Making the Most of Responsive Electricity Customers

Mid-America Regulatory Conference

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Richard Sedano

The Regulatory Assistance Project

Vermont ♦ Maine ♦ New Mexico ♦ California ♦ Illinois ♦ Oregon ♦ Washington

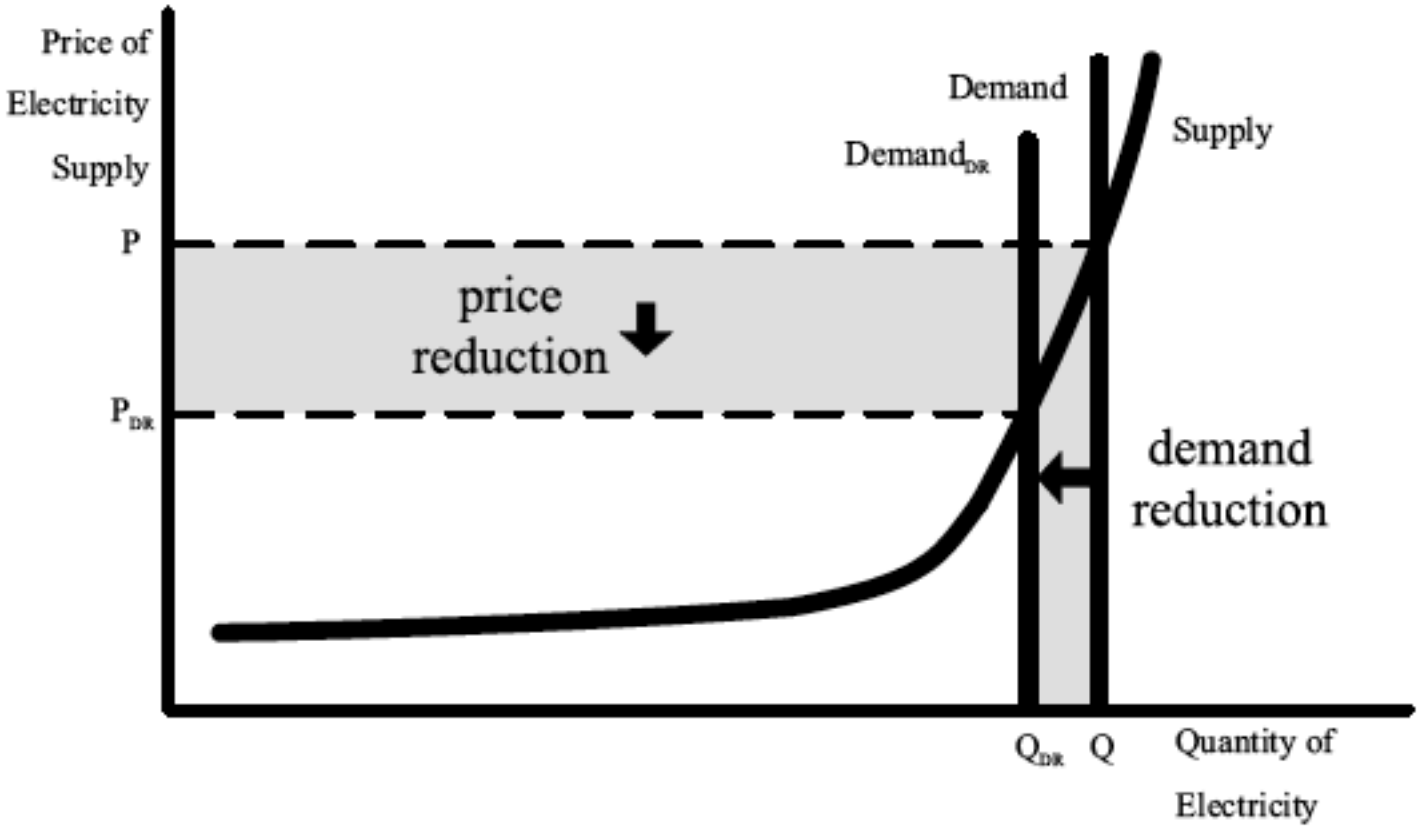
About the Regulatory Assistance Project

- RAP is a non-profit organization providing technical and educational assistance to government officials on energy and environmental issues. RAP Principals all have extensive utility regulatory experience.
  - Richard Sedano was commissioner of the Vermont Department of Public Service from 1991-2001 and is an engineer.
- Funded by foundations and the US Department Of Energy. We have worked in nearly every state and many nations.
- Also provides educational assistance to stakeholders, utilities, advocates.

