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

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

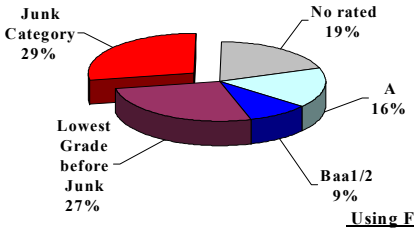
- Scarcity leads to:
  - Lower level of reliability
  - In clearing markets, politically untenable volatility and perceived transfer of wealth
- Oversupply leads to
  - Adequate or better reliability
  - Inadequate return on invested capital
- Which leads to scarcity

The Result of the Market Failure

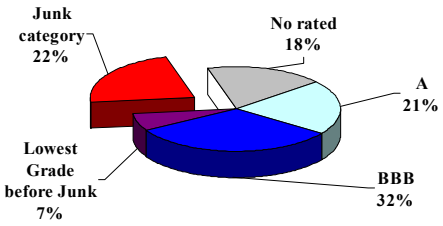
NYMEX Analysis of Credit Quality

NEPOOL Summer Capacity 2001 ~ 27,500MWs

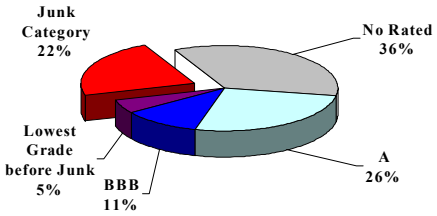
Using Moody's Unsecured Debt



Using S&P LT Issuer Credit

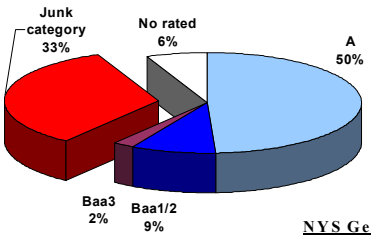


Using Fitch Senior Debt

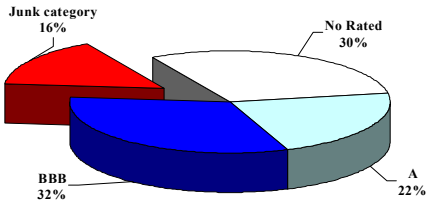


NYS Generation Summer Capacity 2001

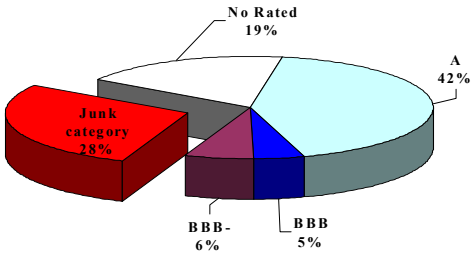
NYS Generation Summer Capacity 2001 Using Moody's Senior Unsecured Debt



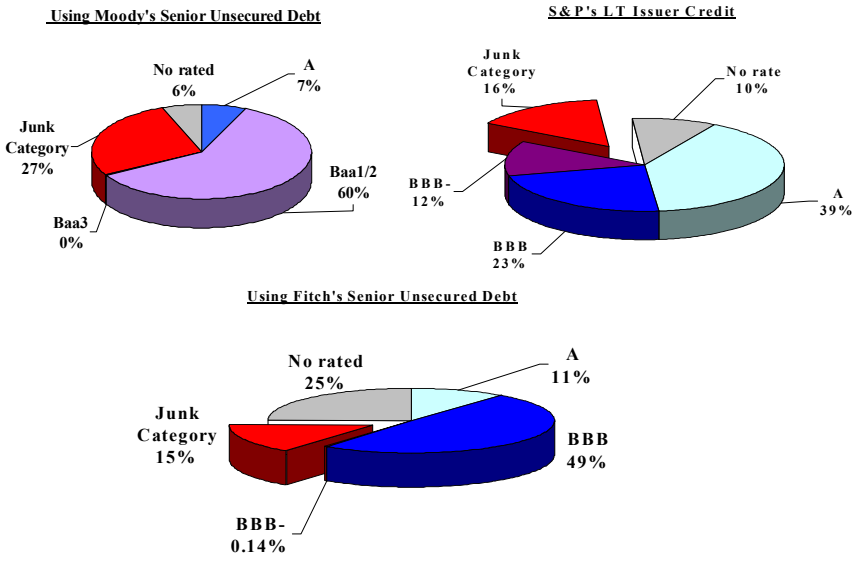
NYS Generation Summer Capacity 2001 Using S&P Long Term Issuer Credit



