Response Project**
- **Demand Response Research Center**
- **Next Steps**

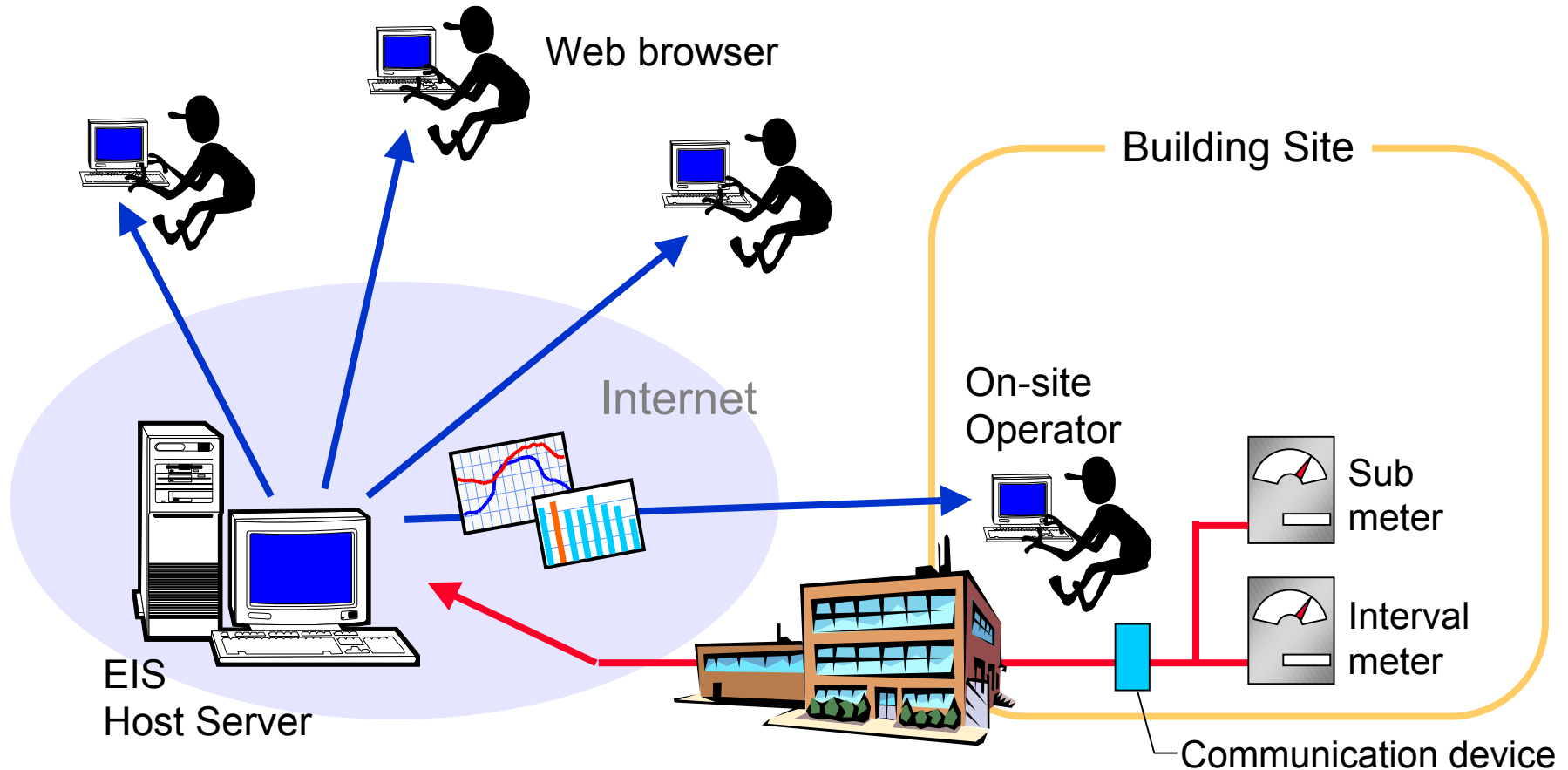
Demand Response & Project Goal



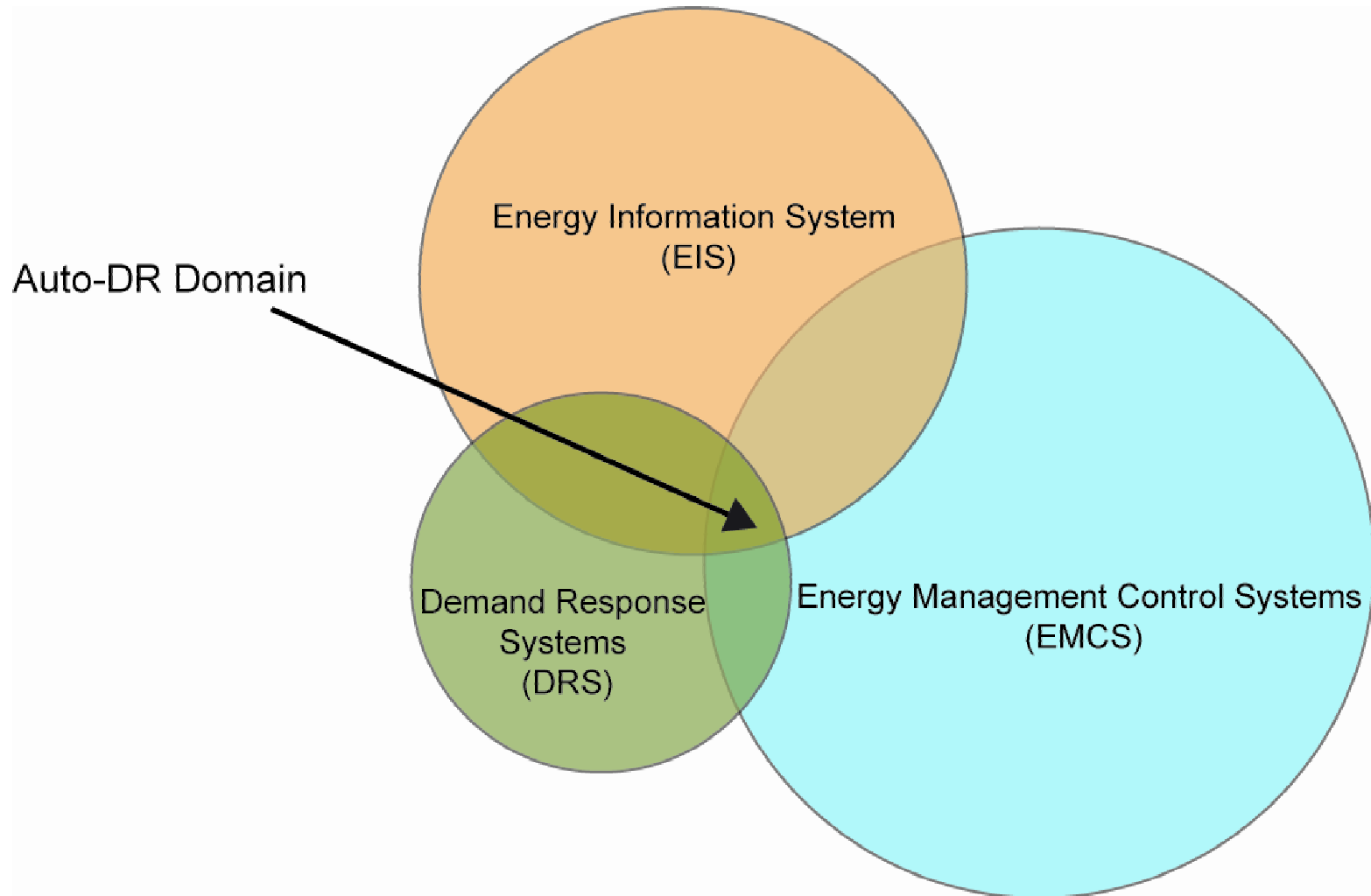
- **Motivations for Demand Response**
 - Improve grid reliability
 - Flatter system load shape
 - Lower wholesale and retail electricity costs
- **Primary Goal:** Evaluate technological performance of Automated Demand Response (Auto-DR) hardware & software systems in large facilities



Energy Information Systems



Types of Web-Based Energy Information Systems (EIS)



