Market Rules Assessment
RTC – RTD Price Convergence

Market Issues Working Group
September 05, 2008

Background – Purpose of Initiative

- In the 2007 State of the Market report, Dr. Patton indicates, "Prices between New York and adjacent markets have not been well-arbitraged." The report also recommended the NYISO, "*evaluate potential improvements in its real-time commitment model ("RTC") and the real-time dispatch model ("RTD") to improve their consistency.*"

- Market Participants have indicated an interest in the efficiency of RTC's forecast and scheduling at the external interfaces.

Purpose – What do we hope to achieve?

- **Two fundamental questions must be answered.**

- **How converged are prices:**
  - ✓ *Between RTC forecast of RT and actual RT prices*
  - ✓ *Between NY pricing of proxies and the other control areas' pricing of NY.*

- **Ultimately what we want to know is, how effective are the NY RT transaction scheduling protocols.**

First Steps – Where to go

- **Focus on three key areas:**
  - ✓ *Divergences caused by RTC (forecast issues, scheduling issues, etc..).*
  - ✓ *Divergences caused by RTD (volatility issues, scheduling issues, unexpected events, etc…).*
  - ✓ *Divergences caused by inefficiencies between Control Areas.*
    - Perfect convergence between RTC and RTD could still lead to inefficient outcomes if pricing between the two control areas is inconsistent.

Analysis Overview (What we show)

- **For this phase of the analysis, Potomac Economics and the NYISO analyzed price convergence at the external interfaces and scheduling efficiency.**

