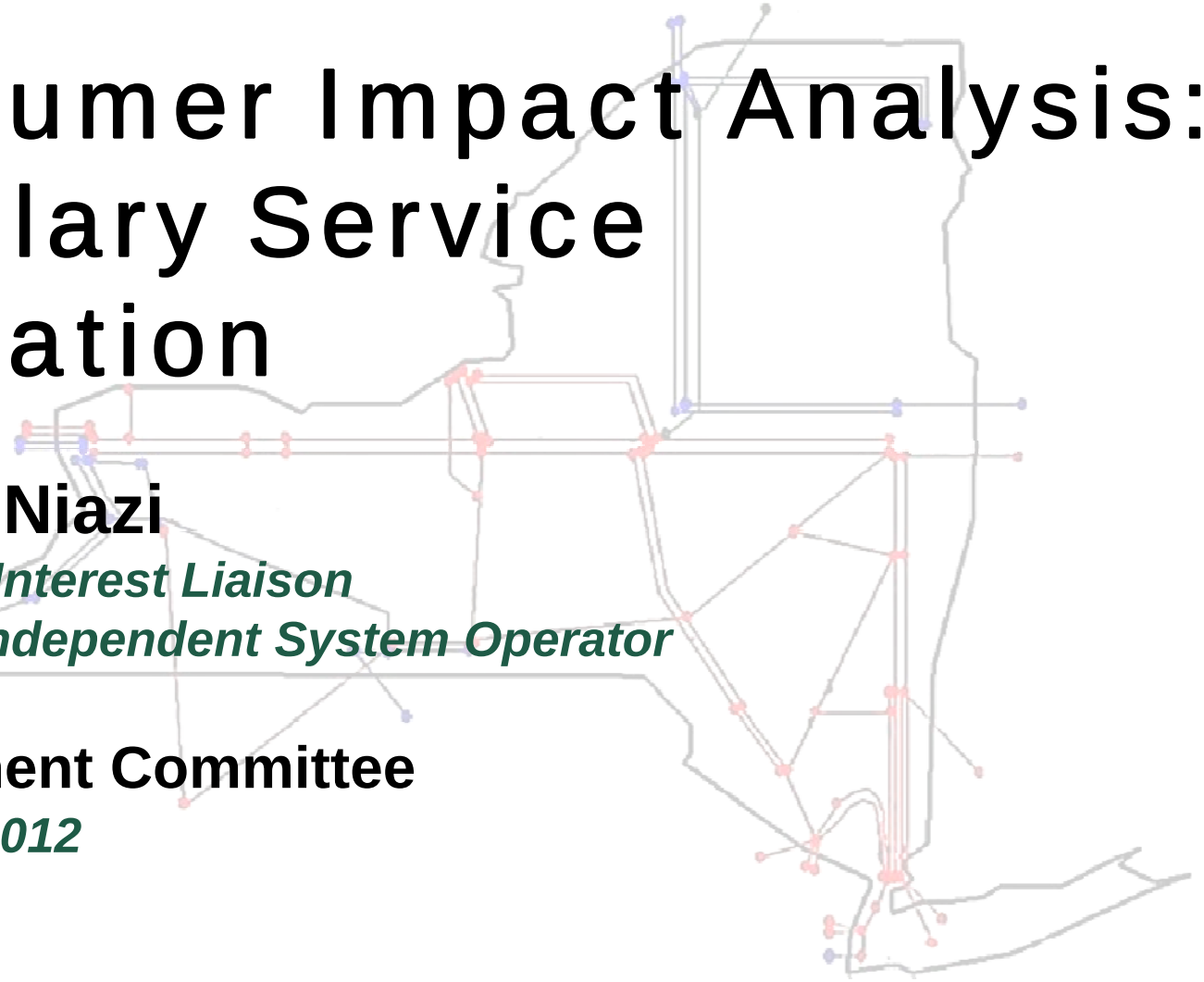
# Consumer Impact Analysis: Ancillary Service Mitigation



