NYISO 2003 PRL Program Evaluation Summary

Presented to

NYISO PRL WG

Neenan Associates

12/11/2003

August 14th Blackout Recovery Process

- EDRP and SCR called on August 15th (HB09 – HB22) and August 16th (HB12 – HB19)
- According to system operators every MW of load taken off the system allowed another MW to come up faster during the rebuilding process
- Even with these curtailments, load still had to be shed during some hours on August 15th

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Emergency Curtailment Valuation (1)

- **The standard practice**
  - **Establish a range of representative VOLL values**
    - **Rolling blackouts tend to temper costs of those effected**
    - **Thus, lower range of values ($1.00 to $2.50 may be most reasonable)**
  - **Establish LOLP improvement associated with DR curtailments**
    - **Standard is operating reserve margin**
    - **Generally confined short periods**
    - **Usually 2-5% of total system load**
  - **Estimate load at risk**
    - **Usually relatively confined - 2-5%**
- **Result Value = LOLP improvement * load at risk * VOLL**

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Emergency Curtailment Valuation (2)

- System rebuild situation Customer *without* power
  - VOLL reflects extension of an already long period without power at their premise, and at any local or convenient premise
    - The upper range of values is more appropriate ($5.00-10/kWh
  - For customers without power LOLP = 1 (dark to light)
  - Load risk is their entire load restored

- System rebuild situation Customer *with* power
  - An outage after restoration would be more costly than a typical rolling, short duration blackout
  - LOLP change might be greater than under typical curtailments due to lack of system stability
  - Load at risk may be localized, but higher than normal, and subject to a full curtailment

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Methodology for Estimating Reliability Benefits (3)

- **System Rebuild State**
  - In the case when the system was not entirely recovered, and unsaved load exceeds the DR curtailed
    - **Change in LOLP = 1**
    - **High VOLL applies ($5.0/kWh)**
    - **Load at risk = DR curtailments**
- **Recovered System state**
  - When the system had been fully re-energized, DR contribute to reestablishing and maintaining design reserve margin
    - **Utilize the same methods that were employed in previous years**
      - **Assume 20% improvement in LOLP**
      - **Assume EUE of 5% of load served**
    - **But, use high VOLL ($5.00/kWh) given value to get service back**

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Estimates of Reliability Benefits

Outage cost = $5,000/MW

Date	System State	Benefit
August 15	**Recovering**	$50.8 Million
August 16	**Fully Recovered**	$3.5 Million

Total August event curtailment payments = $7.5 Million

August 15 $5.9 million

August 16 $1.7 million

- Gross Benefits of August DR Curtailments
  - Fully Recovered value places a lower bound on the value of DR curtailments
  - Recovering places an upper bound on the that value
- Benefits Net of Payments
  - Fully recovered and low VOLL yields B/C = **1.5**
  - Recovering and high VOLL yields B/C = **9.0**

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Market Price Impacts for EDRP Summer 2001 - 2003

	EDRP Curtailed MWHs	Collateral Savings ($M)	Reduced Hedge Cost ($M)	Reliability Benefits ($M)	Program Payments ($M)
2001	8,159	13.0	3.9	20.1	4.2
2002	6,632	0.5	0.3	4.8	3.3
2003	6,665	NA	NA	14.3	3.8

- For comparison purposes, attempted to adjust 2003 numbers to reflect only EDRP

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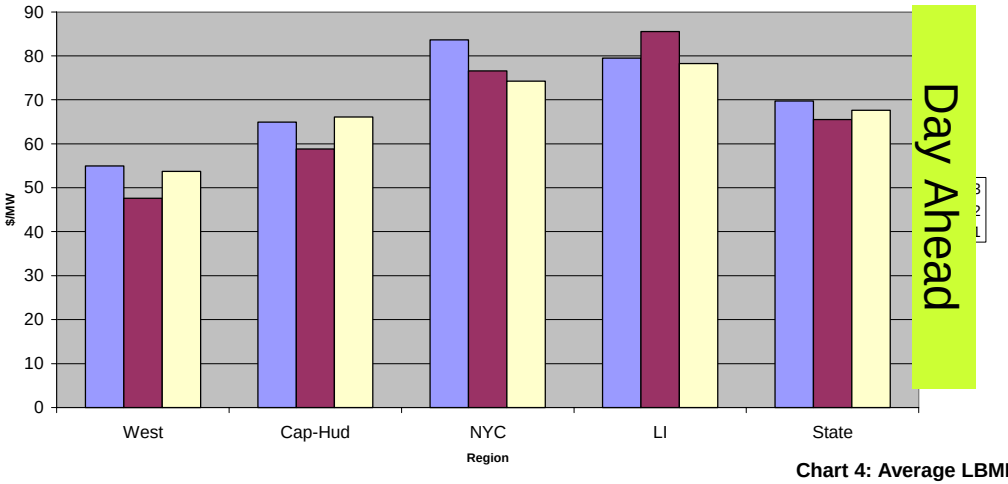
Summer 2003 NYISO Average Prices