Context

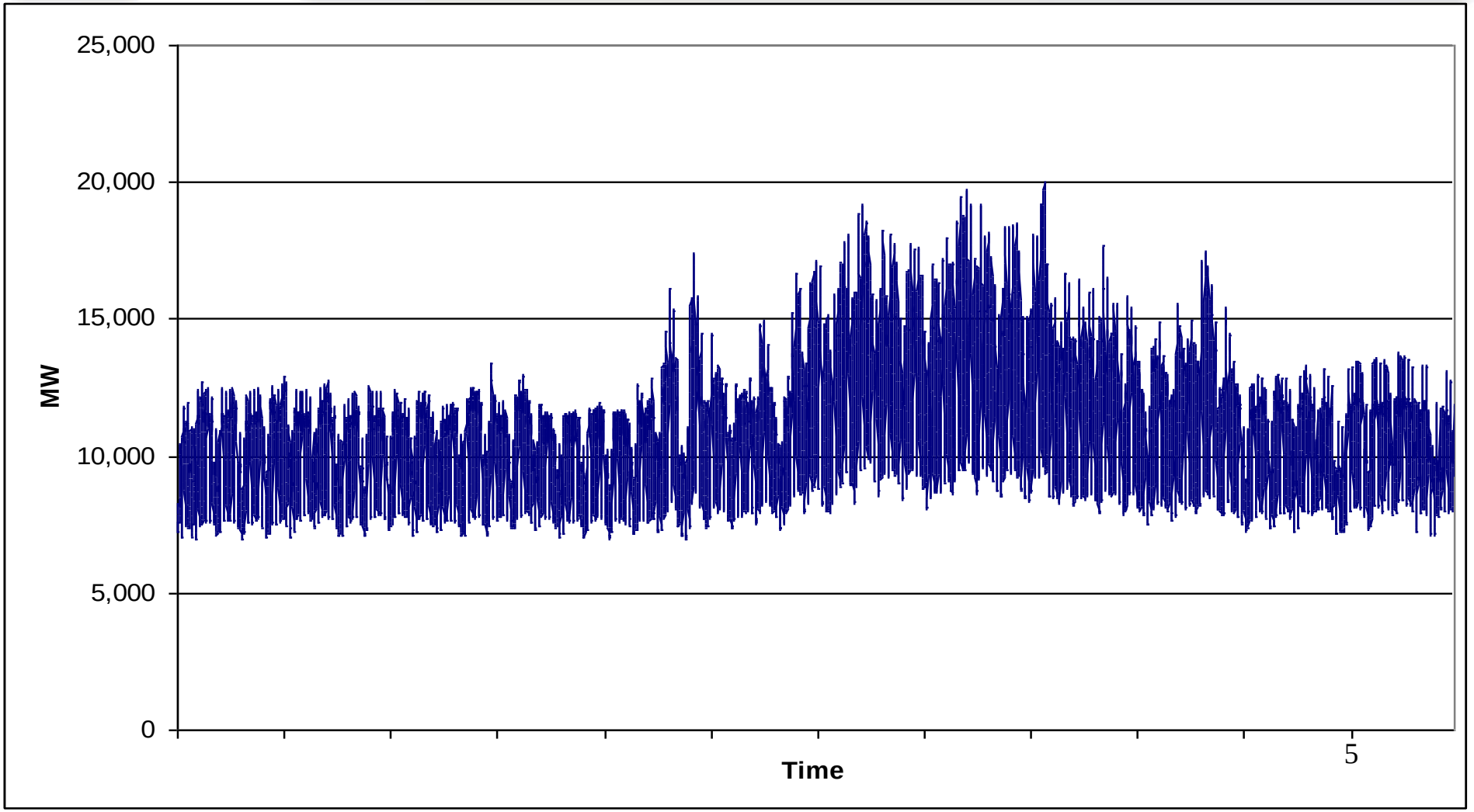
- Vibrant interest in demand resources
  - Cost effective compared with supply
  - Less environmental impact
  - Risk management
  - High volume potential
  - Depends on customers
- Demand Response is customers voluntarily curtailing usage, benefitting the grid