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**Management Committee**
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*KCC*



**DRAFT – FOR DISCUSSION PURPOSES ONLY**

# Background

- **The State of the Market Report recommended that the NYISO modify the following two mitigation provisions that may limit competitive 10-minute reserves offers in the DAM:**
  - *Limit GTs to a 10-minute non-spinning reserve reference of $2.52/MWh*
  - *Require New York City steam units to offer 10-minute spinning reserves at $0/MWh*

# Background, Contd.

- **Ancillary Service Mitigation identified as a 2012 Project and approved in the budget process**
- **Several stakeholders requested that the NYISO conduct a Consumer Impact Analysis on this project**
- **Included in the 2012 Consumer Impact Analysis Project List**

# Consumer Impact Analysis (IA) Evaluation Areas

| | |
|---|---|
| **RELIABILITY** | **COST IMPACT/ MARKET EFFICIENCIES** |
| **ENVIRONMENT/ NEW TECHNOLOGY** | **TRANSPARENCY** |

# Cost Impact/Market Efficiencies

- ***Potential for moderate increases in Day Ahead prices during some peak days***
- ***Potential efficiency gains from better convergence of DAM and RT prices***

# Cost Impact

**We have looked at the Cost Impact in several different ways:**

- **Potential Impact on Prices in the DAM**
- **Potential gains from a more efficient commitment of resources**
- **Impact on Generator Revenues**
- **Impact on Capacity Prices**

# Potential Impact on Cost/Prices in the DAM

- **How market outcomes would change if suppliers raised their DA reserve offer prices to account for predictable differences between DAM and RT clearing prices?**
- **We performed several simulations of potential increases in supplier bid behavior (Ranger Runs) on a number of peak days during Summer 2011**

# 10 Minute Reserve Offers Increased Based on Linear Regression Model

- **During some high load periods when the expected RT reserve clearing prices are predictably higher than the expected DAM reserve clearing prices, we would expect suppliers to raise their DAM reserve offers to reduce the likelihood of being scheduled for DAM reserves at a price lower than the RT price.**
- **To model this behavior, 10-minute Spin and 10-minute Non-Spin Reserves were modified as follows:**
  - ***10-minute Spinning Reserves- modified NYC unit offers only***
    - **A regression model was used that looked at the price difference of the reserve clearing price in the DAM and RT, over the previous year, in peak hours, on high load days (forecast load >26GW)**
    - **The model correlated the price difference with (a) the time of day, and (b) the forecasted daily peak load level.**
  - ***10-minute Non-Spinning Reserves – all units in East NY examined***
    - **Hours with initial offers less than $4.90 were not changed**
    - **A similar regression model was used (although it was separately estimated using non-spinning reserve prices)**
- **On the days studied, the offer price increases ranged from $0 to $26/MWh, depending on the time of day and the forecasted daily peak load level.**

# Results – In Four Areas

- **Total Cost to Load**
- **Reserve Clearing Price**
- **Scheduled Reserve Shifts**
- **Day-Ahead to Real-Time Schedule Alignment**

# Results – Cost to Load

- **Small increases in Total Load Payment (pre-AMP)**
  - ***e.g. July 12, 2011***
    - **Delta Total Energy + AS = $59,000 [+0.1%]**
- **Small decreases in Total Load Payment (post-AMP)**
  - ***e.g. July 12, 2011***
    - **Delta Total Energy + AS = - $110,000 [-0.2%]**

# Results – Cost to Load

- **Small increases in Total Load Payment (pre-AMP)**
  - ***e.g. July 22, 2011***
    - **Delta Total Energy + AS = $110,000 [+0.1%]**
- **Small decreases in Total Load Payment (post-AMP)**
  - ***e.g. July 22, 2011***
    - **Delta Total Energy + AS = - $227,000 [-0.2%]**

# Results – Reserve Clearing Prices

- **East Reserve**
  - ***10 Min. Spin***
    - **6.6% average increase (HB06-HB21)**
  - ***10 Min. Non-Spin***
    - **11.6% average increase (HB06-HB21)**
  - ***West 10 Min. & NYCA 30 Min.***
    - **Negligible Price & Cost Changes**