Chart 3: Average LBMPs in New York's Day-Ahead Electricity Market, by Region and Year (Summer Months, noon through 7:00pm)

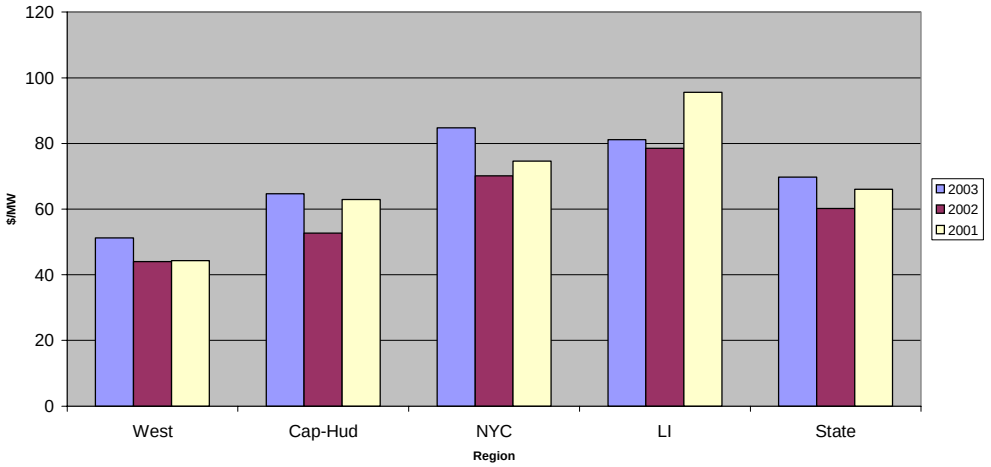


Day Ahead

2001
2002
2003

Real Time

Chart 4: Average LBMPs in New York's Real Time Electricity Market, by Region and Year (Summer Months, noon through 7:00pm)



- **Statewide average prices higher in 2003 in both RTM and DAM, not so in all zones**

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Summer 2003 NYISO Price Volatility

Chart 5: Relative Variability in LBMPs in New York's Day-Ahead Electricity Market, by Region and Year
(Summer Months, noon through 7:00pm)