Supply and Demand Tell the (short run) Basic Story

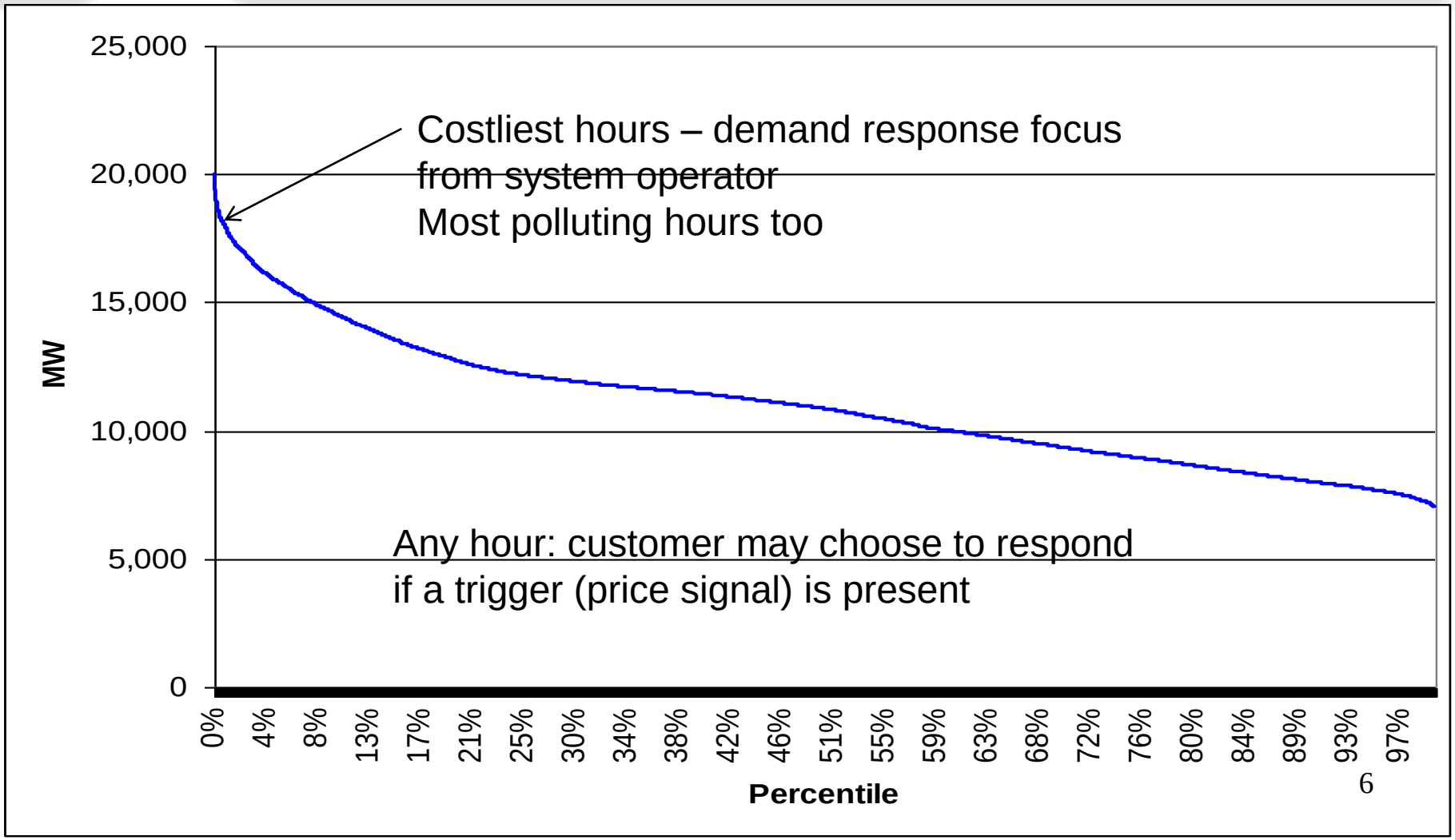


Benefits of Demand Response in Electricity Markets – US DOE Feb 2006

Annual Aggregate Load



The Load Simplified



Demand Response Features

- Demand Response helps energy markets
  - Clearing prices lower w/ price responsive demand
- Demand Response meets capacity reqmts
  - In MISO, qualify as Alternative Capacity Res.
- Demand Response provides ancillary svcs
  - Reliability maintained/enhanced w/ lower cost
  - Supply – Demand balance with growing renewables
- Include, Integrate in Planning
  - Scenarios could reflect DR/EE only solutions

Benefits of Demand Response Resources

- Avoided generation capacity costs
- Avoided energy costs
- Adjusted for losses
- Deferred/avoided investments in T&D capacity
- Environmental Benefits, net
- Reliability Benefits
- Hard to Quantify Benefits

Summarized from a cost-effectiveness process created for **PNDRP**, the Pacific Northwest Demand Response Project

Costs of Demand Response

- Program Administration
- Customer Costs
- Payments to Customers

- Costs have fixed and variable elements and can be factored into IRP-type analysis

Table 2-2. Common Types of Demand Response Programs

Price Options	Incentive- or Event-Based Options
TOU rates: Rates with fixed price blocks that differ by time of day.[a]	**Direct load control:** Customers receive incentive payments for allowing the utility a degree of control over certain equipment.
CPP: Rates that include a pre-specified, extra-high rate that is triggered by the utility and is in effect for a limited number of hours.	**Demand bidding/buyback programs:** Customers offer bids to curtail load when wholesale market prices are high.
RTP: Rates that vary continually (typically hourly) in response to wholesale market prices.	**Emergency demand response programs:** Customers receive incentive payments for load reductions when needed to ensure reliability.
	Capacity market programs: Customers receive incentive payments for providing load reductions as substitutes for system capacity.
	Interruptible/curtailable: Customers receive a discounted rate for agreeing to reduce load on request.[b]
	Ancillary services market programs: Customers receive payments from a grid operator for committing to curtail load when needed to support operation of the electric grid (i.e., ancillary services).[c]

CPP = critical peak pricing; RTP = real-time pricing; TOU = time of use.

What demand is responding?

- Lighting
- Space cooling
- Space heating
- Water heating
- Industrial process (non-critical)
- Irrigation
- At the limit: Whatever customer wants

Demand Response Potential

- Planners want to estimate **potential**
  - Technology
  - Customer behavior
  - Regulation (rate design, utility motivation)
  - Varies by time, season, base customer characteristics
- Assess **baseline**, measure departure from baseline