NYS Generation Summer Capacity 2001 Using Fitch Senior Unsecured Debt



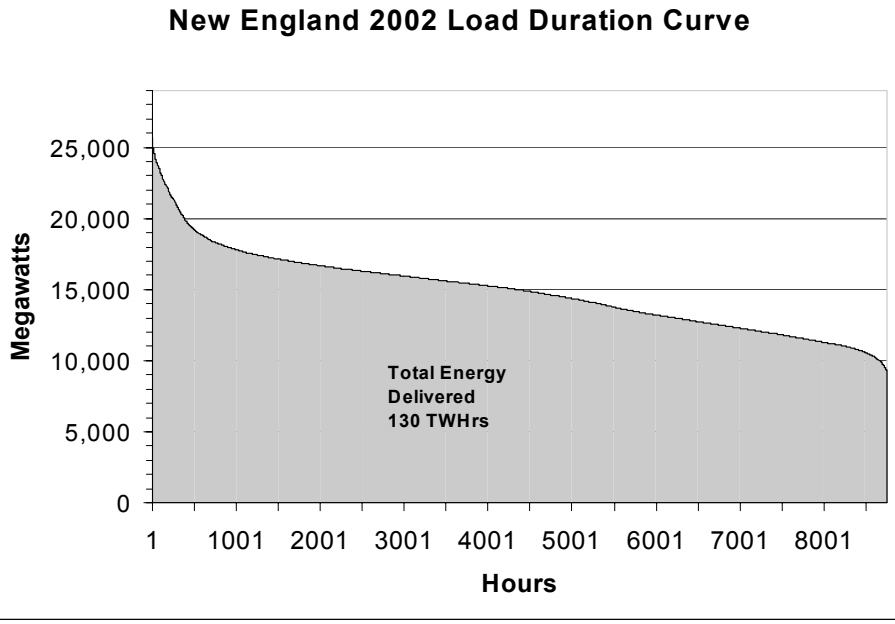
PJM Summer Capacity 2001 ~ 58,000MWs



Compiled by the NYMEX Research Department

Market Failure
What Happened?

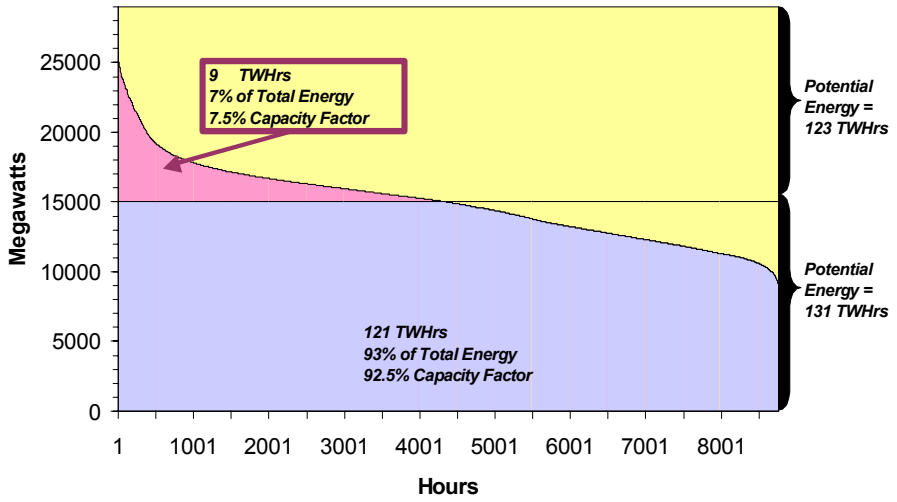
- Conventional wisdom
  - Over supply caused by overbuilding
  - Poor financial structure (too much debt not enough equity)
  - Bust phase of boom bust cycle
  - Poor behavior (just deserts?)
- **AND** the market design is seriously flawed
  - An analysis of the New England 2002 Load Duration Curve demonstrates the flaws



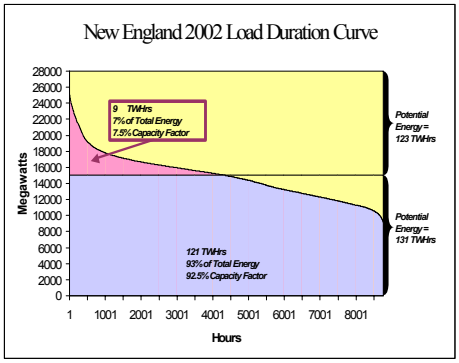
Basic Assumptions

- 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 a*rbitrarily* chosen at 15,000 MWs