Recruited Sites and EIS

Albertsons – East 9th St. Oakland

Engagenet

Bank of America – Concord Technology Center

Webgen

General Services Admin - Oakland Fed. Building

BACnet Reader

Roche Palo Alto – Office and Cafeteria

Tridium

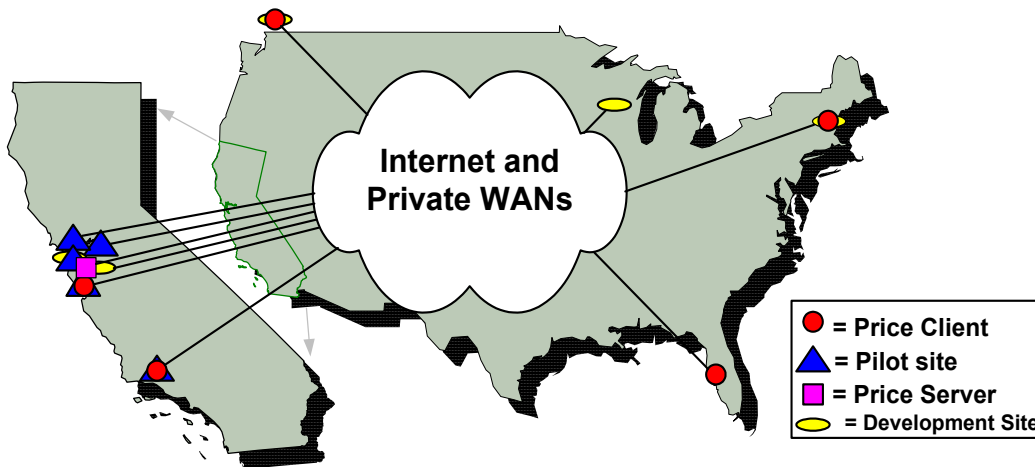
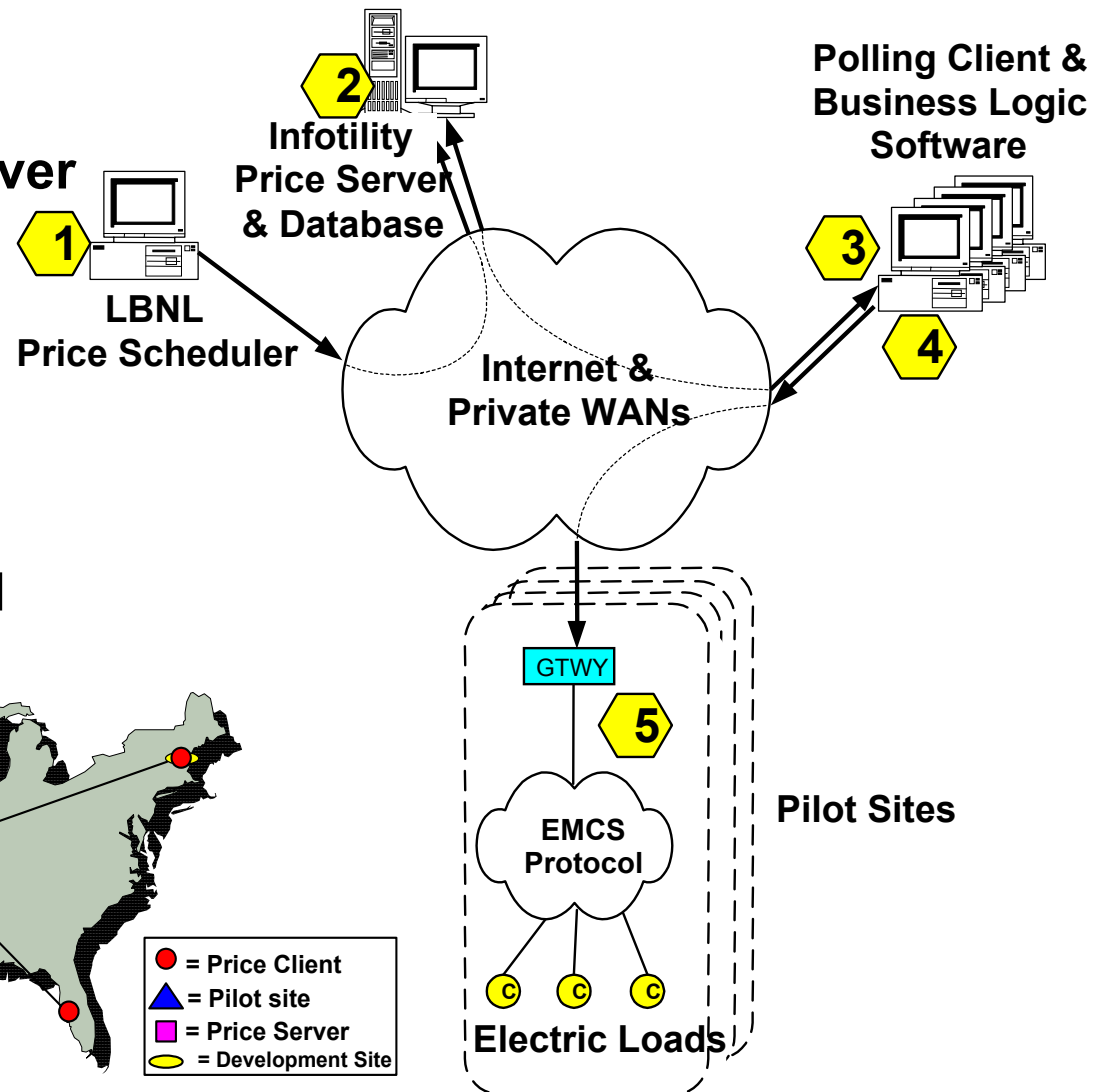
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Itron Silicon Energy