# Results – Scheduled Reserve Shifts

- **Similar Pattern of Shifting of DA Scheduled Reserve across all simulated days**
  - ***Off-Peak***
    - **At low load:**
      - Decrease in NYC 10 Min. Spin
      - Increase in non-NYC, SENY 10 Min. Spin & Non-Spin
      - Increase in Scheduled Energy
    - **As load rises:**
      - Replacement of NYC Spin by NYC Non-Spin and West 10 Min. Spin
  - ***Peak***
    - **Decrease in NYC 10 Min. Spin & Non-Spin**
    - **Increase in Scheduled Energy**
    - **Increase in Upstate East 10 Min. Spin**
      - Fulfills East Spin & 10 Min. Total Reqs.

# Potential Gains from Improved Efficiency

- **In the simulations, we saw reserve and energy commitment patterns that more closely resemble the RT indicating that there is a potential efficiency gain to lifting the two AS mitigation measures.**
- **A  better convergence of DAM and RT prices should lead to a more efficient alignment of resources.**
- **When the prices and flows scheduled in the DAM closely approximate the RT operational conditions, the RT market is best positioned to respond to any unanticipated conditions.**
- **The current AS mitigation measures lead to two distortions in the DAM compared to RT:**
  - ***Spinning reserves are predominantly scheduled in NYC (because Spinning Reserves are cheapest there) and energy tends to be scheduled outside of NYC***
  - ***Spinning reserves are frequently used to satisfy the total reserve requirement since NYC spinning reserves are frequently less expensive than non-spinning reserves***

# Impact on Generator Revenues

- **According to the SOM, modifying the two Ancillary Services Mitigation provisions should improve convergence between the day-ahead and real-time 10-minute reserve prices during peak load hours**
- **Potomac Economics has estimated that supplier revenues would be higher if they could better arbitrage between DAM and expectations of RT prices**

# Estimate of Generator Revenues

- **A primary concern with the current offer limitations for DAM reserve suppliers is that they require suppliers to sell reserves in the DAM when it would be more profitable for them to defer reserve sales until the RTM.**
- **Hence, DAM reserve suppliers have an opportunity cost, which is equal to the expected differential between the revenues they would receive by selling in the DAM rather than just the RTM.**
- **Hence, a primary benefit from lifting these offer limitations is that DAM reserve suppliers would no longer incur such opportunity costs. To estimate this benefit, we calculate:**
  - ***DAM Reserve Sale MW * (RTM price minus DAM price)***
  - ***This includes the highest three load hours of each day on high load days (>27 GW)***

# Potomac Economics' Estimates

| Year | Upper Bound Cost (in Millions $) | Load (MW/hr) | Upper Bound Cost ($/MWh) | Average Daily Cost (Energy & Ancillary Services) ($/MWh) | Upper bound cost as a percentage of Average Daily Cost |
|---|---|---|---|---|---|
| 2011 | 1.6 | 158,878,121 | 0.0101 | 56.55 | 0.0178% |
| 2010 | 2.7 | 158,491,342 | 0.0170 | 58.92 | 0.0289% |
| 2009 | 0.3 | 152,643,823 | 0.0020 | 48.63 | 0.0040% |
| 2008 | 1.4 | 160,953,604 | 0.0087 | 95.31 | 0.0091% |
| 2007 | 4.4 | 161,996,208 | 0.0272 | 80.29 | 0.0338% |

- **A small difference indicates that average DAM prices were more consistent with average RT prices**
- **A large difference indicates that average DAM prices were less consistent with average RT prices**

# Upper bound of costs to consumers

- **Price increases in RT can be the result of:**
  - ***Expected factors (for example, higher prices on some afternoons because of the probability of a TSA on a summer afternoon when thunderstorms are expected around NYC)***
  - ***Unexpected factors (for example, a high price to due to a low likelihood equipment failure)***
- **An Economically Efficient market will arbitrage the expected prices difference between DAM and RT prices but could not arbitrage unexpected price differences.**
- **These estimates are an upper bound on the increase in revenues to generators (and hence costs to consumers) as they capture both expected and unexpected price differences**