New England 2002 Load Duration Curve



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

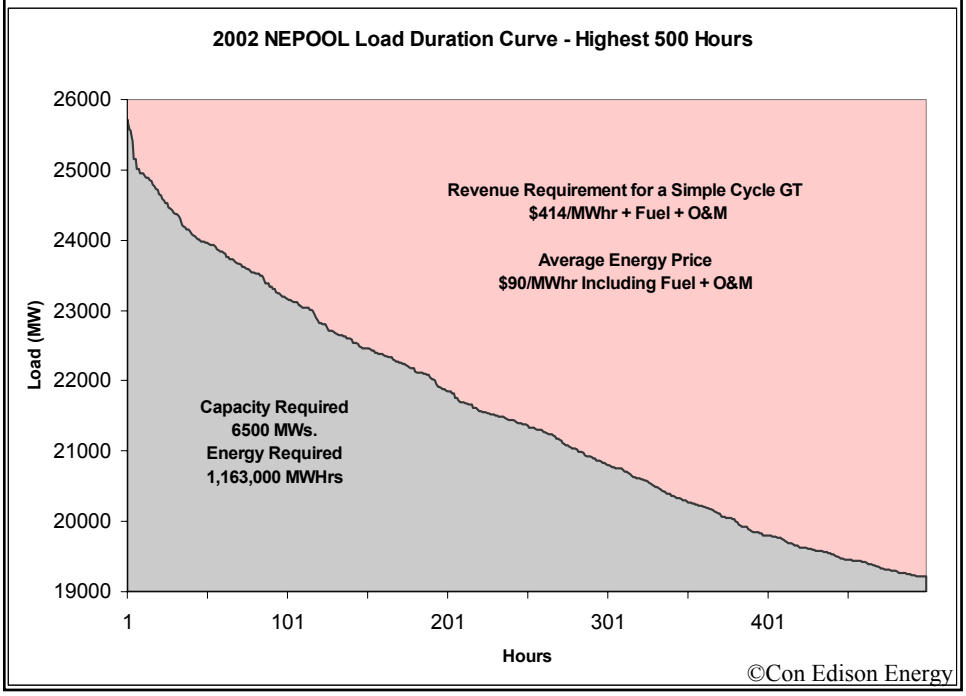
1,163,000 MWHRs

Required margin above fuel and O&M

481,000/1163 = **$414/MWHr**

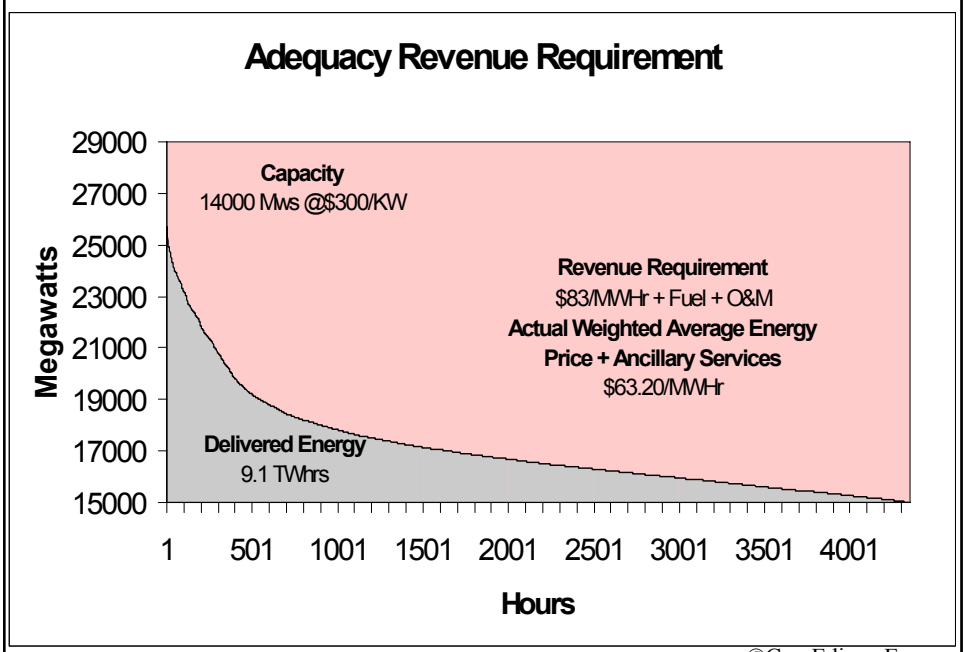
Actual weighted average clearing price

$90/MWHr



Analysis of Adequacy Resource Margin Requirement

Capacity value
$300/KW
Margin requirement based on E-Acumen report
(300/413)*74 = $54/KW-yr
Total margin requirement
$54,000/MW-yr * 14,000 MW = $756 Million/yr
Total delivered energy in top 4000 hours
9.1 Million MWHRs
Required margin above fuel and O&M
756/9.1 = **$83/MWHr**
Actual weighted average clearing price = $53.20/MWHr
Ancillary service = $10.00/MWHr
Total revenue = $63.20/MWHr (includes fuel +O&M)



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

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

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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