Load Management & Demand Response

May 10, 2010

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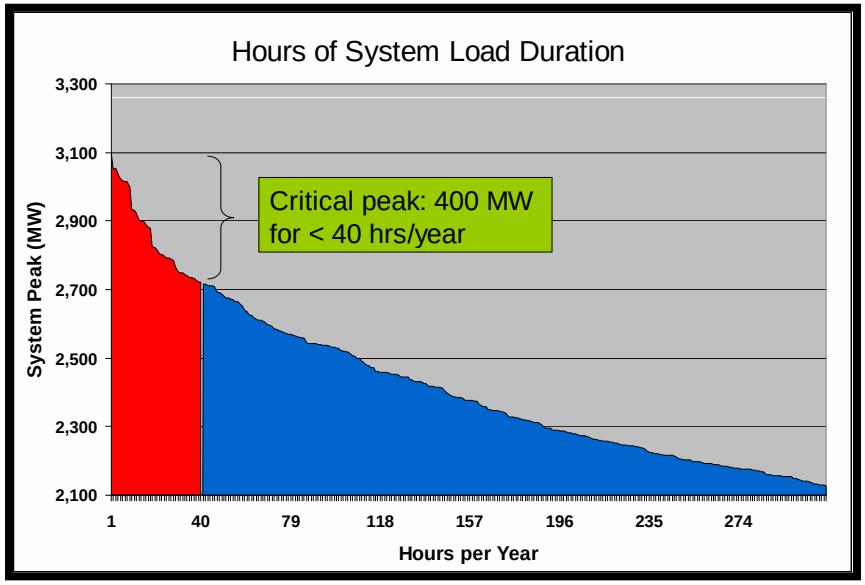
United States Energy Association

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
6201 S Street, Sacramento, CA 95817-1899
The Power To Do More.

Why is Demand Response Important Now?

- Growing consensus among federal and state policy managers that insufficient levels of demand response exist in the U.S. electric power system (EPACT 2005, FERC 2003)
- California Energy Action Plan – LM and DR are included in the energy stacking order after EE.
- CPUC and CEC have an Order Institute Rulemaking on demand response to have the IOUs explore demand response.
- California wants to adopt load management standards
- Gap in available resources for SMUD
- SMUD emphasis to increase reliability of electric system by reducing peak load
- SMUD offering customers greater choice in helping to manage electricity use through rates and incentive programs

SMUD System Load



- Highest 40 hours responsible for 400 MW
- System load projected to grow by 15% over next 10 years
- Resource gap projected in 2012 and beyond due to expiring bilateral and renewable contracts and growth

Terms

- Load Management
  - Definition: Any utility program or activity that is intended to reshape a utility's load duration curve
  - Reduces or delays the need for new electric generation capacity and reduces fuel consumption for electricity generation

- Demand Response
  - Definition: means that customers can reduce their electricity use over a given time period, shift that use to another time period, or contribute to grid reliability in response to a price signal, a financial incentive, environmental condition, or a reliability signal.
  - Reduce energy use during those few hours of near maximum load each year, can result in “load shifting” to lower price time periods.

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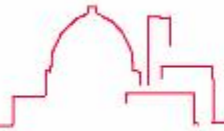
Classifying Demand Response Options

- Price-Based – customers adjust the timing of their usage
  - Time-of-Use
  - Time-of-Use with Critical Peak Pricing Periods
  - Real Time Pricing

- Incentive-Based – customers reduce demand at critical times and receive an incentive
  - Curtailable/Interruptible
  - Direct load control (A/C)
  - Emergency programs for reliability



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Focus Group Findings on Rates (as it related to LM/DR)