# Impact on Capacity Prices

- **There are potential savings to consumers from a secondary effect of higher Ancillary Service prices**
- **Additional ancillary service revenues will be considered in the demand curve reset process**

# Impact on Reliability

- ***No negative impact expected***

# Impact on the Environment/New Technology

- ***No negative impact expected***

# Impact on Transparency

- ***No change expected***

# Questions/Comments

# Appendix

# Appendix

- **Summer 2011 Days:**

| | Peak Load (MW) |
|---|---|
| July 12, 2011 | 29,516 MW |
| July 22, 2011 | 31,707 MW |
| July 26, 2011 | 27,980 MW |
| August 1, 2011 | 28,634 MW |
| August 18, 2011 | 25,603 MW |

- **10 Min. Reserve Requirements**
  - ***East Spin: 300 MW***
  - ***East Total Reserve: 1200 MW***
  - ***NYCA Spin: 600 MW***

# Appendix

- **East 10-Min Spin and Non-Spin Clearing Prices**

| Change in Avg. Reserve Clearing Price | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **Post-AMP** | **East** | **10 Min Spin** | | | **10 Min Non-Spin** | | |
| | **Daily Avg.*** | **Base** | **Study** | **Delta** | **Base** | **Study** | **Delta** |
| | July 12, 2011 | $23.45 | $24.77 | 5.6% | $16.30 | $17.63 | 8.2% |
| | July 22, 2011 | $30.78 | $31.08 | 1.0% | $14.04 | $14.57 | 3.8% |
| | July 26, 2011 | $10.10 | $10.89 | 7.8% | $7.20 | $7.76 | 7.8% |
| | Aug. 1, 2011 (Offers A) | $12.21 | $13.07 | 7.0% | $7.96 | $8.97 | 12.7% |
| | Aug. 1, 2011 (Offers B) | $12.21 | $15.49 | 26.9% | $7.96 | $11.96 | 50.3% |
| | August 18, 2011 | $7.47 | $8.34 | 11.6% | $3.21 | $4.03 | 25.5% |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **Pre-AMP** | **East** | **10 Min Spin** | | | **10 Min Non-Spin** | | |
| | **Daily Avg.*** | **Base** | **Study** | **Delta** | **Base** | **Study** | **Delta** |
| | July 12, 2011 | $22.19 | $23.52 | 6.0% | $16.61 | $17.47 | 5.1% |
| | July 22, 2011 | $30.60 | $31.13 | 1.7% | $14.08 | 14.51896 | 3.1% |

*** HB06 – HB21**

# Appendix

- **Generation Bid & Total System Bid Costs**

| | DAM Peak Load (Physical) | Δ Gen. Bid Cost* | Δ Total Sys. Bid Cost* |
|---|---|---|---|
| 7/12/2011 | 29,516 MW | $50,668 | -$15,012 |
| 7/22/2011 | 31,707 MW | $21,289 | $11,039 |
| 7/26/2011 | 27,980 MW | $24,952 | $23,563 |
| 8/1/2011 | 28,634 MW | $60,918 | $24,373 |
| 8/18/2011 | 25,603 MW | $50,961 | $14,208 |