- **The following analysis shows a comparison of RTC forecasted prices to RT pricing, and an evaluation of scheduled and unscheduled transaction bids.**
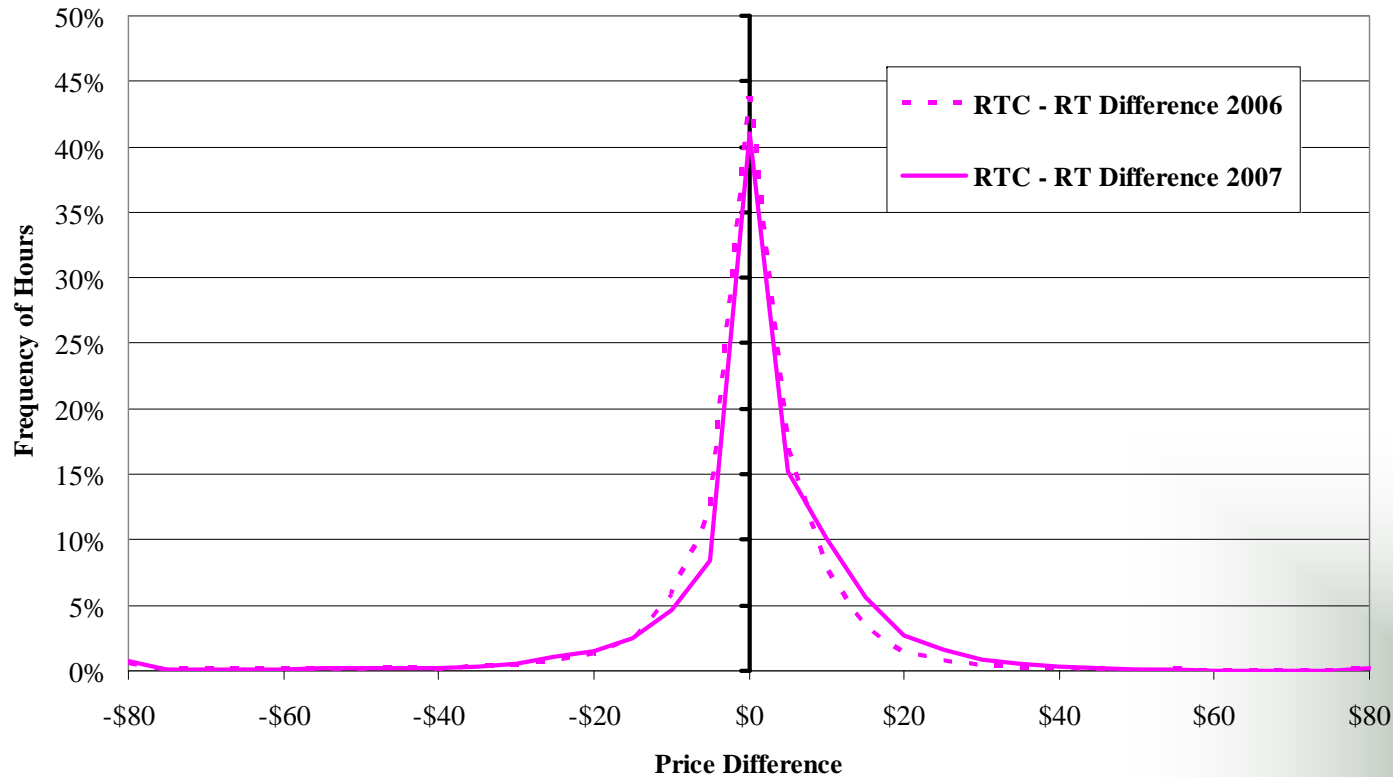