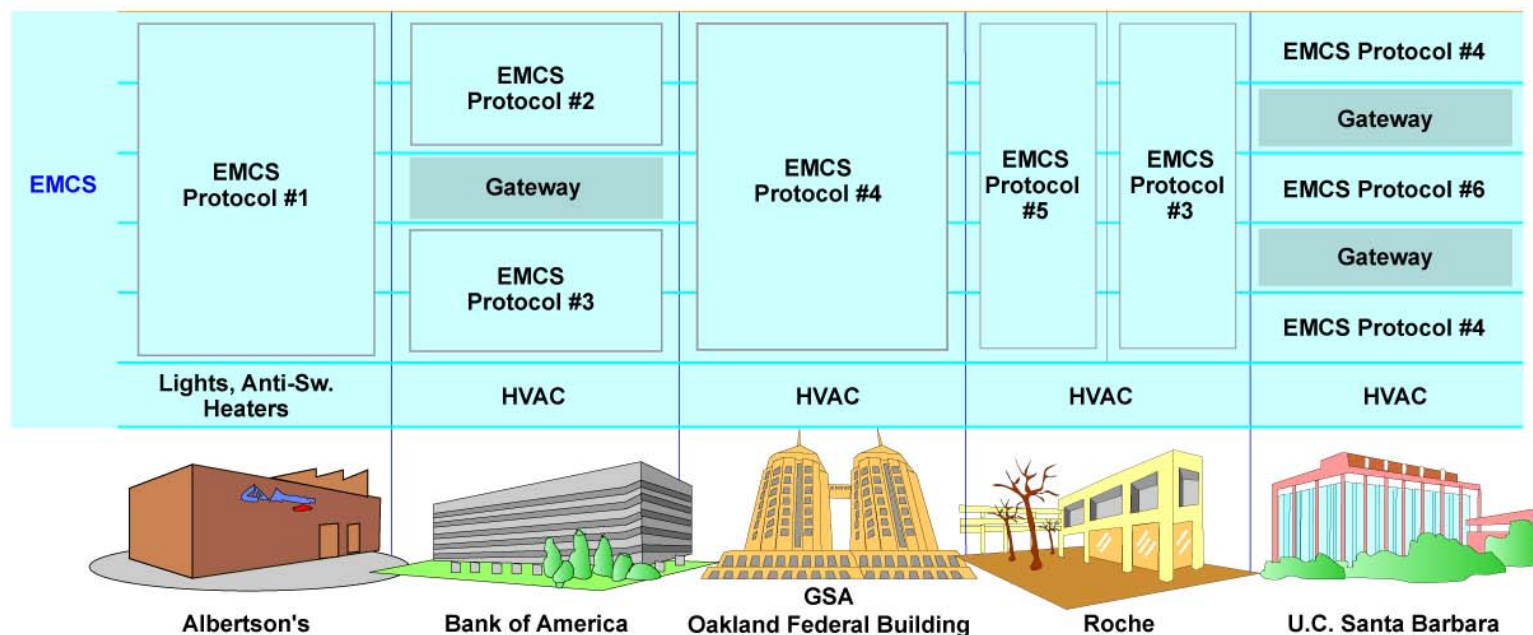


Auto-DR System Communications

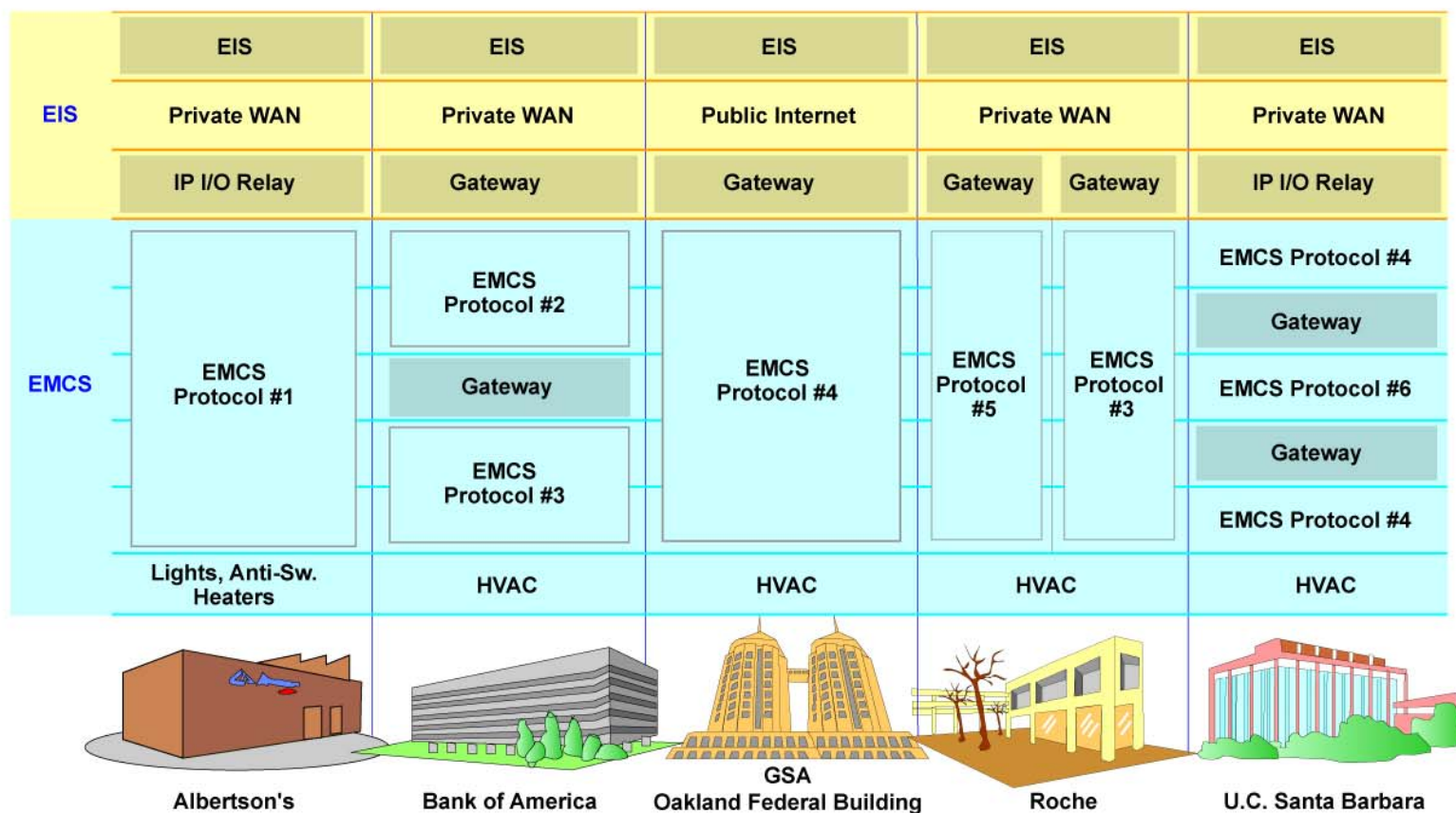
1. LBNL defines price schedule
2. Price published on server
3. Clients request price every 1-5 minutes & replies to server
4. Business logic determines response
5. EMCS carries out shed