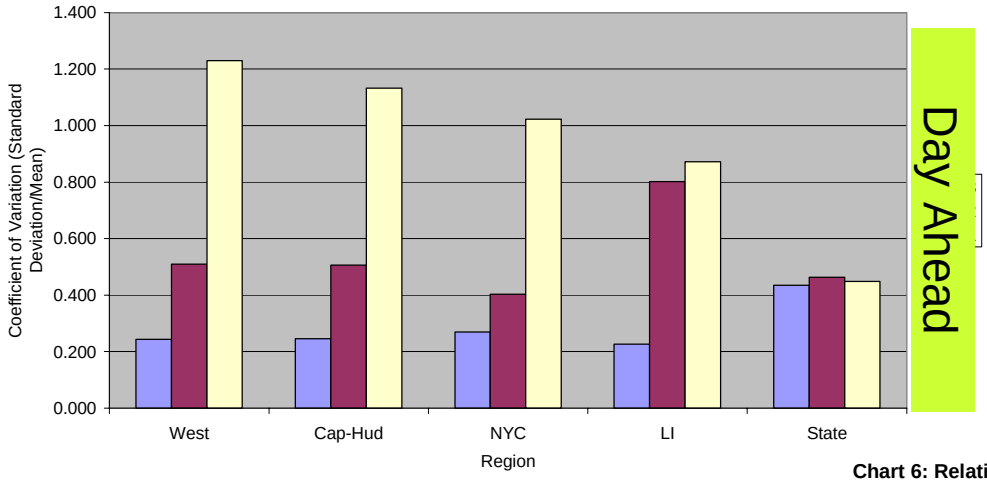
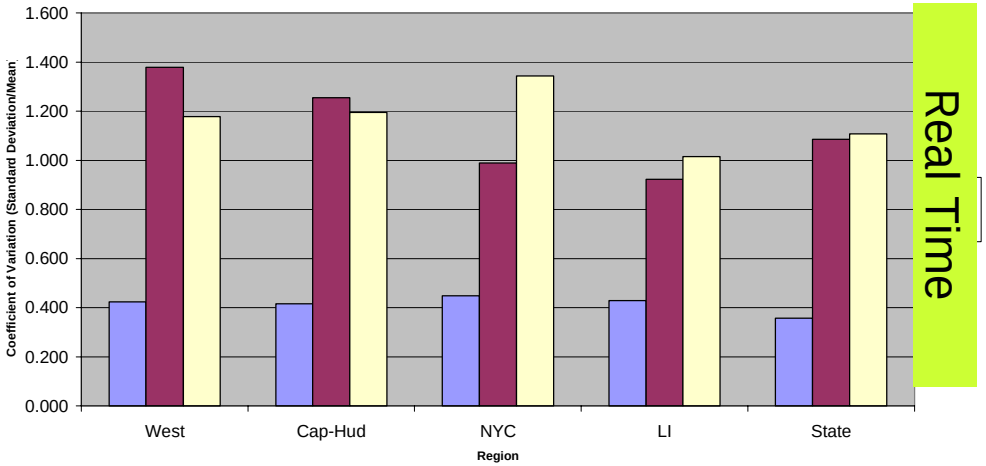


Chart 6: Relative Variability in LBMPs in New York's Real Time Electricity Market, by Region and Year (Summer Months, noon through 7:00pm)



- **Relative price volatility has been markedly reduced in both RTM and DAM during 2003**

