Reliability and Standard Market Design
(Wholesale Power Market Platform)

A Square Plug and a Round Socket

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The Power System

• First and foremost: It is a SYSTEM
  – Made up of various elements
    • Wires/Transformers/Phase Angle Regulators
    • And generation CAPACITY (not energy)
  – Designed and built to deliver reliable energy supply
  – Design parameters determined by the physical characteristics of the power SYSTEM

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Reliability

• Requires Redundancy
  – Failure of single SYSTEM element should not lead to failure of the entire system
• Redundancy equates to oversupply
• Oversupply results in:
  – Prices at marginal cost of production
  – Inadequate return on capital investment
  – Economic failure of suppliers

Competitive Markets

• Require:
  – Elastic supply and demand
  – Scarcity pricing to:
    • Attract new investment
    • Motivate demand reaction
  – Oversupply to ‘weed out’ uneconomic resources
  – Transparent pricing
Square Plug – Round Socket

- Scarcity leads to:
  - Lower level of reliability
  - In clearing markets, politically untenable volatility and perceived transfer of wealth
- Oversupply leads to
  - Adequate or better reliability
  - Inadequate return on invested capital
- Which leads to scarcity

The Result of the Market Failure

NYMEX Analysis of Credit Quality
Market Failure
What Happened?

• Conventional wisdom
  – Over supply caused by overbuilding
  – Poor financial structure (too much debt not enough equity)
  – Bust phase of boom bust cycle
  – Poor behavior (just deserts?)

• AND the market design is seriously flawed
  – An analysis of the New England 2002 Load Duration Curve demonstrates the flaws

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Basic Assumptions

- 2002 load data
- System peak of approximately 26,000 MWs
- Capacity reserve requirement of 12%
- Total capacity requirement 29,000 MWs
- Demarcation between base load and other resources \textit{arbitrarily} chosen at 15,000 MWs
Analysis of Curve

- 29,000 MWs of capacity is a **REQUIREMENT** to assure reliability.
- The first 15,000 MWs represent the ‘true’ commodity portion of the curve.
- The Top 14,000 MWs will **NEVER** exhibit the properties of a commodity.
- There is **NO** competitive industry that can rationalize building 48% of its capacity to operate at a 7.5% **Capacity Factor** to serve 7.0% of its load…” U.S. refineries are operating at 87.5 percent of capacity, far below the five-year average of 92.3 percent, according to the department *(Reuters - 2/28/2003)*
- An analysis of the top 500 Hrs (energy supplied by peakers) shows a revenue requirement in excess of $400/MWhr above fuel cost to recover capital costs and a reasonable return.
Cost/Revenue Analysis

E-Acumen Study
Top 500 Hours
Adequacy Resources

E-Acumen Study on Levelized Cost of Peaking Unit

• Commissioned by ISO-NE
  – Report issued on December 10, 2001
• Assumed capital cost of $413/Kw
  – Considered low based on CEE experience
• Results in levelized margin requirement of $74/Kw-yr excluding fuel and variable O&M
• Full report available at:
  www.iso-ne.com/special_studies/Other_Special_Studies/
**Analysis of Top 500 Hour Margin Requirements**

Capacity requirement
6500 MWs

Margin requirement based on E-Acumen Report
$74/KW-yr

**Total margin requirement**
$74,000/MW-yr * 6,500 MW = $481 Million/yr

**Total delivered energy**
1,163,000 MWHrs

**Required margin above fuel and O&M**
481,000/1163 = $414/MWHR

**Actual weighted average clearing price**
$90/MWHr

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Analysis of Adequacy Resource Margin Requirement

Capacity value
$300/KW

Margin requirement based on E-Acumen report

\[
\frac{300}{413} \times 74 = \frac{54}{KW\text{-yr}}
\]

Total margin requirement

$54,000/MW\text{-yr} \times 14,000 \text{ MW} = $756 \text{ Million/yr}

Total delivered energy in top 4000 hours

9.1 Million MWHRs

Required margin above fuel and O&M

\[
\frac{756}{9.1} = $83/MW\text{hr}
\]

Actual weighted average clearing price = $53.20/MW\text{hr}

Ancillary service = $10.00/MW\text{hr}

Total revenue = $63.20/MW\text{hr} (includes fuel +O&M)

Adequacy Revenue Requirement
The Market Design is Flawed

• The current market design does **NOT** pay for reliability
  – It fails to compensate generation for capital at risk.
  – It fails to address the fact that almost half the capacity supplies less than 10% of the energy.

• Without a significant change in the market design the current liquidity crisis can only grow and the possibility of a reliability crisis only looms larger because of:
  – Economic failure of current participants.
  – Failure to attract new entrants.

Fixing the Problem

• The Power System is a **SYSTEM**
  – The power system consists of various elements required to maintain reliability
  – Capacity could be viewed as an element of a reliable power system equivalent to transmission
  – The decision process necessary to resolve a reliability problem would include either capacity or transmission alternatives or both.

• Competitive energy markets would be operated under the umbrella of a reliably designed **POWER SYSTEM**

• Think of the US Highway **SYSTEM** as an analog

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Competitive Procurement

A market based approach to fixing the problem

Competitive Procurement (1)

- The ‘Reliability Authority’ is charged with procuring ALL the resources required to assure a reliable Power System
- Procurement would be through a ‘Competitive RFP Process’
- Resources would be procured under ‘long term’ contracts (10 years plus/minus)
- A percentage of these contracts roll off every year and the requirement subject to re-bidding
- ‘Reliability Authority’ would collect costs through a rate design

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Competitive Procurement (2)

• Reliability Authority is charged with the responsibility of determining the services required
  – The Power System configuration should be determined by the physical characteristics as well as the economics
• Winners of the contracts would be required to provide ‘reliability services’
  – Capacity/reserve; voltage support; regulation; etc
• All resources could bid to provide services
  – Load
  – Generation
  – Transmission

Competitive Procurement (3)

• Providers are contractually bound to provide services
• Penalties for failure are subject to contract terms and conditions
• The energy/congestion markets as currently executed in the Northeast will remain intact.
• The procurement would require input from stakeholders
Advantages of Competitive Procurement

• Length of commitment by ‘Reliability Authority’ encourages entry and may reduce cost of capital
• Because contracts ‘roll off’ and are subject to periodic re-bid – stranded cost exposure is limited
• The ‘right’ resources in the ‘right’ places
• Encourages retail competition because cost/risk of entry and exit are significantly reduced
• Reduces number of products but simplifies and thus increases liquidity of remaining products (energy/congestion)

Concerns with Competitive Procurement

• Requires that a planning function be vested with the ‘Reliability Authority’
• Implementation may be difficult (transition issues/market uncertainty/etc.)
• Smacks of ‘IRP’
• Reduces number of traded products
• May introduce ‘stranded cost’
Fixing the Problem

• Requires collaborative process
• Should build on current work
  – Resource Adequacy Market (RAM) Group
  – NYISO ICAP Working Group
  – Power System Resource Adequacy WG (ISO-NE)
  – Applicable for all the 3 Northeast Pools
• Time is of the essence

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