RTC/RT Convergence Compared for NE
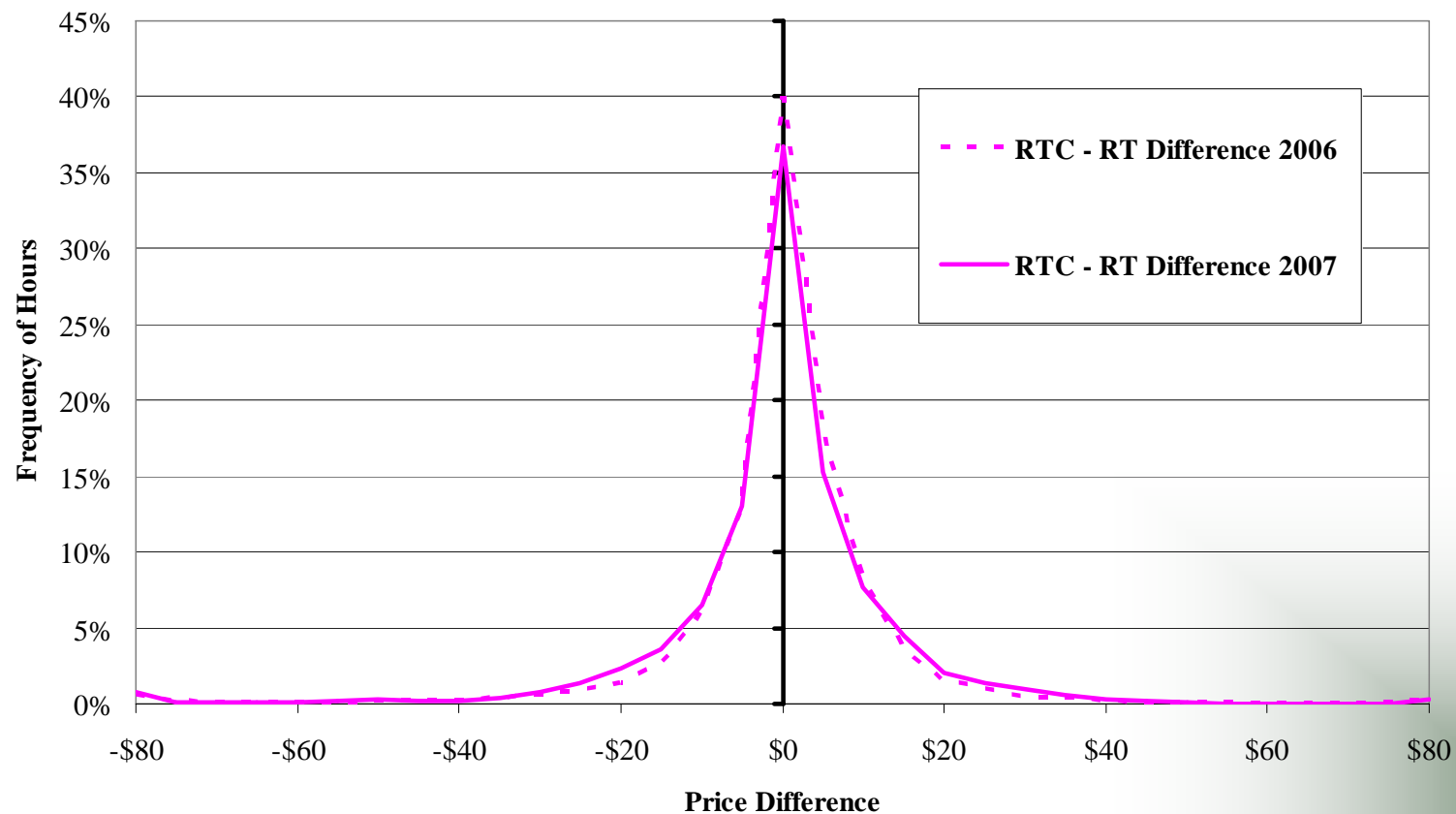
Histogram of Price Differences, 2006 - 2007
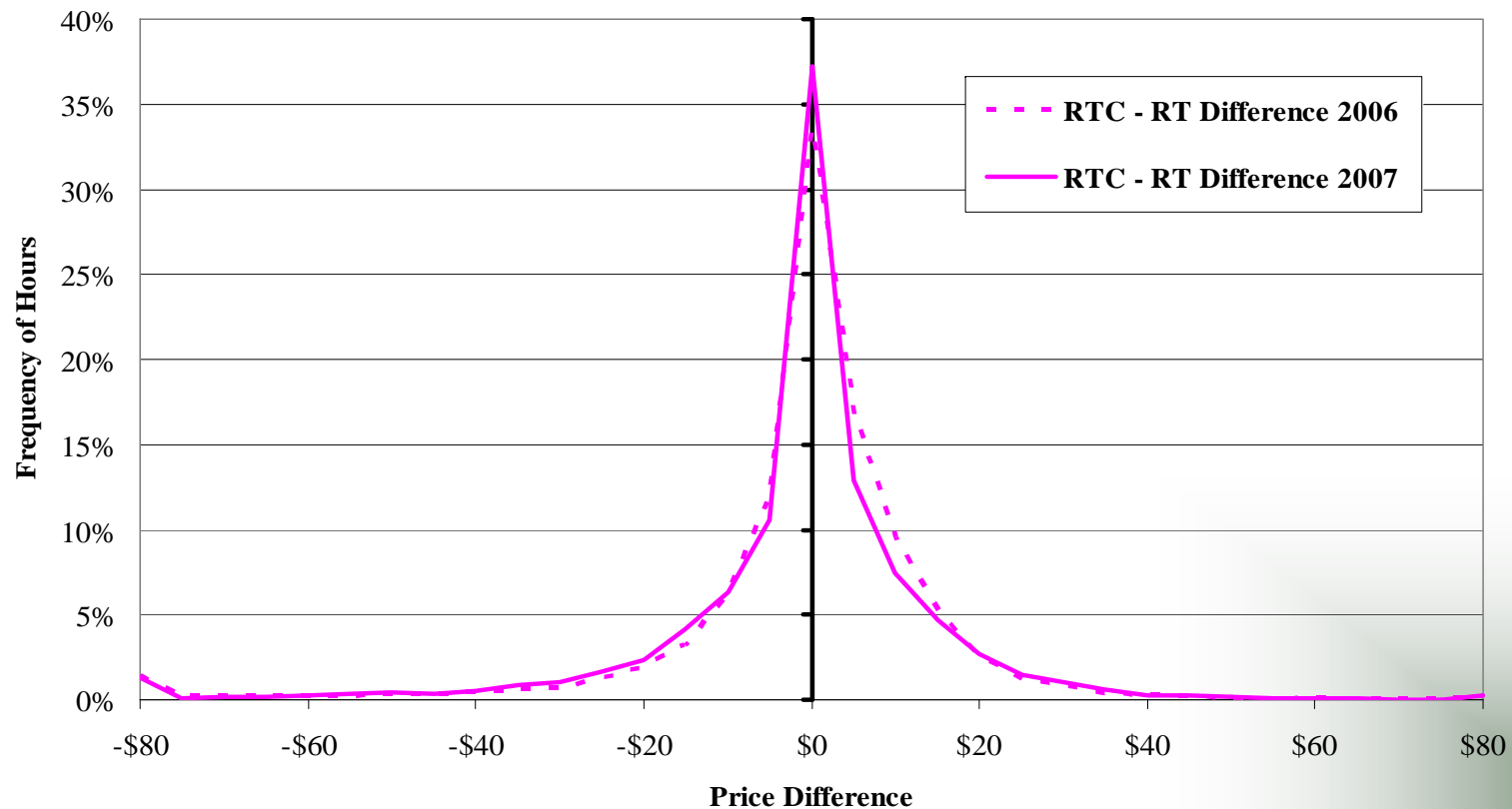
RTC/RT Convergence Compared for PJM

