
Consumer and Environmental Benefits of Load Response

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Keeping the Lights on and the Air Clean

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Load response is good – *if we make it so*

- The promise:
 - Market efficiency
 - Lower prices for all
 - Opportunities low emission alternatives to grid power
 - Emission reductions through power system optimization
 - Reliability
- The threat:
 - “Load response programs” without demand elasticity
 - Missed opportunities for innovation and load reduction
 - “Dirty Little Diesels” operating on bad air days
- Where we end up depends on the questions we ask, what we learn, and what we do with our learning.



Seizing the Opportunity: the Northeast Load Response Initiative

- Project includes UCS, Pace Energy Project and Project for Sustainable FERC Energy Policy
- Goal: Encourage load response AND ensure that it's consistent with long term goal of environmental quality
 - Focus on load response programs as first step
 - Broaden discussion to include environmental issues associated with load response as well as economic and reliability issues.
 - Unique perspective in market participant discussions
- Coordination in Northeast to identify and encourage best practices consistent with goal

Overview of Load Response

- Electricity consumer(s) *responding* to outside indicators by changing their grid electricity usage (“load”).
- Indicators:
 - Economic – e.g. bills, prices, payments, shared savings
 - Power system conditions – e.g. reliability
- Methods:
 - Shift load off peak – load management
 - Shift load to non-grid power source – customer-site generation
 - Reduce peak load – energy efficiency, conservation
- Tools:
 - Signal to consumer
 - Measure change in load



*(Un)*Necessary Components of Load Response

- Reason for customer to change usage - signal to consumer
 - Economic
 - Mechanical
- Load response doesn't *require* real-time pricing
- Method to measure change in load
- Load response doesn't *require* interval metering

Why Load Response?

Old Idea + Evolving Technology + New Urgency

“Spot Pricing of Electricity,” Fred Schweppe, et al 1988

Load control from the 1970s enhanced with developments of microprocessors and electronic communications

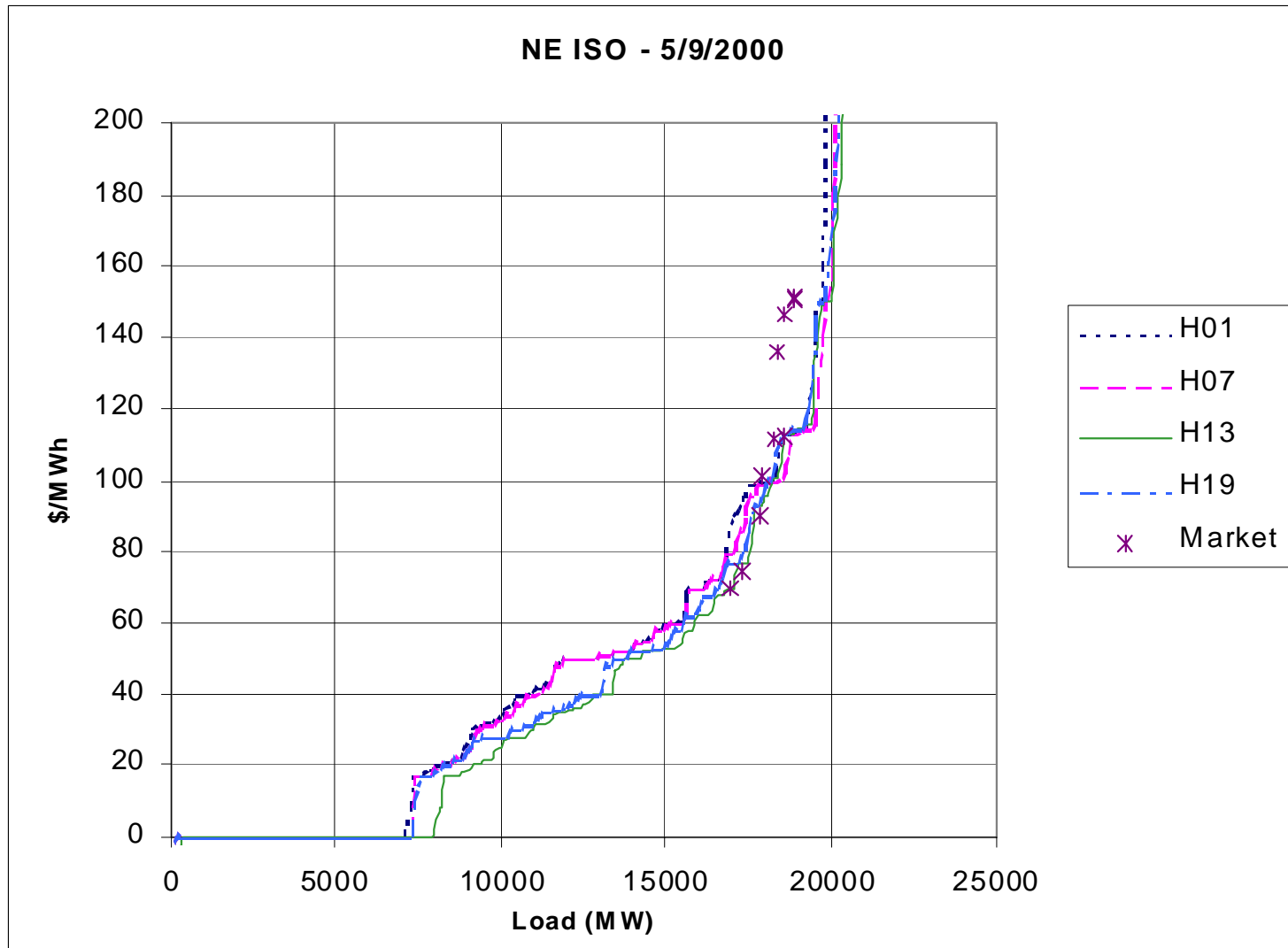
Bid based wholesale markets with price volatility and system reliability problems