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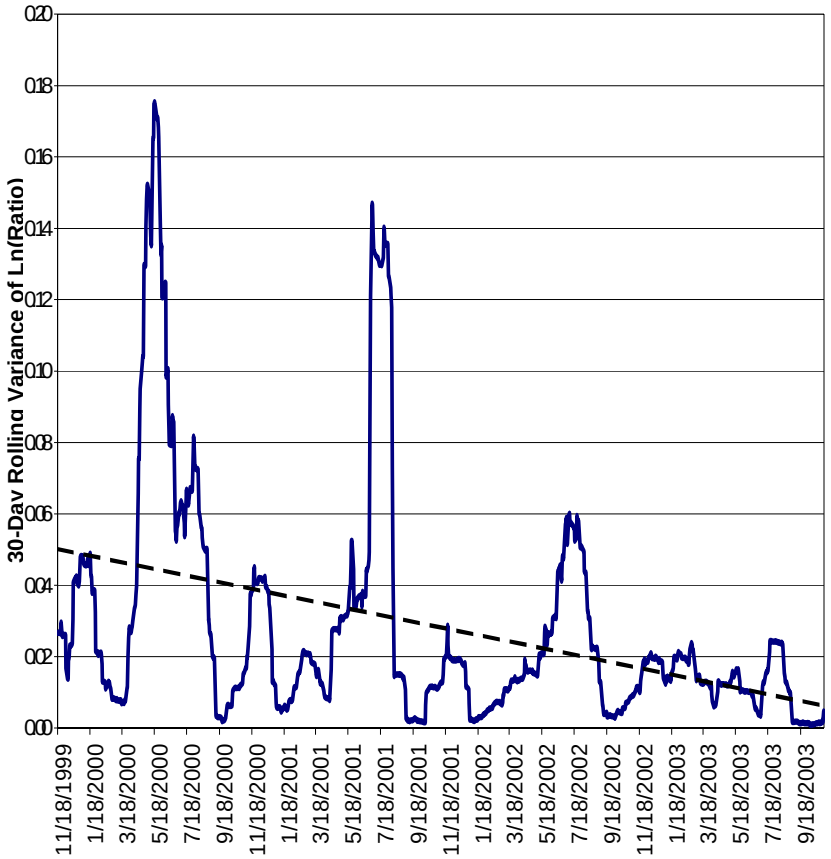
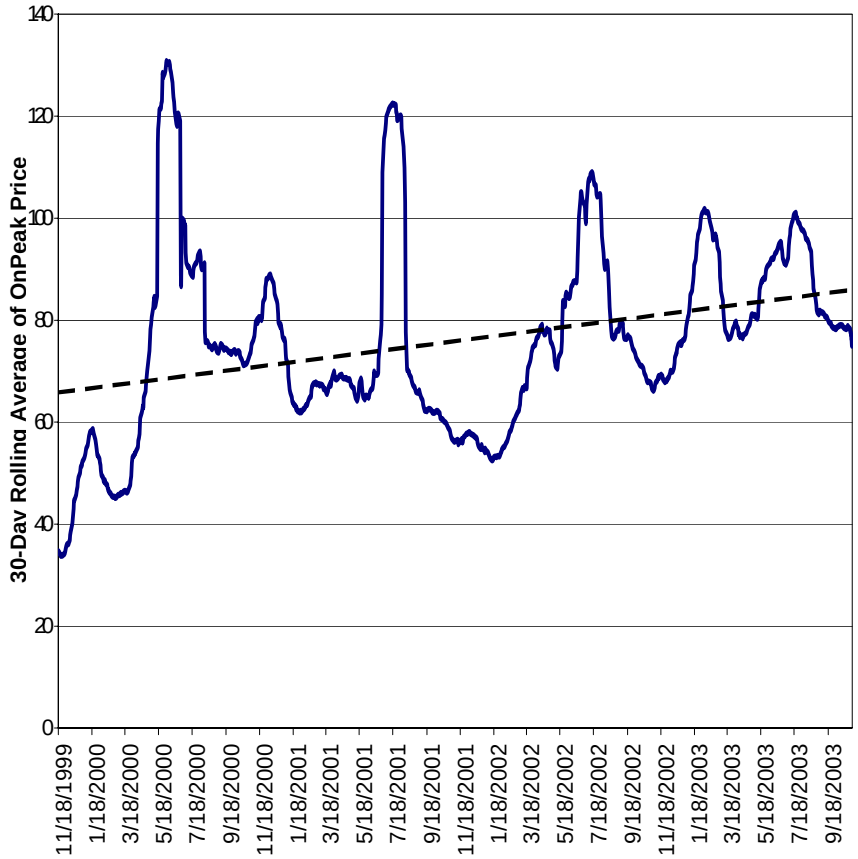
Capital Region RTP Prices

30-day rolling variance of Ln Ratio of Peak Prices



30-day rolling average Peak Price



Peak is weekdays 7 a.m. to 11 p.m.