- **General:**
  - Customers readily understood that SMUD's cost of supplying energy is higher in the summer, especially in very hot weather
  - Customers understood that they would pay higher rates over fewer summer months and lower rates over more winter months
  - Most like a narrow (3-hour) super peak period
- **Commercial:**
  - Customers who find it difficult to shift load and/or have flat load prefer a demand charge, and vice versa
  - Customers want a minimum of 24-hour notice for CPP event
  - Prefer fewer CPP hours with higher prices vs. more hours with lower prices
- **Residential:**
  - Customers with flexible lifestyles said they will shift activities off peak
  - Want energy savings (from TOU vs. Tier) shown on bill
  - Basically like the idea of having pricing choices

Focus Group Findings on LM/DR

- **General:**
  - Most customers said they would respond to public pleas for energy conservation during periods of peak demand
  - Customers want the ability to override DR events
  - Generally more receptive to temperature reset than to AC cycling
- **Commercial:**
  - Small and medium customers want education on DR—more likely to participate in DR when it was explained to them
  - Some find it challenging to curtail/shift energy usage during peak periods due to industry type or business situation
  - Customers were creative in finding ways to adjust their business operations around peak periods
  - Many want event notification by cell phone or email
- **Residential:**
  - Households with ill or elderly members said personal control of their AC is critical
  - Renters find DR challenging because they don't own the AC or have window AC units
  - Responses were mixed regarding preference for manual controls vs. "set it and forget it" controls

Current LM and DR Programs

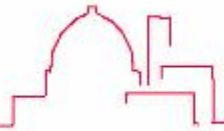
- **Curtailment contracts—6 MW**
- **Temperature-Dependent Rate—16 MW**
- **Used only in emergencies:**
  - Voluntary Emergency Curtailment Program—**~45 MW**
  - Peak Corps (residential AC cycling)—**97 MW cycling, 135 MW shed**
- **Total dispatchable load = 103 to 141 MW**
  - Using AC cycling, and special curtailment contracts
- **Total non-dispatchable load = 0 to 61 MW**
  - Using Temperature-Dependent Rate and VECP

Proposed LM and DR Offerings

- Program concepts are being evaluated in IRP process
- Designed to be used for active LM and DR
- Residential Customers
  - Air conditioning cycling
  - Air conditioning temperature reset
  - Choice of time-of-use rates, critical peak pricing
  - Public appeal to reduce electrical load
- Commercial Customers
  - Air conditioning temperature reset (<300 kW)
  - Special curtailable contacts (300 kW +)
  - Choice of time-of-use rates, critical peak pricing, real time pricing
  - Technical assistance to evaluate demand response potential
  - Technology incentives for enabling equipment (Auto DR)
  - Public appeal to reduce electrical load

How Peak Corps May be Changing Down the Road

- Aging and obsolete Peak Corps infrastructure is forcing SMUD to transition to a modern system
- Leverage AMI as much as possible
- Know when devices become removed
- Giving participants ability to override a limited number of times
- Use to manage system peak loads
- Offer participants more choice
  - Cycling
  - Temperature reset
- New incentive structure
- Devices can be supplied by the utility or purchased by the homeowner at retail locations
- Ability to do targeted load management down to a specific substation area (s) or service territory wide