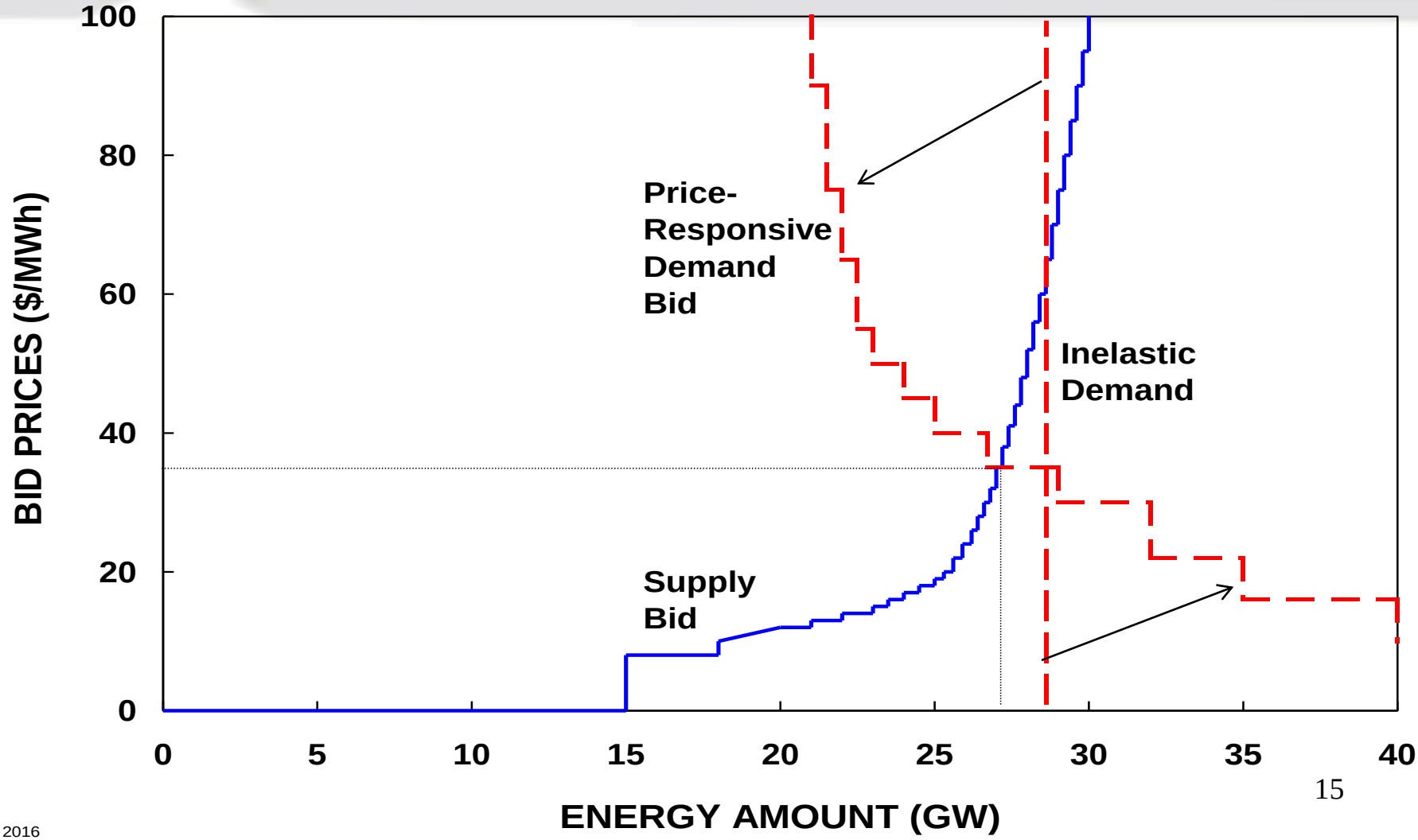
Reliability Factors

- Can operator count on demand response?
  - Persistence over a series of events
    - Operating decisions to ration resource
  - Customer acceptance over time
    - Fair (and perceived fair), understandable terms
  - Automation (set it and forget it)
    - Smart grid, radio
  - Contracts with liquidated damages

Demand Response Elements: Event and Trigger

- Demand Response can be characterized by an **event**
  - Reliability problem
  - Price spike
- And is released by a **trigger**

Tilting the Demand Curve



Including Demand Response in Capacity Markets

- ISO-New England and PJM
  - Bid-based capacity markets for future years
- Demand Response fully qualified to bid
  - With criteria for qualification and performance with liquidated damages
- Any place with a capability responsibility can award capacity value to demand response (and energy efficiency also)

Delivery of Demand Response

- Utility
- ISO/RTO
- Curtailment Service Provider
  - Where allowed
  - Market maker and specialist w/ customer relation
- Keys: Optimize DR quantity; sell customer on curtailment value and convenience
  - Customer behavior awareness