Consumer “qua consumer” benefits

- All consumers can benefit
 - Lower peak load – lower peak prices
 - Market discipline – less opportunity for market manipulation
 - Reliability
 - System optimization

- Individual consumers can benefit
 - Avoid peak prices
 - Various “incentives” – shared savings, payment, etc.
 - Better electrical service

Load response reduces market price



Environmental benefits (*we hope!*)

- Direct – No- or low-emission resources
 - Energy efficiency
 - Improved load management
 - New technologies and applications
- Indirect – System optimization
 - Displacement
 - Reserves
 - Ramp-up and ramp-down for peak

Improving system operations

- ISO NE analyses project emissions reductions from meeting reserve requirements with customer-site DG.
- Results for 300 MW case (presented to NE air regulators 11-00):
 - Total Production Cost Savings: \$17 Million (Minimum)
 - ◆ \$7 Million Ozone Season
 - ◆ \$10 Million Non-Ozone Season
 - Total Annual Reduction in SO₂ Emissions: 88 Tons
 - ◆ (26) Tons Ozone Season
 - ◆ 114 Tons Non-Ozone Season
 - Total Annual Reduction in CO₂ Emissions: 268 Ktons
 - ◆ 114 Ktons Ozone Season
 - ◆ 154 Ktons Non-Ozone Season
 - Total Annual Reduction in NO_x Emissions: 390 Tons
 - ◆ 214 Tons Ozone Season
 - ◆ 176 Tons Non-Ozone Season



Northeast load response initiative – focus areas

- Assess and address environmental impacts
 - Environmental regulation
 - Avoid bias towards generation
 - Resolve unanswered questions
- Broaden participation to small and medium customers
 - Metering and statistical methods
 - Load profiling
 - Load response aggregation, ...
- Ensure demand bidding
- Understand gaming and free/riders
- Establish load response participation targets
- Expand use of load response: reserves, capacity credit
- Program review

Next steps

- Program review (successes and failures)
- Environmental regulatory action
 - New regulations for a new context
 - Competitive efficiency
 - Integration of load response into the market
- Answers to questions
 - How do customers act in load response programs?
 - What's the load response supply curve?
 - What are the direct emissions impacts of load response?
 - How does load response, especially DG, interact with the power system?
 - What are the barriers to no- and low-emission load response options?