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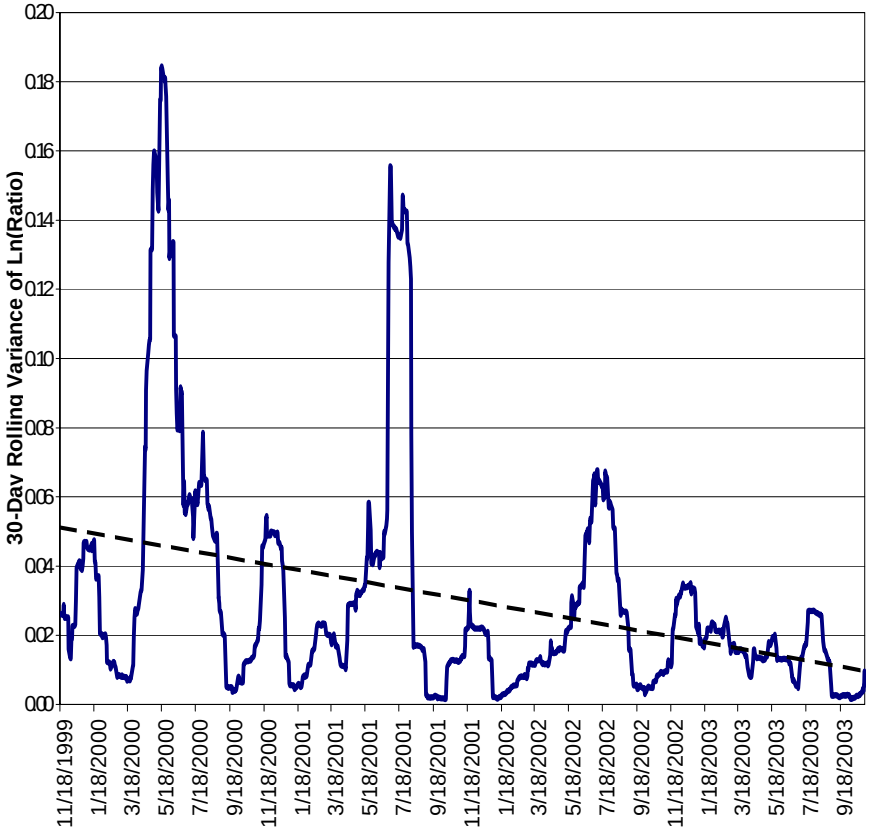
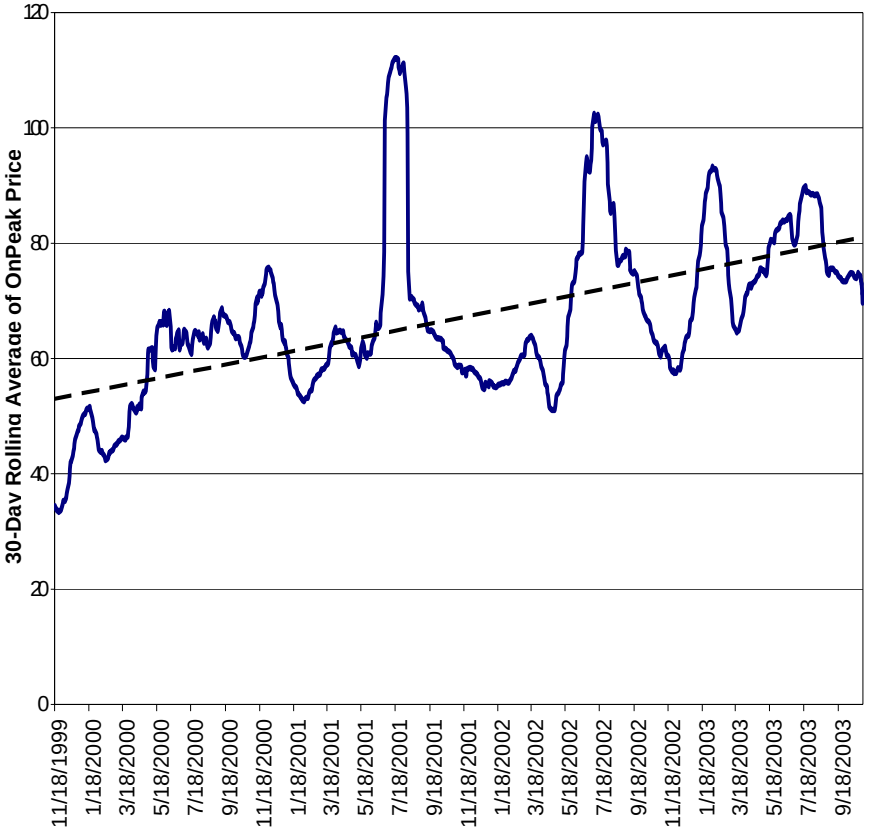
Frontier Region RTP Prices

30-day rolling variance of Ln Ratio of Peak Prices



30-day rolling average Peak Price



Peak is weekdays 7 a.m. to 11 p.m.