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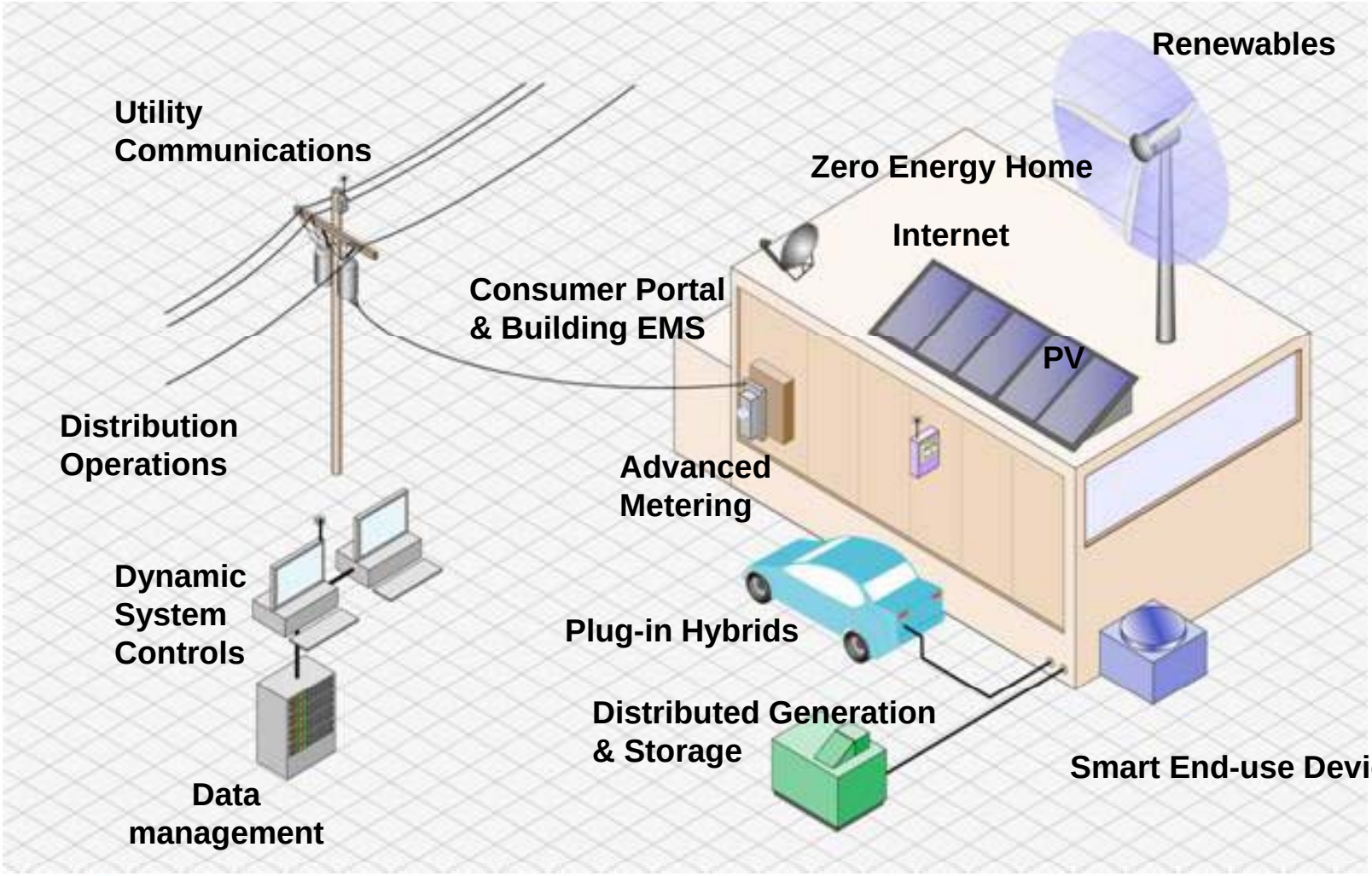
Demand Response Challenges

- **Retail Pricing**
  - Retail price signals do not typically reflect prevailing wholesale market hourly costs
- **Valuation**
  - Methods and practices to establish value of DR programs and dynamic pricing are not there
- **Integration**
  - Integration of demand side resources into the supply side involves complex planning and operations
- **Enabling Technologies**
  - DR enabling technologies and system integration to achieve sustainable price-responsive demand

Smart Grid Vision



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SMUD Smart Grid Elements

- **Distribution System Smartening**
  - Upgrade SCADA for distribution system automation
- **AMI**
  - Intercommunications with SCADA
  - Communications with end uses
- **Demand Response**
  - System and targeted load control
  - Price response
- **Distributed Generation**
  - PVs
  - CHP
  - Plug-In Hybrids
  - Storage
- **Zero Energy Smart Homes**
  - Combines all of the above

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