Demand-Side Resources and Electricity Markets
A Policy Agenda for New England

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4 Basic Points

(1) Load growth and current market structures are causing serious problems;

(2) The pain is unnecessary: efficiency and load management offer low-cost, cleaner, reliable solutions;

(3) Market reforms will enable demand responses to stabilize power markets;

(4) "Baseload efficiency" is also critical -- market, governmental, and regulatory actions needed here too.
New Problem #1: Price Spikes
Weekly peaks vary by 50%

NEPOOL Weekly Peak Loads
May 1, 1999 through July 21, 2000
While weekly peak PRICES vary by 10,000%!

NEPOOL Weekly High Spot Prices
May 1, 1999 through July 21, 2000

While weekly peak PRICES vary by 10,000%!
New Problem #2: Market Power

Market Power: "The ability of a producer to affect prices through output or pricing (bidding) decisions"

High prices in thin markets -- higher than effective competition would produce

California: + $10 Billion and counting

Rising concentration in generating capacity:
- Just 10 companies now control > 50% of IOU generating capacity; The largest 20 companies control more than 72%
- In regional markets, it's even higher
- We're back to 1935
New Problem #3: Reliability

- Outages, warnings, close calls in several regions
- Symptoms vary:
  - Transmission overload (West-wide)
  - Generation adequacy (NE, CA 2000)
  - Load pocket peak (SF 2000)
  - Distribution overload (Chicago, NY 1999)
- Causes vary, too -- but all are related to growing loads
New Problem #4: Monopoly without portfolio management

- Half of the nation: still in franchise
- The other half: Power supply is 95% default service (a monopoly)
- Everywhere:
  - Wires -- 100% monopoly
  - System operation, reliability rules are centralized, regulated operations
- IRP left behind, but
- Portfolio management still essential
Strategic Energy Choices

- A. Supply-side facilities
- B. Reforming energy markets
  - Demand-side bidding, price-responsive load at wholesale
  - Real time pricing at retail
- C. End-use energy efficiency
  - Market transformation, utility, and governmental programs
- D. Portfolio management: all of the above
Challenge for NE ISO

- Wholesale rates and markets are not "just and reasonable" if structural flaws impose unnecessarily high costs on consumers.

- Costs will be unnecessarily high unless the wholesale market is structured to allow LSEs and demand-side managers to realize the wholesale value of their services.

- To realize those values, the wholesale market must: (a) remove cross-subsidies and barriers that undermine cost-effective efficiency and load management; (b) include demand-side bidding; and (c) support cost-effective energy efficiency investments.
Sales up 31% last decade;
---another 37% in this decade?

Peak loads growing rapidly
- summer peak up 56,000 MW in 4 years
- NERC predicts +160,000 MW, 1999-2010
- We're adding the electrical equivalent of an entire New England every 14 to 18 months

DOE forecast: adding the equivalent of Japan and Germany to the US grid by 2020

Can we build and run over 300,000 MW of new capacity? What are the transmission, emission and cost consequences?
Reliability Myth: It's All About Supply

Retail Sales (GWH): 2,861,462, 2,934,517, 3,008,641, 3,097,810, 3,139,826

DSM Energy Savings (GWH): 35,563, 45,294, 52,483, 57,421, 61,842, 66,406
Lighten the Load

- Demand-side initiatives will help with all four problems: price spikes, market power, reliability, and portfolio balance
- Exclusive supply side focus: the never-ending problem of weakest links
- Demand-side resources: can be cheaper, cleaner, faster
- Reliability benefits for the entire network -- from local wires to regional fuel supply
- Power cost benefits, too
Competition Myth: Load Will Respond to System Costs

- Customers see average prices, and they see them long after consumption
- Few customers on interval meters or real-time prices
- Many generation and reliability costs are socialized
- Low, fixed default service prices blunt customer interest in both EE & LM
- Historic market barriers to efficiency remain: first-cost, discount rates, information barriers etc.
More Anti-efficiency practices

- **Load profiling by pools or RTOs**
  - An LSE charged for usage on a customer profiled basis will not benefit from high-value peak-load reductions unless a new profile is created for those customers.

- **Reliability rules and practices**
  - Favor turbines and wires solutions--
  - "Dispatchable load" often cannot compete fairly with generation in ancillary services markets.
  - Demand-side options not permitted to compete with generation and wires for uplift and other "socialized" support.
Discovering the Demand Curve

- Demand Curve
- Supply Curve
- Assumed Demand

Price

- $P_1$
- $P_2$

Quantity

- $Q_2$
- $Q_1$
Solution Menu (A): Wholesale Market Features

➢ (1) Demand-Side Bidding:
   - Price-sensitive load bids reveal a real demand curve
   - Reform load profiles to support demand mgt

➢ (2) Multi-Settlement Markets:
   - Day-ahead settlement permits economic resales of load reductions