Histogram of Price Differences, 2006 - 2007

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RTC/RT Convergence Compared for OH

Histogram of Price Differences, 2006 - 2007

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RTC/RT Proxy Convergence - Continued

- **The previous slides indicate that while RTC-RT convergence is not perfect, for the most part the two markets price near similar levels, with no real bias in either direction.**

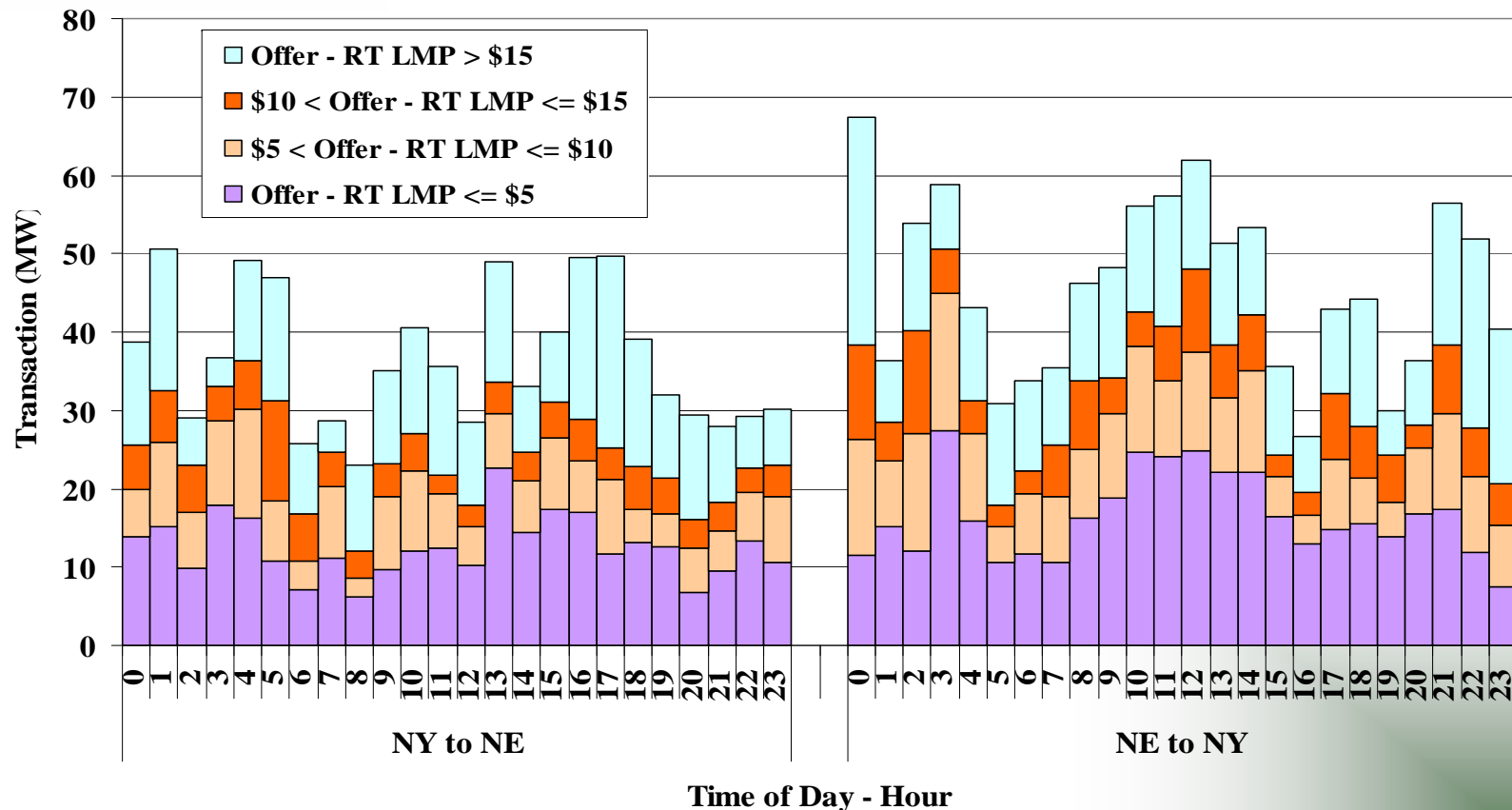| 2006-2007 Statistics	NE	OH	PJM
Average	-$1.75	-$0.55	$0.17
Mean Absolute Error	$11.07	$8.59	$8.00
Standard Deviation	$25.73	$23.06	$22.68