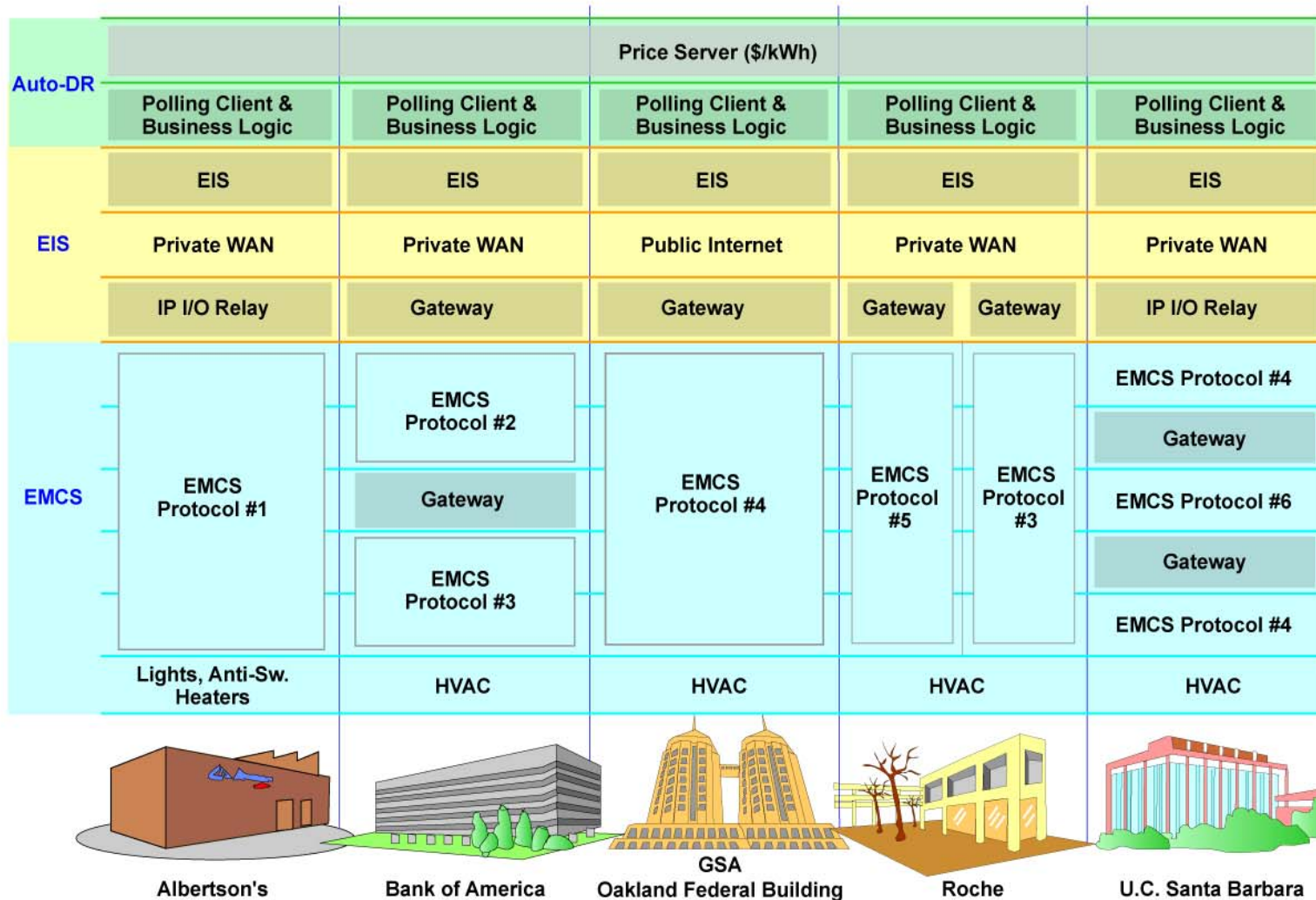
Test Sites - Circa 1999 (1 of 3)