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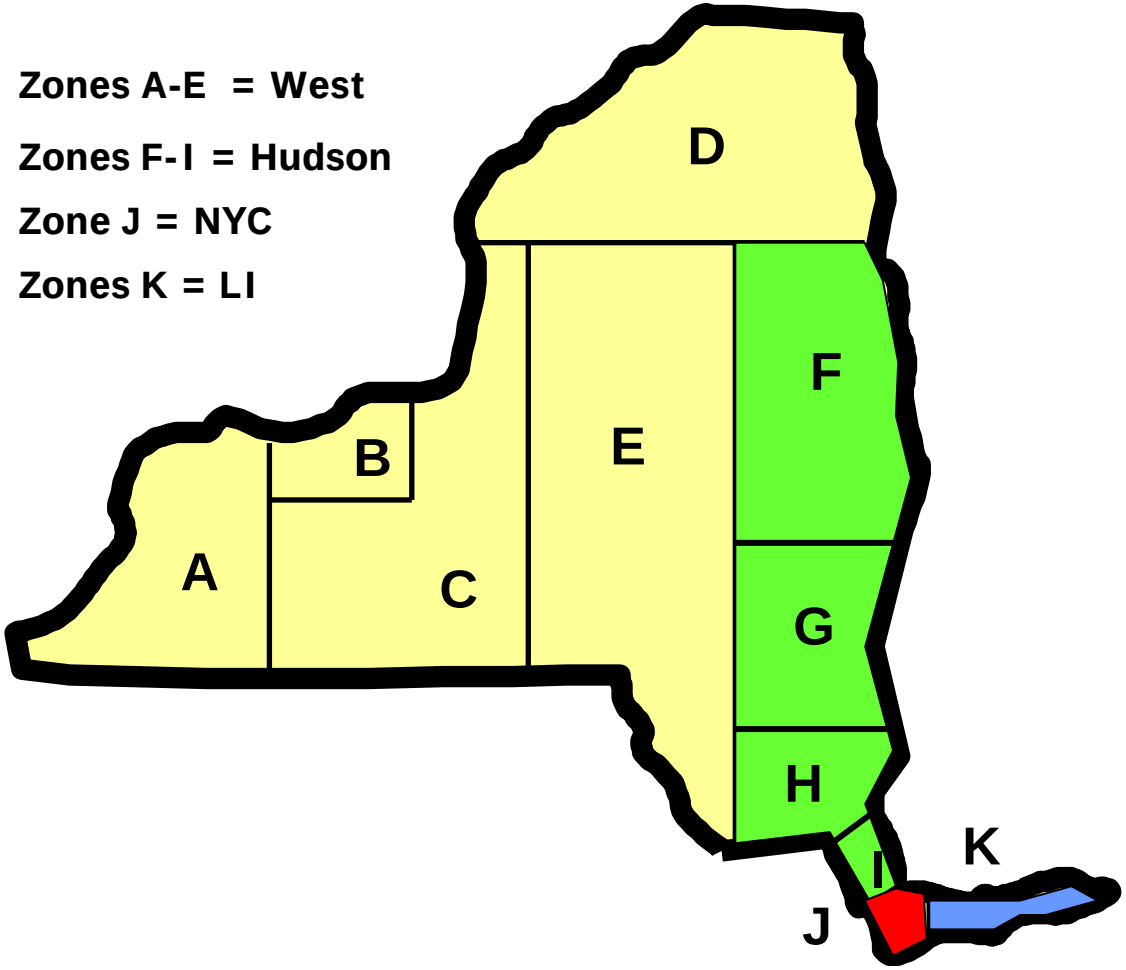
NYISO Pricing Zones Characterization Used for DADRP Impact Evaluation

Zones A-E = West

Zones F-I = Hudson

Zone J = NYC

Zones K = LI



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2003 Price Flexibility Estimates

	DAM Avg. PF	RT Avg. PF
West	1.4	3.4
Hudson-Capital	1.9	2.5
New York City	3.5	5.9
Long Island	1.2	6.0

Price flexibility = % change in price due to a 1% change in the load served

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Comparison of Avg. DAM Price Flexibilities

	2001	2002	2003
West	9.4	4.2	1.4
Hudson/Capital	5.1 / 11.8	3.9 / 5.0	1.9
New York City	9.4	3.6	3.5
Long Island	5.1	6.5	1.2

- Low flexibilities in 2003 due to lack of price volatility and extreme price spikes
- No “hockey-stick” shaped supply curve observed in 2003