Energy Efficiency: Longer Term Demand Response

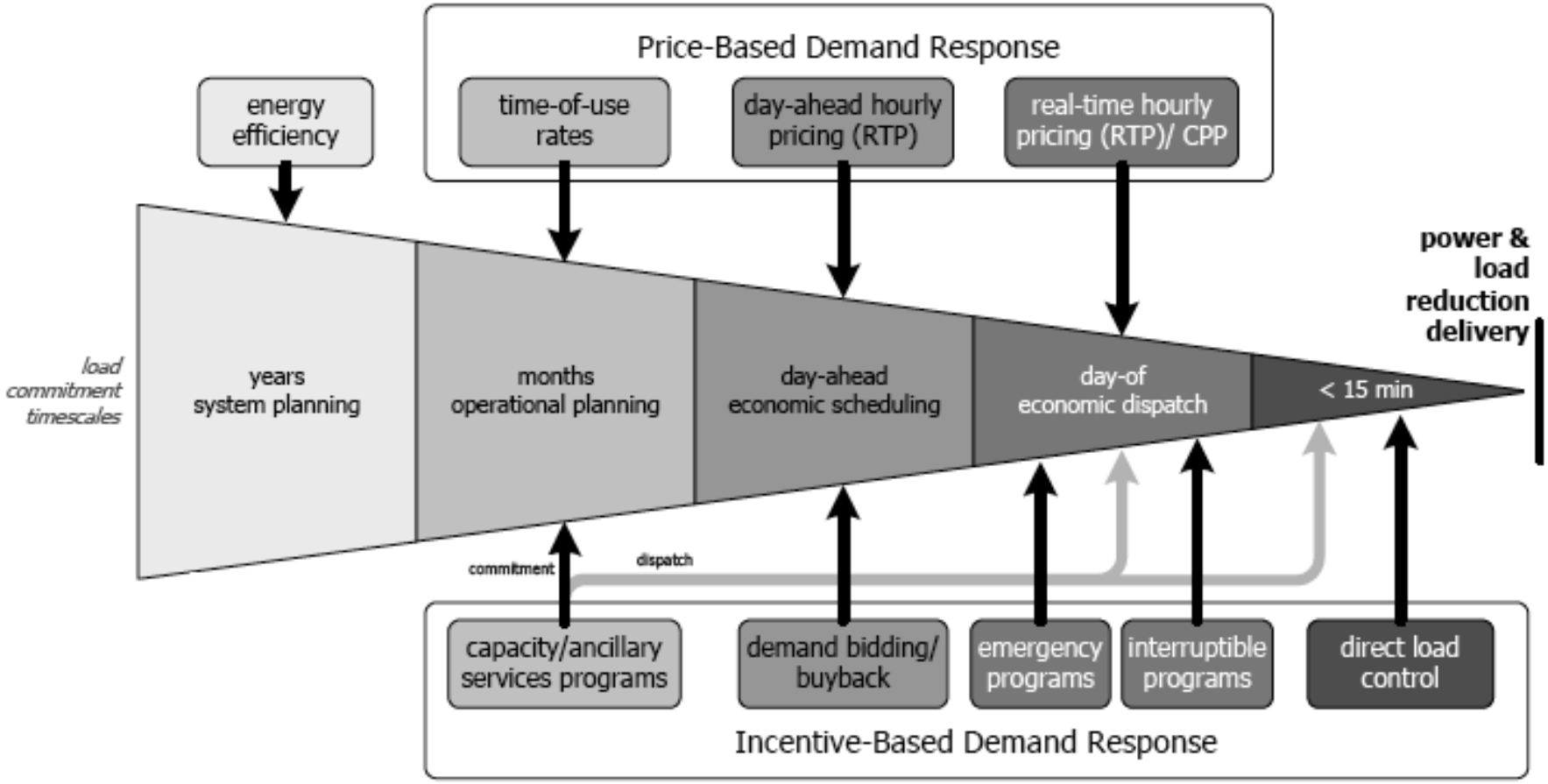


Figure 2-3. Role of Demand Response in Electric