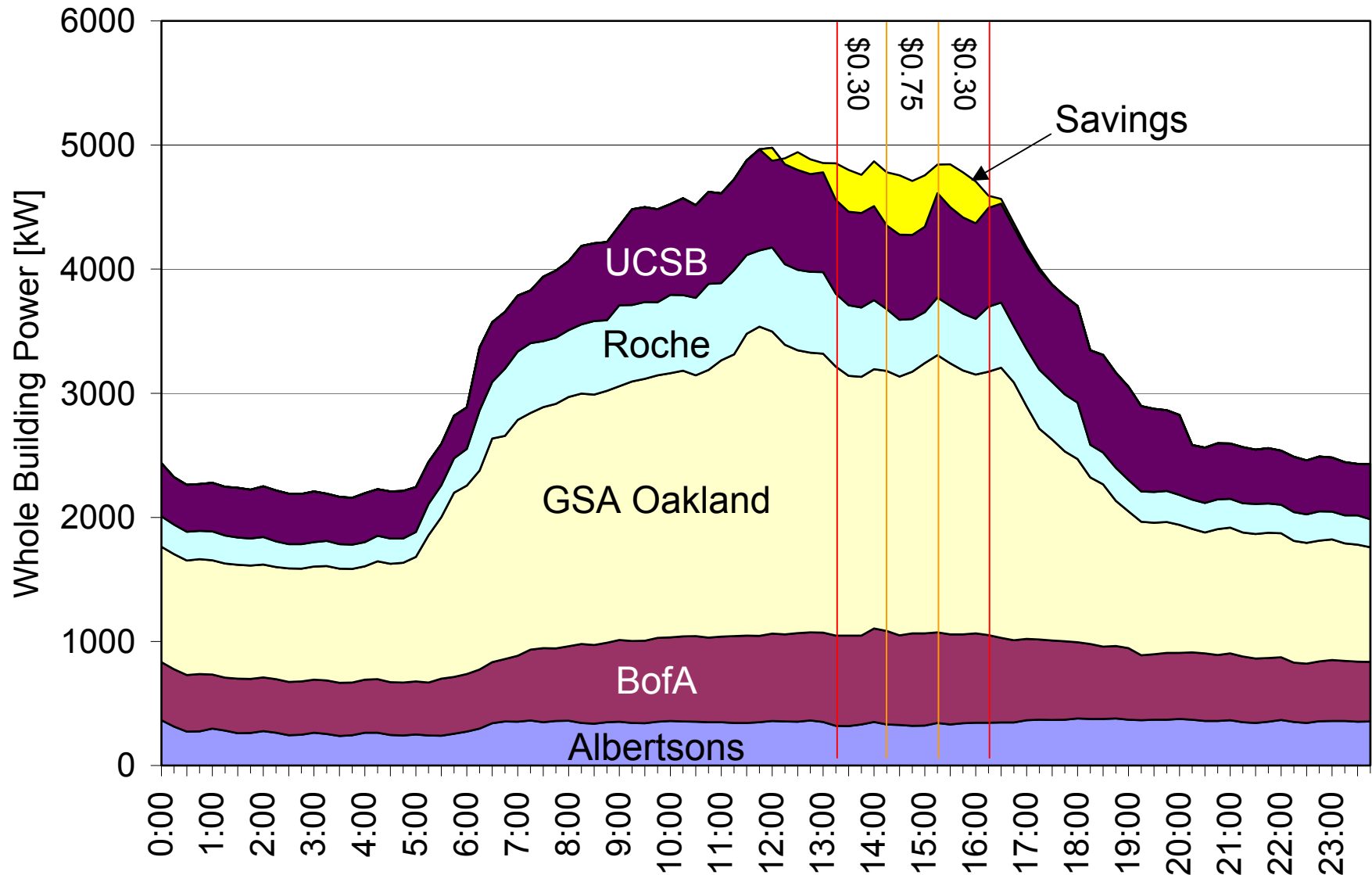
Test Sites - After Energy Crisis (2 of 3)



Test Sites –2003 Auto-DR Test (3 of 3)



Results - Day-2 Test



Summary of DR Strategies – Tests 1 & 2



		Albertsons		B of A		GSA		Roche		UCSB	
		1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
HVAC	Global zone set-point increase					×	○				
	Direct control of fans							○	○	×	○
	Reset duct static pressure			×	○					○	○
	Reset cooling and heating valves									○	○
Lighting	Reduce ambient lighting	○	○								
Other	Reduce Anti-sweat Heaters	×	○								