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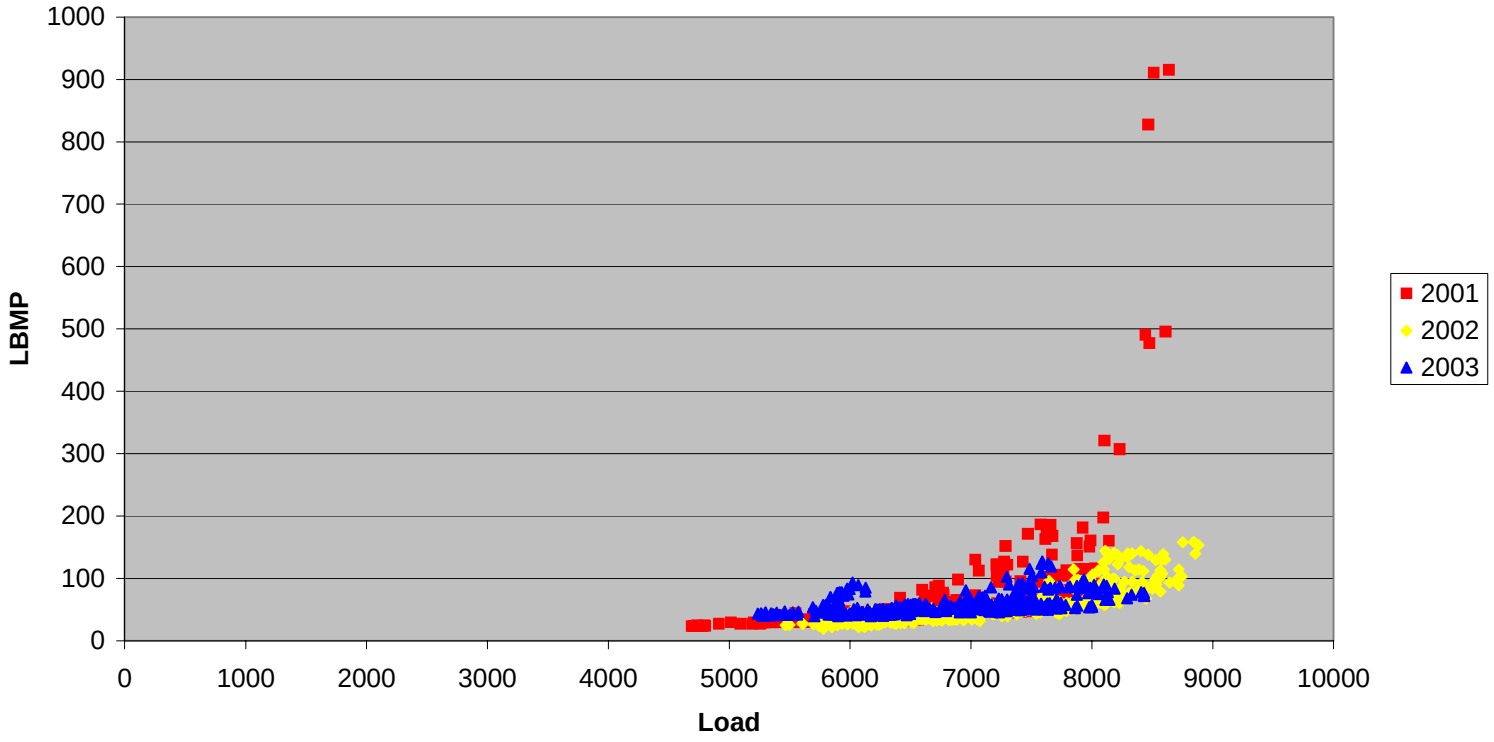
Where is the 2003 DAM "Hockey Stick"?

Figure B-1. Load vs. LBMP in the DAM, by Year, Western New York



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Comparison of Avg. RT Price Flexibilities

	2001	2002	2003
West	6.4	6.7	3.4
Hudson/Capital	8.6 / 8.4	4.7 / 6.0	2.5
New York City	14.5	12.8	5.9
Long Island	10.4	5.2	6.0

- Low flexibilities in 2003 due to lack of price volatility and extreme price spikes
- No “hockey-stick” shaped supply curve observed in 2003