➢ (3) Demand-Side Reserves:
   - "Dispatchable load" as an ancillary service

➢ (4) Efficient Reliability Standard:
   - Least-cost approach to reliability charges
1% of hours = 16% of annual spot power costs

New England Spot Energy Prices
12 Months Ending July 21, 2000

Max = $6000/MWh, May 8, 2000
1% of hours above $73/MWh
Top 1% of Prices equal 15.8% Wholesale Costs (weighted by load)
Load Response Reservoir

- SAIC study of responses to real-time prices (1995):
  - ~17% of peak load is discretionary and could respond to price signals

- E-Source survey of large firm energy managers (2000):
  - ~15% of large-firm load could be price-responsive in the short run

- **Key concept:** demand buy-back markets
New Business Model

POWER MONITOR

RESIDENTIAL ENERGY LOAD

METER

TRANSMISSION/DISTRIBUTION

GEN

GEN

ENERGY SERVICE PROVIDER

AMR, Billing, Payment

INTERNET

Free ISP Service

PowerPortal Channel Services

Customer Site

Customer Site
Reforming Load Profiles

- LSEs charged for usage on a customer profile basis
- LSE does not benefit from high-value peak-load reductions unless a new profile is created for those customers
- LSEs don't see real time prices
- LSEs cannot capture benefits of efficiency or LM
Before "socializing" the costs of a proposed reliability-enhancing investment through uplift or tariff, PUCs and FERC should first require a showing:

- that the relevant market is fully open to demand-side as well as supply resources;
- that the proposed investment is the lowest cost, reasonably-available means to correct a remaining market failure; and
- that benefits from the investment will be widespread, and thus appropriate for broad-based funding.
Solution Menu (B):
Rates and Rules for the Wires

(5) Transmission Congestion Pricing:
- reveals value of DG, EE, and LM

(6) Enhancing Reliability Through Retail Rate Design:
- Artificial price caps and default plans harm efficiency and reliability
- Revenue caps, not rate caps, for wires companies
Solution Menu (C): Promoting End-Use Efficiency

- **(7) System Benefit funds**
  - Several examples: e.g., NYSERDA

- **(8) Energy Efficiency Utility and other regulated DSM programs**
  - Key example: Vermont Efficiency Utility
  - Utility programs and standards- Texas 10%

- **(9) Codes, standards, and market transformation programs**
  - Regional uplift could enhance reliability, lower power costs
Old Lessons...Again

- Productivity and environmental quality -- still count
- Market failures -- still real
- Peak response AND "baseload efficiency" -- both still needed
- Resource Portfolio Management -- IRP in a new light
DSM: Peak management AND Baseload Efficiency
Efficiency -- A Proven Resource

- Utility DSM programs delivered 29,000 MW savings at a grid cost of 2 to 3 cents per kwh
- Codes and standards have delivered more
- Modular, dispersed, many technologies
- Efficiency lowers customer bills, and lowers the price spikes for everyone
- Lowest in pollution
- Efficiency relieves stressed distribution, generation and transmission constraints
- Programs can be tailored for each market
Who will promote efficiency in today's electric industry?

- Generators profit from high loads and thin markets
- Peakers REQUIRE high prices
- Franchises: getting lean for the future
- Wires companies with rate caps or freezes can be addicted to throughput
  - Lost profits math: a 5% increase in sales can increase profits by more than 50%!
- RTOs, Transcos, FERC: No tradition of support for efficiency
The Efficiency Reservoir

➢ DOE "Five Labs" Study (1997):
  - Cost-effective DSM potential is 15% of total load by the end of this decade

➢ Utility filings in current NJ docket --
  - Available, cost-effective savings potential is as much as 30% of total load

➢ ACEEE studies, summer 2000:
  - At least 64,000 MW available cost-effectively by 2010 from just three program areas:
    - Residential A/C upgrades, repairs
    - Commercial HVAC equipment and tuneups
    - Commercial lighting design and upgrades
The Public Value of Efficiency

Assumed Demand

Shaded area is savings to wholesale market

Price

\( P_1 \)

\( P_2 \)

Quantity

\( Q_2 \)

\( Q_1 \)
The Public Value of Efficiency

- Tracking CA PX Prices ('98-'99)

- 1 MW baseload reduction saves participating customers $219,000

- AND it also saves non-participating customers $658,000 by lowering market clearing prices in the PX for everyone

- "Public savings" $.075/kwh, or three times the direct savings

(Rich Ferguson, CEERT 2000)
Uplift charges are a common element in pool rules and new markets.

Examples: spreading out the costs of congestion; paying for reliability measures that have widespread value.

Question: If the new RTO/ISO/Pool has power to assess "uplift" for imports, reserves or transmission to enhance reliability, why not for efficiency, load management, or DG?
And finally...

- Two bags of savings:
  - Market efficiency and
  - Energy efficiency
- Why trade in one to get the other when we can get both?