Energy Demand Response

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- This presentation represents my views and not those of the California Public Utilities Commission or any of its employees, or of NARUC
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What is Demand Response?

- Changes in electric demand in response to grid operator instruction or price signals
- Used in times of peak demand or electric reliability problems, and increasingly as for load reduction at all hours of the day
- Involves customer reductions in demand or shifts in consumption to off-peak times
- Two basic types of DR:
  - Economic/price responsive: Higher prices to discourage energy consumption at peak.
  - Reliability:
    - Grid operator allowed to remotely control consumption in exchange for incentive payment
    - Customer voluntarily agrees to curtailment in advance; penalties for not reaching agreed curtailment
  - Dynamic pricing: lowers consumption overall

Economic/Price Responsive Programs

- *Capacity bidding* – incentives based on actual reduction in use. Monthly bid for load reduction during events. Penalties for not delivering promised results.
- *Demand bidding* – incentives paid based on actual reduction. Day ahead bids, event-by-event. No penalty.
- *Peak time rebate* – Rebates paid for load reduction during event. Notification when events called. No penalty.

Reliability Programs

- Grid operator system emergency.
  - *Direct load control* - Grid operator controls energy consumption.
  - *Interruptible/curtailment* – Customers agree in advance to have energy curtailed at critical points.
    - Energy Crisis problems – large number of customers experienced curtailments, and opted out of programs thereafter. Took 5 years for any new Demand Response programs to come online.

Dynamic Pricing

- Electric rates discourage consumption at peak; rates reflect market conditions
  - *Critical Peak Pricing* – Higher rate when critical events announced by the grid operator – incentive is reduced rate during non-critical time. Temporary.
  - *Real Time Pricing* – rather that pay levelized rate, customer pays a rate close to actual hourly wholesale price of energy. Rate varies by day, temperature. Year round.
  - *Time of Use Pricing* – lower rates off-peak, higher rates on-peak. Not hourly like Real Time Pricing. Year round.

Why Demand Response?

- Climate change/may lower Greenhouse Gas emissions – heat storms of greater magnitude have increased focus on Demand Response in USA since 2001*
- Cheaper than building power plants
- Renewables integration
- Lower energy use
- Bill savings (not always)
- Helps keep lights on in times of shortage/emergency

* Hopper, N. *et al*., Lawrence Berkeley National Laboratory, "The Summer of 2006, A Milestone in the Ongoing Maturation of Demand Response," The Electricity Journal, Vol. 20, Issue 5 (June 2007), at 1, available at http://emp.lbl.gov/sites/all/files/REPORT%20lbnl%20-%2062754.pdf.

Why Demand Response? (2)

- Short lead times (months rather than years) to implement
- Some DR is fast responding; grid flexibility
- Reduction in market power: “the increase in demand-side resources facilitated by capacity auctions can reduce market power, because more suppliers and more resources means individual generators have less ability to affect bid offers and clearing prices.”*

** Gottstein, M. *et al*., Regulatory Assistance Project, “The Role of Forward Capacity Markets in Increasing Demand-Side and Other Low-Carbon Resources” (2010), at 12, available within http://www.caiso.com/Documents/BriefingBook-Long-TermResourceAdequacySummit.pdf

Concerns/Barriers

- Predictability issues – MWs may not show up if programs are voluntary.
- Subsidies necessary in short-medium term, with ratepayer cost impact.
- Customers not delivering promised reductions – so hard for grid operator to include Demand Response in forecasts. Energy utilities must do fair amount of customer outreach to ensure they deliver reductions – expensive*
- Hard to change customer behavior for savings that may seem elusive.** Only 4 percent of the residential customers of Northern California's electric utility residential customers are signed up for Air Conditioner Cycling and other demand response programs.***

* Hopper, N. *et al.*, *supra* slide 7, at 5.

** Freeman, Sullivan & Co., Energy and Environmental Economics, Inc. , California Independent System Operator Demand Response Barriers Study (FERC Order 719) (2009), at 43, available at http://www.caiso.com/2410/2410ca792b070.pdf.

*** California Public Utilities Commission, Policy and Planning Division, Briefing Paper: A Review of Current Issues with Long-Term Resource Adequacy (Feb. 20, 2013), at 25, available at http://www.caiso.com/Documents/CPUC-BriefingPaper-LongTermResourceAdequacySummit.pdf.

Concerns/Barriers (2)

- “Utilities and regulators underestimate the resistance among customers to allowing direct utility or government control of devices that impact their business or home environments”* (programmable thermostat example).
- Residential and small business customers may have limited ability to shift load.
- Time of use pricing not predictable – not applicable to residential/small business customers in CA (yet).
- “It is not always clear what load reduction will be obtained, how long the load reduction will be sustained, and how quickly the program will respond.”**

*Freeman, *supra* slide 8, at 43.
**CPUC Briefing Paper, *supra* slide 9, at 18.

Concerns/Barriers (3)

- May not solve "missing revenue problem" for generators as capacity market would
- Hard to predict amount of DR that will be available over longer term (5-7 years out), until programs are more ingrained. Calif. ISO: "[R]esources like demand response and energy efficiency are not well-suited to long-term procurement given customer curtailment and energy efficiency commitments cannot reasonably be made ten or more years into the future."*
- Concerns by grid operators that resources will not "show up" leads to differences in ISOs' willingness to "count" DR as a "real" resource. PJM and ISO-New England count it, CAISO more reluctant.**

*CAISO, Comprehensive Forward Capacity Procurement Framework (Feb. 26, 2013), http://www.caiso.com/Documents/CaliforniaISO-BriefingPaper-LongTermResourceAdequacySummit.pdf.

** Gottstein, M. *supra* slide 8, at 9, 11 ("[Demand response (including distributed generation) can now compete on a level playing field with generation in the ISO-NE and PJM forward capacity markets.").

Other Issues

- Opt in or opt out model – are all customers enrolled unless the opt not to be, or must customers affirmatively sign up for programs?
- Should payments for use of programs be in form of energy rate discounts/variations or explicit subsidies such as rebates or incentive payments?

Best Practices

- Planning – FERC National Action Plan on Demand Response, 2010 http://www.ferc.gov/legal/staff-reports/06-17-10-demand-response.pdf, California Energy Action Plan (making DR a preferred resource), http://www.energy.ca.gov/energy_action_plan/
- Advanced metering (smart meters) can aid implementation, especially dynamic pricing
  - "FERC in 2009 concluded that with demand-response resources, peak electric demand in the United States could be cut 38 to 188 GW. This would occur if all customers had advanced metering and the ability to respond to price incentives"*

*Ferrey, S., The Sustainable Corporation: Article: The New Climate Metric: The Sustainable Corporation and Energy, 46 Wake Forest L. Rev. 383, 410-11 (2011)

Best Practices (2)

- Avoid Demand Response programs that are not cost-effective. Ratepayers cannot afford programs that do not meet this basic requirement
  - And programs should be evaluated both before (forecast) and after (track record) implementation to ensure cost-effectiveness
- In procurement planning, Demand Response resources must be counted, and not just serve as an expensive “insurance policy” for reliability
- Demand Response programs should be prioritized (along with Energy Efficiency) above power plant construction