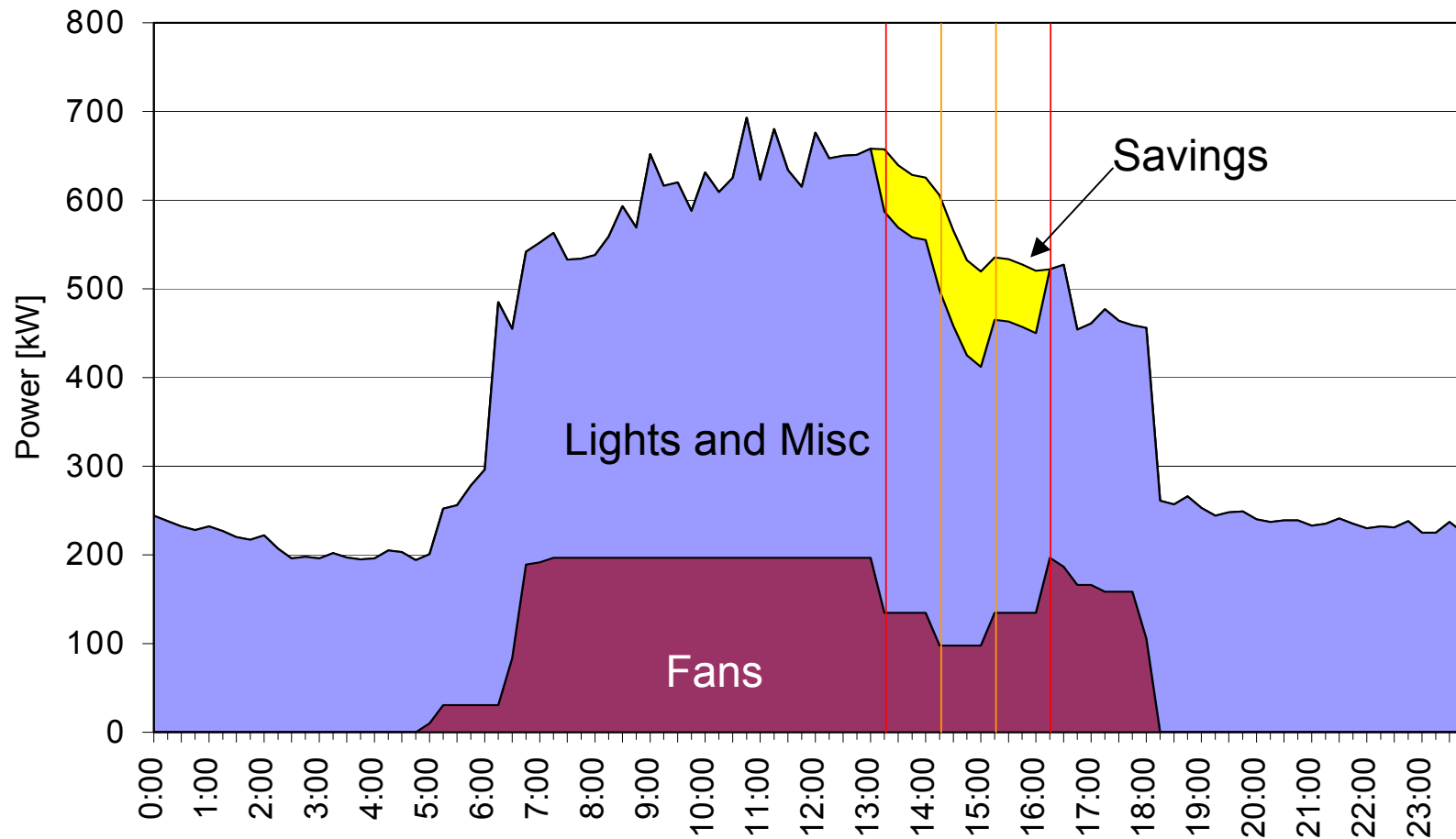
○ – Succeeded

×

Whole-Building and Component Savings at Roche Pharmaceuticals

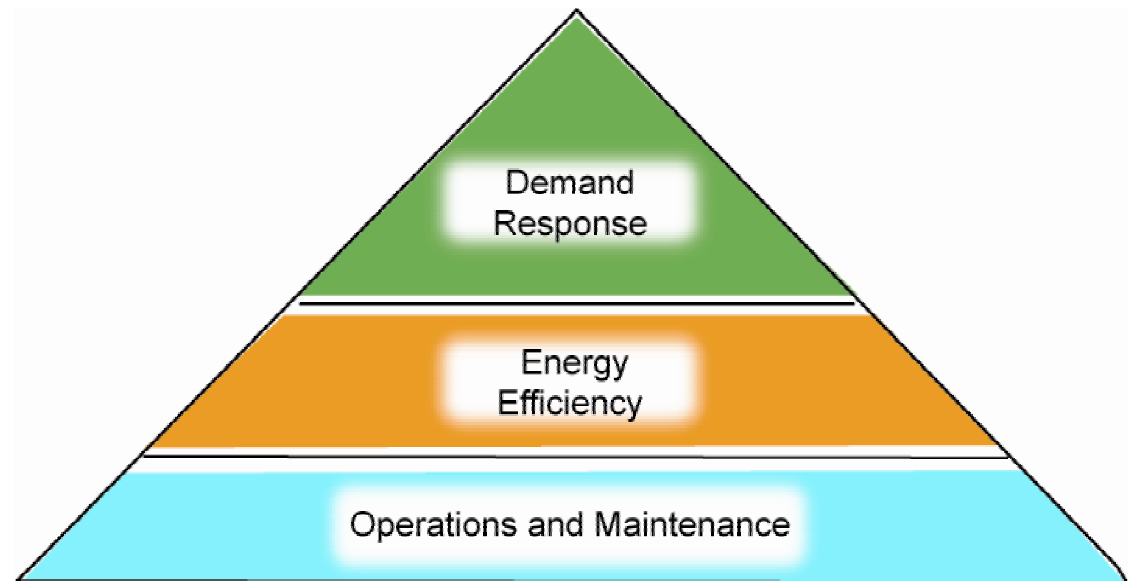


Whole Building and Fan Electricity Use



Findings on Automated-DR

- Fully automated DR is feasible with current technology
- Automation enhances demand response programs
- Large facilities support the objectives of DR
- New knowledge is needed to procure and operate technology and strategies for DR