Efficiency of Transaction Scheduling

- **The next few slides address how efficiently transactions were scheduled or not scheduled by the software, given ultimate RT prices.**

- **The term "Consistent" as described later indicates a transaction that was or was not scheduled in accordance with RT prices.**

  - ✓ *An export was scheduled if the bid was greater then RT prices and not scheduled if the bid was less then RT prices.*

- **The term "Not Consistent" is not the same as inefficient. In order to determine efficiencies these transactions need to be referenced against the price difference between NY and NE.**

Transaction Scheduling NE & NY

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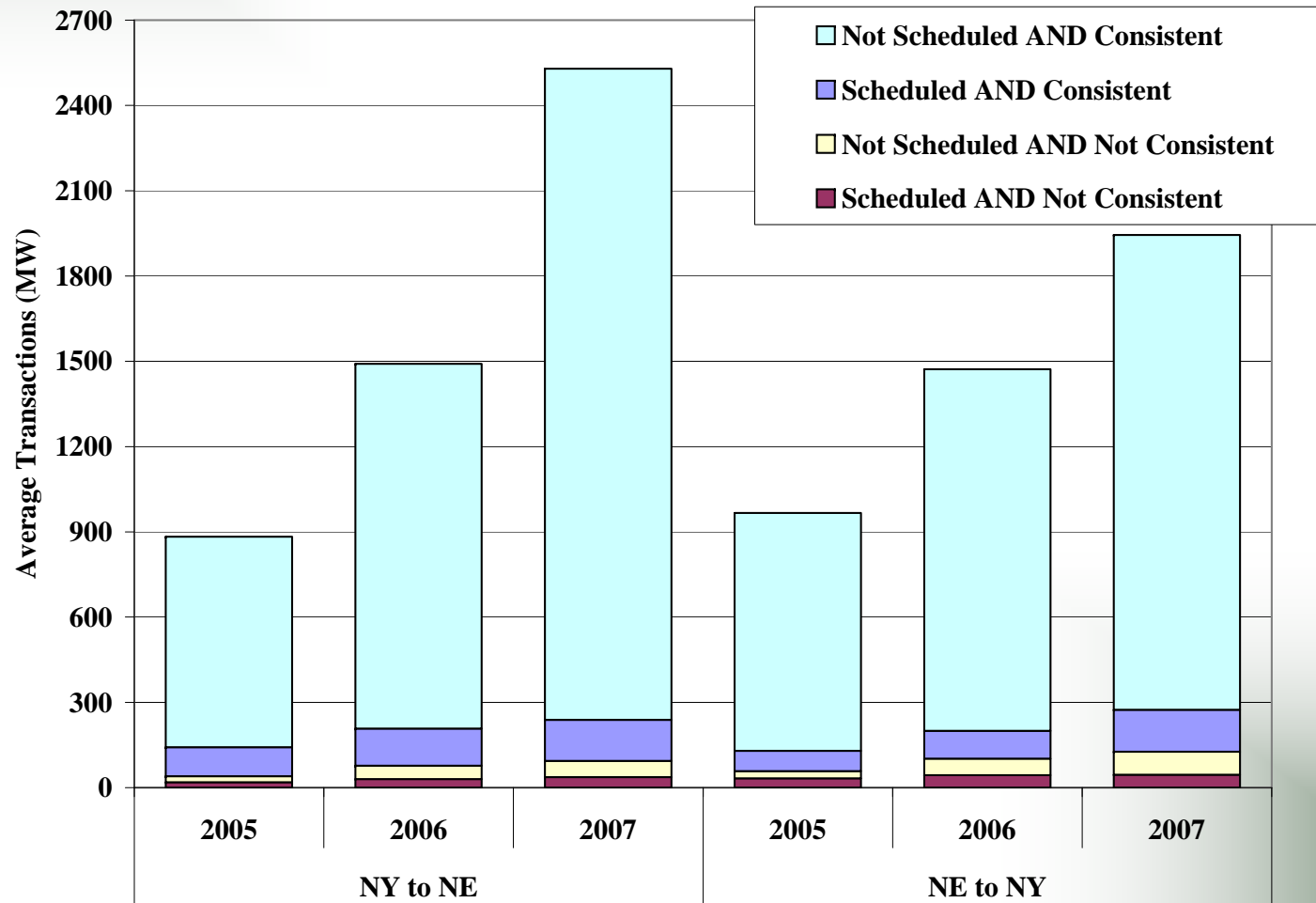
How far off were the uneconomic scheduled transactions?