* Post-Amp Market Solution

# Appendix

- **Total Cost to Load (Energy & Ancillary Services)**

| Post-AMP DAM Solutions | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July 12, 2011 | | | | July 22, 2011 | | | | July 26, 2011 | | | |
| DA Physical Peak Load | 29,516 MW | | | | 31,707 MW | | | | 27,980 MW | | | |
| | Base | Study | Δ | | Base | Study | Δ | | Base | Study | Δ | |
| Energy | $50,330,215 | $50,197,303 | -$132,912 | -0.3% | $100,579,378 | $100,348,413 | -$230,965 | -0.2% | $40,574,800 | $40,490,057 | -$84,743 | -0.2% |
| Ancillary | $470,223 | $493,331 | $23,108 | 4.9% | $731,685 | $736,087 | $4,402 | 0.6% | $260,844 | $275,446 | $14,602 | 5.6% |
| Total | $50,800,438 | $50,690,634 | -$109,804 | -0.2% | $101,311,063 | $101,084,500 | -$226,563 | -0.2% | $40,835,644 | $40,765,503 | -$70,141 | -0.2% |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | August 1, 2011 (Offers A) | | | | August 1, 2011 (Offers B) | | | | August 18, 2011 | | | |
| DA Physical Peak Load | 28,634 MW | | | | 28,634 MW | | | | 25,603 MW | | | |
| | Base | Study | Δ | | Base | Study | Δ | | Base | Study | Δ | |
| Energy | $43,720,656 | $43,529,956 | -$190,700 | -0.4% | $43,720,656 | $43,430,119 | -$290,537 | -0.7% | $25,862,744 | $25,877,694 | $14,949 | 0.1% |
| Ancillary | $301,523 | $322,250 | $20,727 | 6.9% | $301,523 | $386,357 | $84,834 | 28.1% | $171,778 | $171,773 | -$5 | 0.0% |
| Total | $44,022,179 | $43,852,206 | -$169,973 | -0.4% | $44,022,179 | $43,816,477 | -$205,702 | -0.5% | $26,034,522 | $26,049,467 | $14,945 | 0.1% |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Pre-AMP DAM Solutions | | | | | | | | | | | | |
| | July 12, 2011 | | | | July 22, 2011 | | | | | | | |
| DA Physical Peak Load | 29,516 MW | | | | 31,707 MW | | | | | | | |
| | Base | Study | Δ | | Base | Study | Δ | | | | | |
| Energy | $50,190,892 | $50,235,724 | $44,832 | 0.1% | $99,776,082 | $99,875,727 | $99,644 | 0.1% | | | | |
| Ancillary | $481,476 | $495,147 | $13,671 | 2.8% | $729,473 | $740,028 | $10,555 | 1.4% | | | | |
| Total | $50,672,369 | $50,730,871 | $58,503 | 0.1% | $100,505,555 | $100,615,755 | $110,200 | 0.1% | | | | |

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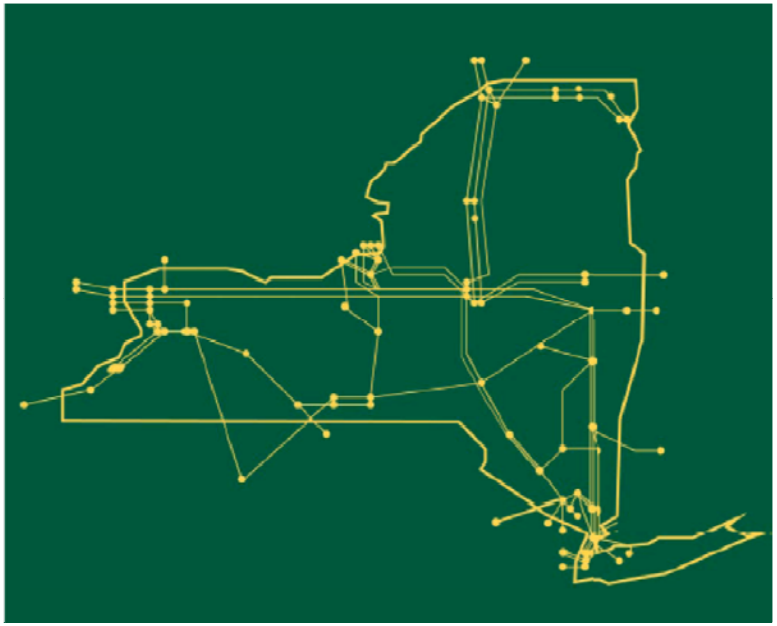

*www.nyiso.com*