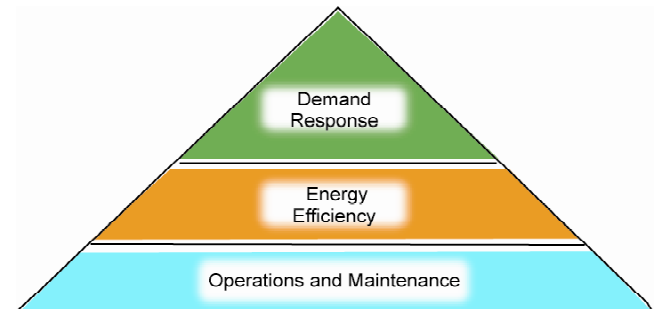
- **Objective:** to develop, prioritize, conduct, and disseminate multi-institutional research to facilitate DR
- **Scope:** technologies, policies, programs, strategies and practices, emphasizing a market connection
- **Method:** Partners Planning Committee, Annual R&D Plan
- **Stakeholders:**
 - State policy makers
 - Researchers
 - Information & metering system developers
 - Aggregators
 - Program implementers
 - Utilities
 - Industry trade associations
 - Building owners, engineers & operators
 - Building equipment manufacturers
 - Other end-use customers

- **Create a PIER Research roadmap for DR**
- **Establish multi-institutional partnerships to broaden expertise and leverage funding**
- **Foster connections with stakeholders through outreach efforts**
- **Sustain long-term attention to DR research topics**
- **Conduct DR related research, development, demonstrations, and technology transfer**

First Year Projects



- **Automated-DR in Large Facilities**
- **Follow on to RTP Program Evaluation in NY**
- **Scoping Study for Annual R&D Plan**
 - Policies, Programs, and Tariffs
 - Utility Markets, Technology, and Systems
 - Customer and End-Use Technology & Systems
 - Consumer and Institutional Behavior



Next Steps

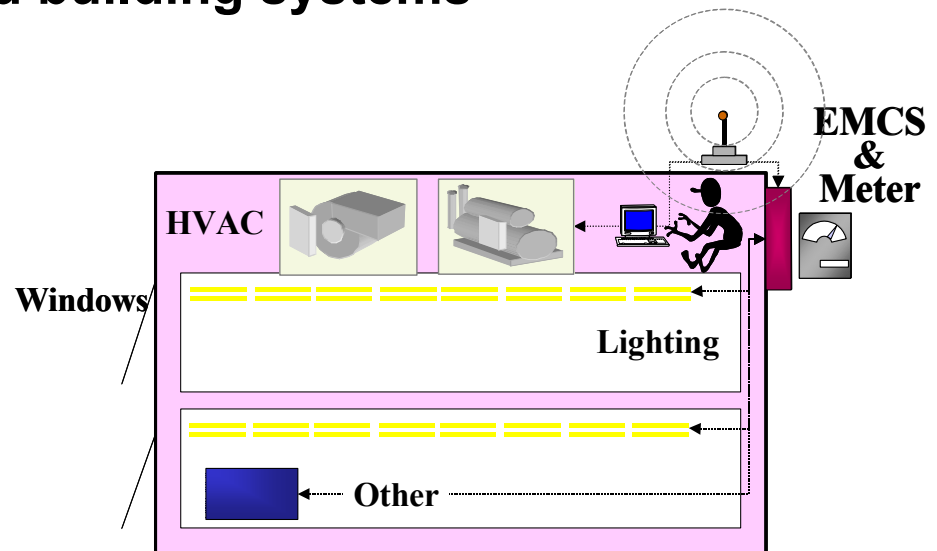
- **Launch Center**
- **Begin Two First Year Projects**
- **Recruit Partners Planning Committee**
- **Initiate Scoping Study**
- **Convene R&D Planning Workshops**
- **Create outreach materials**
 - Web site
 - Newsletters
 - Workshops and conferences



Future Buildings Research



- **Scale Up Automation Research - Recruiting for 2004!**
 - Larger sheds (more buildings, more per building)
 - Bandwidth, throughput, costs and benefits, security
- **Review of Control Technologies and Strategies**
 - Scenarios on economics and building systems
 - **Lighting controls**
 - Dimmable ballasts
 - Bi-level switching
 - **HVAC control**
 - Thermostat set up
 - Pre-Cooling strategies
 - Fan & chiller control
 - Real-Time Simulation Tools
- **Building comfort, productivity, feasibility, behavior**



Further Information



- **Contact:** Mary Ann Piette, mapiette@lbl.gov, 510 486-6286
- **Demand Response Research Center**
drrc.lbl.gov
- **Current CEC Demand Response Sites**
 - Consortium for Electric Reliability Technology Solutions (CERTS)
certs.lbl.gov
 - Center for the Study of Energy Markets (CSEM)
www.ucei.berkeley.edu/power.html
 - Demand Response Enabling Technology Development (DRETD)
cjee.ucop.edu/dretd
- **Buildings.lbl.gov/hpcbs/Pubs.html**
 - Case Studies of Energy Information Systems and Related Technology: Operational Practices, Costs, and Benefits
 - Web-based Energy Information Systems for Energy Management and Demand Response in Commercial Buildings