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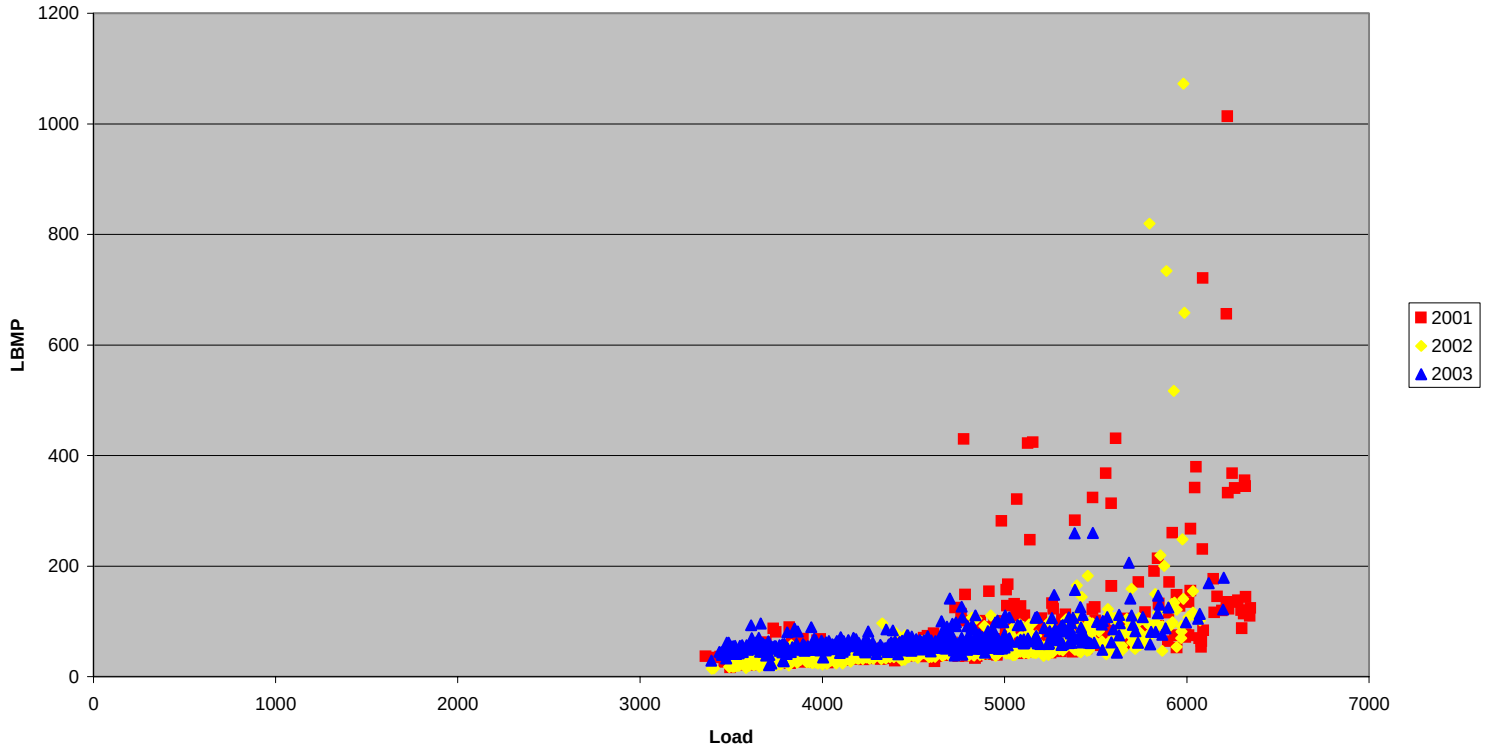
Where is the 2003 RTM "Hockey Stick"?

Figure B-6. Load vs. LBMP in the RTM, by Year, Capital and Hudson Region



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Market Price Impacts for DADRP Summer 2003

	Scheduled DADRP	Collateral Savings	Reduction in Hedge Cost	Program Payments
West	176MWh	$3,529	$72,613	$9,844
Hudson-Capital	1,576 MWh	$42,244	$88,945	$111,300

- Program payments exceed the direct market price impacts (collateral savings) because of the low supply flexibility associated with many accepted bids
- Total benefits exceed payments

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Market Price Impacts for DADRP Summer 2001 - 2003

	Scheduled DADRP	Collateral Savings	Reduction in Hedge Cost	Program Payments
2001	2,694 MWh	$1.5 Mil.	$0.7 Mil.	$0.2 Mil.
2002	1,468 MWh	$0.2 Mil.	$0.2 Mil.	$0.1 Mil.
2003	1,752 MWh	$0.5 Mil.	$0.2 Mil.	$0.1 Mil.

- Program costs and benefits are of similar orders of magnitude in all years but benefits clearly depend upon size of price responsiveness and scheduled curtailments

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Summary

- **Events of August provided an opportunity to examine a new dimension of the value of dispatchable DR**
  - In recovery state, DR value can be expressed in terms of the rate at which customer has service restored, where the LOLP improvement is going from one to the prevailing level of reliability
  - Reliability benefits for August events are several times the payment made to those that curtailed.

- **DADRP performance is**
  - Low DADRP participation results in small transfers from suppliers to producers
  - Low impact on market prices
  - But, that reflect condition that are good for consumers and participants

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