Scheduled But Not Consistent
2007

Legend:
- Offer - RT LMP > $15
- $10 < Offer - RT LMP <= $15
- $5 < Offer - RT LMP <= $10
- Offer - RT LMP <= $5

Y-axis: Transaction (MW)

X-axis: Time of Day - Hour

NY to NE

NE to NY

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Assessment of the impact of volatility

- **The next slide addresses how much these deviations may have been caused by unexpected RT events. This slide compares RT prices by hour to RTC forecasted prices for the NE proxy.**

- **Unpredictable events frequently lead to large RTD price volatility. This volatility will often make the hourly RT price inconsistent with RTC.**
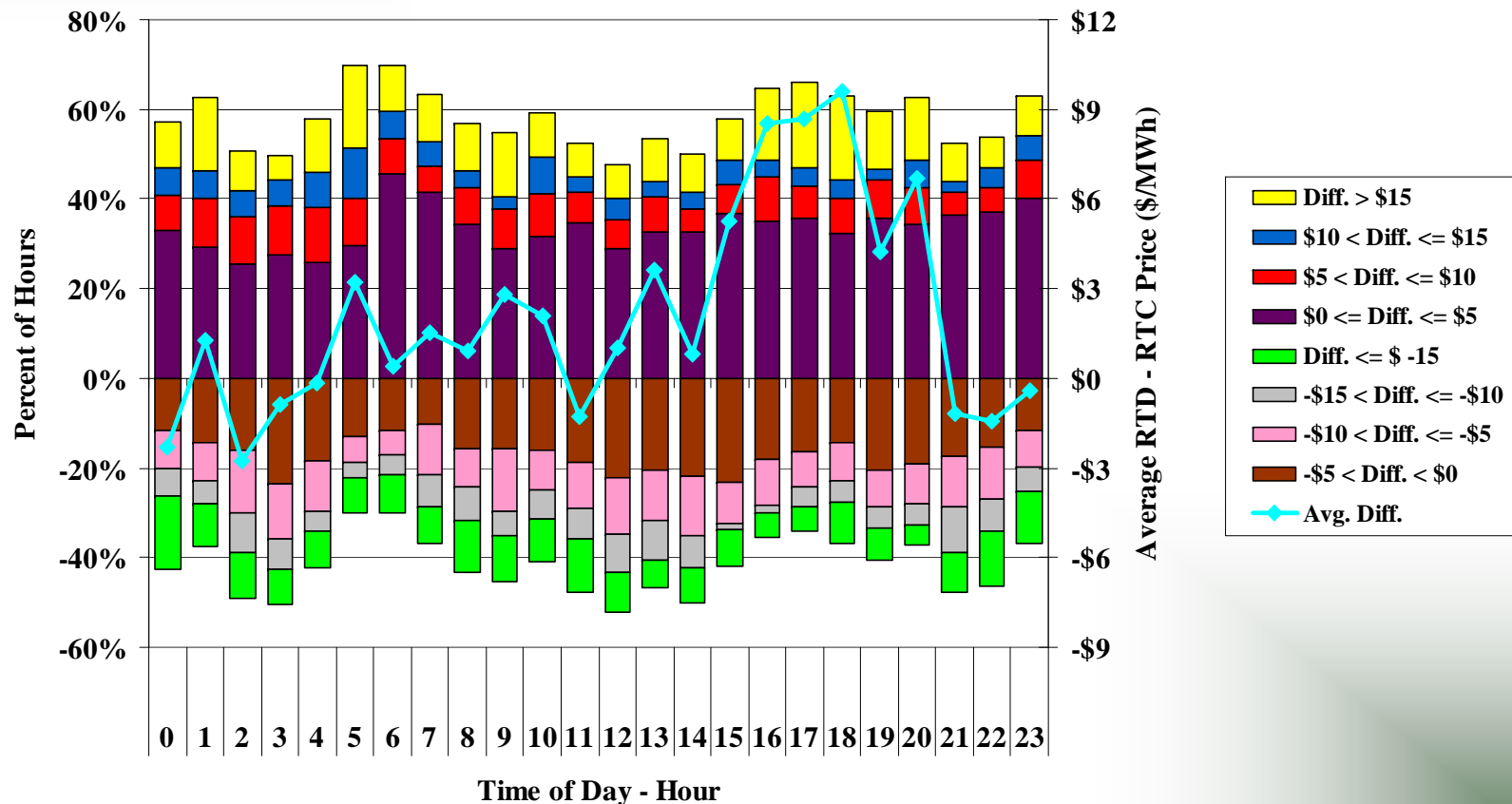
How to read the next slide