System Planning and Operations

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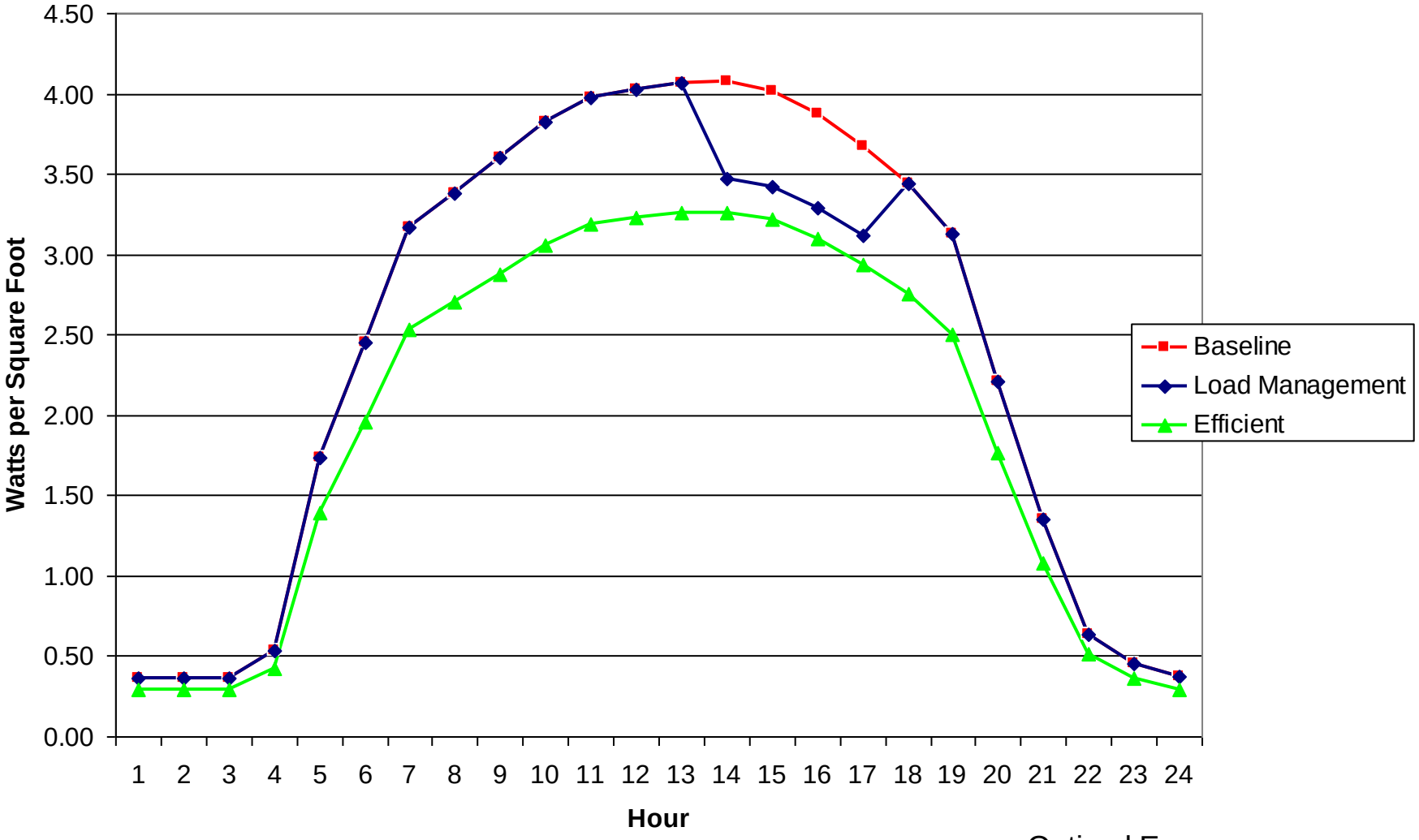
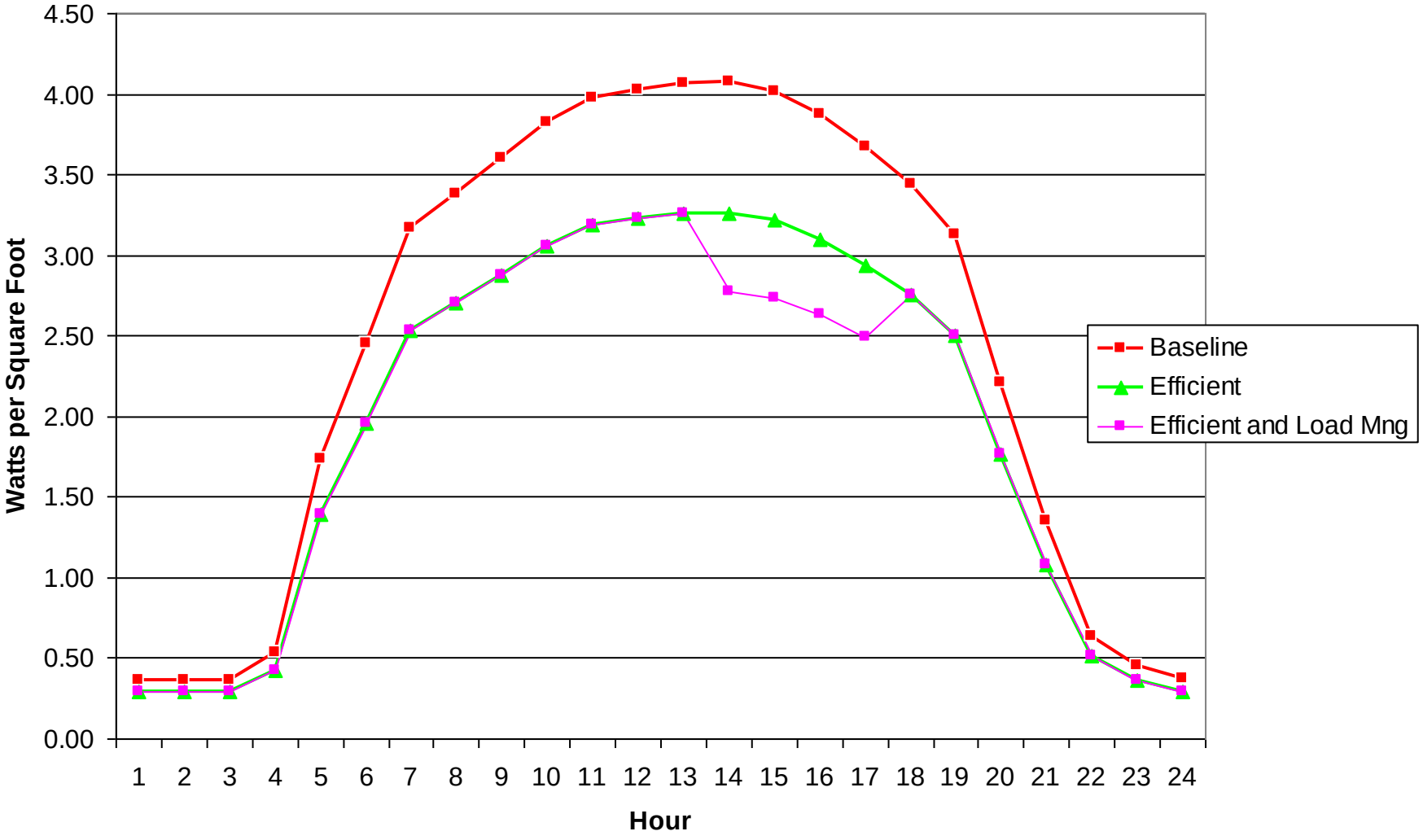
Combined Commercial Cooling and Lighting Loadshape
Baseline, Load Management (STDR), and Energy Efficiency