- **The bar columns on the next slide represent the percentage of hours the RT price differed from the RTC price in 2007 by hour of day.**

- **The aqua line represents the average difference of RT prices from the RTC prices in 2007 by hour of day.**

- **The bar columns on the next slide are associated with the left y-axis (% of hours), the line is associated with the right y-axis (avg. $ deviation).**

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Systematic vs. unexpected differences

Hourly RT Minus RTC Price at NPX Proxy Bus
2007

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Walk through of slide – HB 00

- **We see several things in the HB 00 data presented on the previous slide.**
- **The bar columns indicate to us:**
  - ✓ *(Eggplant portion) Just over 30% of all hour 0s in 2007 RT were between $0 to $5 more then RTC.*
  - ✓ *(Red portion) Around 10% of all hour 0s in 2007 RT were between $5 to $10 more then RTC.*
  - ✓ *(Blue portion) Around 10% of all hour 0s in 2007 RT were between $10 to $15 more then RTC.*
  - ✓ *(Yellow portion) Around 10% of all hour 0s in 2007 RT were $15 more then RTC.*
  - ✓ *(Brown portion) Around 10% of all hour 0s in 2007 RT were between $0 to $5 less then RTC.*
  - ✓ *(Pink portion) Around 10% of all hour 0s in 2007 RT were between $5 to $10 less then RTC.*
  - ✓ *(Grey portion) Around 5% of all hour 0s in 2007 RT were between $10 to $15 less then RTC.*
  - ✓ *(Green portion) Around 15% of all hour 0s in 2007 RT were between $15 less then RTC.*

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Walk through of slide – HB 00 continued

- **In summary, roughly 60% of all HB 00s in 2007 had a RT price equal to or greater then the RTC price.**

- **However, the aqua line indicates that the average difference for that hour for the year is approximately -$2.50. This indicates that some of the intervals where RT was lower then RTC were substantial. In this case, it indicates we had some hours of unforecasted extreme negative prices in RT.**

Increased Liquidity from Confidence

- **The next slide indicates the increased liquidity at this interface, which in turn has led to more competitive pricing.**

    ✓ *Price sensitive bidding of export transactions at the ISONE interface has increased roughly three fold since 2005. This would seem to indicate an increased confidence in the capability of RTC.*

Transaction Liquidity and Competitiveness (Average Hourly Volume)
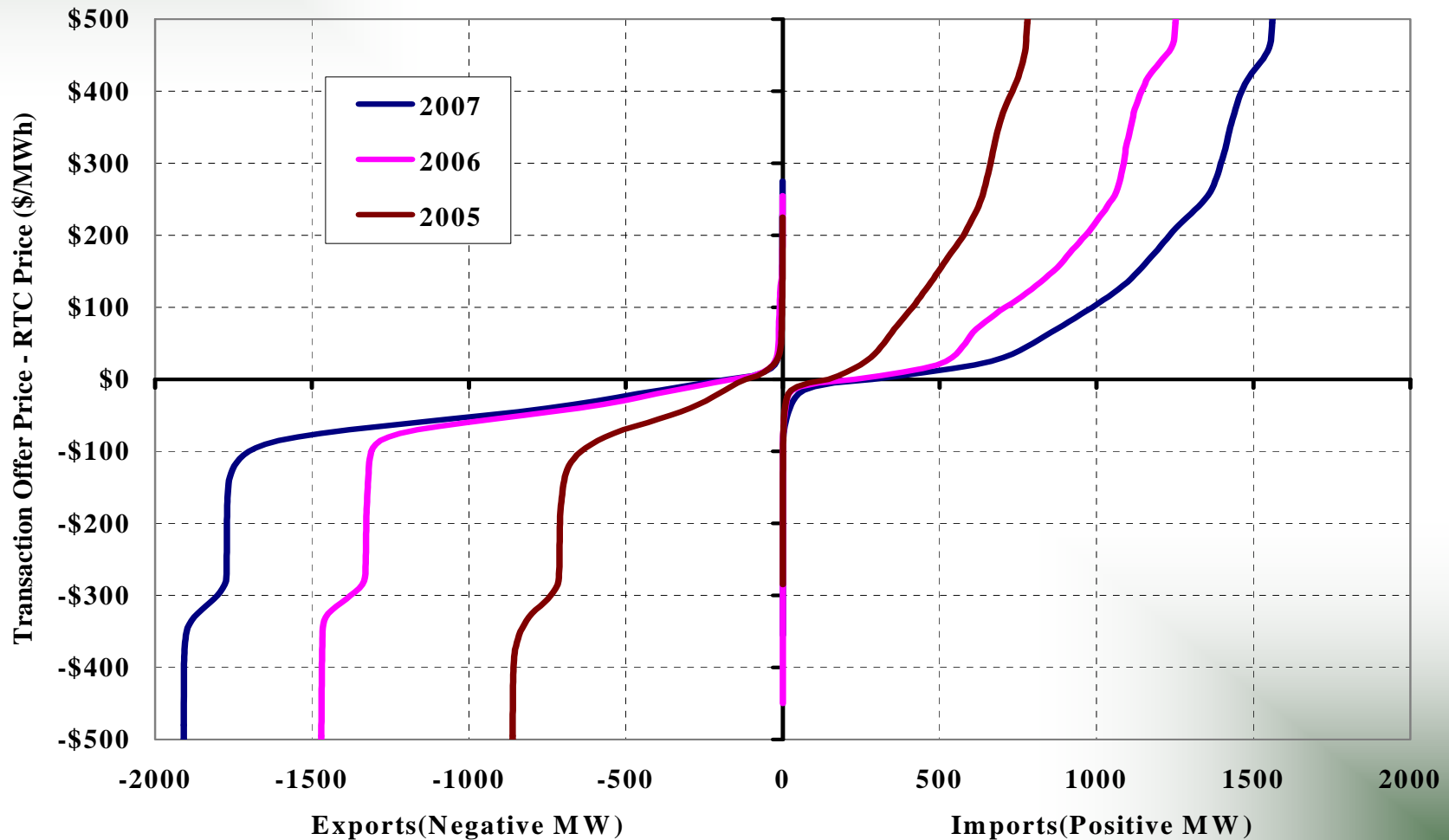
Initial Conclusions

- **This analysis indicates that RTC's forecast of RT is reasonably predictable.**

- **Improvement in this process can still be found, however, by focusing on two key areas:**

  ✓ *RTC's forecasting process*
  ✓ *RTD's optimization*

Next Steps

- **Continue analysis on the external interfaces.**

- **Begin to identify refinements that can be made to RTC to improve scheduling if possible.**

- **Identify ways to reduce unnecessary volatility in RTD leading to uneconomic transaction scheduling.**

- **Analyze differences between NY pricing and other control areas for improvement.**

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Questions