Optimal Energy

Combined Commercial Cooling and Lighting Loadshape
Baseline, Load Management (STDR), and Energy Efficiency



Pitfall for Demand Response: Dirty Back-up Generation

- What happens to curtailed demand?
  - Gone
  - Shifted in time
  - Substituted with on-site generation
- What if: Proliferation of on-site generation
  - A potential source of pollution, unless…
  - Output standards can guard against negative outcome – environmental regulators concerned

From ISO/RTO Council 2009 State of the Markets Report

- Presently, **31,695 MW** of demand response are available in ISO and RTO markets, up from 17,146 MW at the end of 2006. Such gains represent 6.6 percent of 2008 peak electricity demand within the regions combined.
- Demand response capacity resources have nearly tripled in the New England ISO and PJM territories, and resources providing ancillary services accounted for more than **4,000 MW** at the end of 2008. Such an infusion of demand response resources has aided in providing greater grid reliability, mitigation of generation market power, and an overall decline in fuel-adjusted power prices in organized wholesale markets.

Demand Response Policy Statements

- **MADRI** Policy: June 2006
- **OMS** Principles (MWDRI): November 2007
- See also **DOE** report to Congress in response to EPACT 2005: February 2006
- And look forward to **National Action Plan for Demand Response** from FERC: Final due June 2010

Thanks for your attention

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- RAP Mission: ***RAP is committed to fostering regulatory policies for the electric industry that encourage economic efficiency, protect environmental quality, assure system reliability, and allocate system benefits fairly to all customers.***