NEW YORK
INDEPENDENT
SYSTEM OPERATOR

November 26, 2003

ORIGINAL

Magalie Roman Salas
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Report on Impact of Virtual Trading on the Summer 2003 New York Electricity Markets; Docket Nos. ER01-3009-000 and ER01-3153-000

Dear Secretary Salas:

Enclosed for filing are an original and 14 copies of this letter and the New York Independent System Operator Inc.'s ("NYISO") Evaluation of the Impact of Virtual Trading on the Summer 2003 New York Electricity Markets ("Report"). Also enclosed are four copies of this letter and the Report that we request that you stamp and return to our messenger for our records.

The Report was prepared by the NYISO's Market Monitoring and Performance Department in response to ordering paragraph (D) of the Commission's October 25, 2001 Order Accepting Virtual Bidding Proposal and Mitigation Measures and Directing Compliance Filing ("Order"), that was issued in the above dockets. Ordering paragraph (D) of the Order instructed the NYISO to file periodic reports with the Commission describing its experience with virtual bidding. The enclosed Report is the second report filed in accordance with ordering paragraph (D) by the NYISO. It recommends the continuation of the NYISO's virtual trading market.

Please contact the undersigned if you have questions regarding this letter or the enclosed Report.

Sincerely,

Alex M. Schnell
New York Independent System Operator
3890 Carman Road
Schenectady, NY 12303
Tel: 518-356-8707
Fax: 518-356-4702

Enclosure

CERTIFICATE OF SERVICE

I hereby certify that copies of the New York Independent System Operator, Inc.'s transmittal letter and Evaluation of the Impact of Virtual Trading on the Summer 2003 New York Electricity Markets were mailed on this day to the parties appearing on the Secretary's official service list in these proceedings by first-class mail, postage prepaid.

Dated at Schenectady, New York, this 26th day of November, 2003.

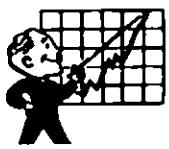
Alex M. Schnell
New York Independent System Operator
3890 Carman Road
Schenectady, NY 12303
518-356-8707

ISO NEW YORK INDEPENDENT SYSTEM OPERATOR

Building The Energy Markets of Tomorrow . . . Today

Market Monitoring & Performance Department

MARKET ANALYSIS UNIT



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1 Executive Summary

During the Summer 2003 Capability Period, the New York Independent System Operator ("NYISO") did not intervene in the market for Virtual Trading of Transactions ("Virtual Trading"). There were no conditions observed in the Virtual Trading market in the Summer 2003 Capability Period that warranted limiting a Market Participant's participation in the Virtual Trading market or suspending the Virtual Trading market, nor has the NYISO ever intervened in the Virtual Trading market since its inception.

While it is difficult to isolate the effects of Virtual Trading from other factors affecting the New York market, the NYISO does not believe that Virtual Trading has had an adverse effect on the relationship between prices in the Day Ahead and Real Time markets. This analysis, conducted by the NYISO's Market Monitoring and Performance Department ("MMP"), as well as an independent analysis prepared by the Market Advisor and included in the 2002 Annual Report to the NYISO Board of Directors,[1] both indicate that, since the introduction of Virtual Trading, there has been general price convergence between the Day Ahead and Real Time markets in New York.

Of the four different metrics employed in this analysis, three indicate relative price convergence between the Day Ahead and Real Time markets since the introduction of Virtual Trading in November, 2001, while a fourth is inconclusive.

1. Price Difference between Day Ahead and Real Time hourly prices

   The average difference between Day Ahead and Real Time prices in 2003 was generally smaller than the difference that existed in 2002. There has also been greater convergence of prices between the Day Ahead and Real Time markets in the most recent Summer Capability period (2003), compared to the Summer Capability Periods prior to the introduction of Virtual Trading.[2]

2. Percentage Price Difference between Day Ahead and Real Time hourly prices

   The percentage price differences over the Summer 2003 Capability Period are more centered around zero than in the two prior Summer Capability periods and have smaller absolute divergence from zero. This suggests that prices are converging and that there is a more consistent relationship between the Real Time and Day Ahead prices.

[1] David Patton's 2002 Annual Report to NYISO Board of Directors. This report is available at: http://www.nyiso.com/topics/miscellaneous/dpatton_2002_reports/2002_annual_report.pdf

[2] It has not been feasible, however, to isolate definitively the effects of virtual trading from other factors that can lead to price convergence or divergence between the two markets.

3. SCUC Simulations of the Day Ahead market

   The Day Ahead LBMP excluding Virtual Trading is generally lower than the Day Ahead LBMP including Virtual Trading. However, as the SCUC studies are not able to evaluate the Real Time price impact, MMP is not able to draw any conclusions from these studies on whether Virtual Trading alone is leading to any convergence or divergence.

4. Comparison of Price differences during hours with similar load conditions

   There is a clear indication that during the Summer Capability Periods following the introduction of Virtual Trading (2002 and 2003) the Day Ahead and Real Time prices have converged when compared to Summer 2000. However, comparing the two recent Summer periods to Summer 2001 shows no conclusive trends.

In addition to a general convergence in prices, MMP also notes the following trends of the Virtual Trading market:

- A pattern of net virtual energy purchases (virtual load) in southeastern New York and net virtual energy sales (virtual supply) in upstate New York was evident during the Summer 2002 and 2003 capability periods. There was an increase in total volume (virtual and real) of energy transactions in the Day Ahead market, but the introduction of Virtual Trading does not appear to have distorted market-clearing prices.
- The NYISO has been reporting Virtual Trading data on a zonal basis since the April 2003 NYISO Monthly Report, in response to a request from Market Participants. This change in reporting practices does not appear to have altered trading patterns or strategies.
- There was a sharp increase in the volume of virtual MWh authorized to bid in the NYISO market in July 2003 and another smaller increase in September 2003. The amount of virtual MWh offered into the market also increased, though at a smaller rate than the authorizations. As a result, the majority of authorized megawatts have not been fully utilized in the market, continuing a trend highlighted in previous Virtual Trading reports.
- Virtual trading has had no known negative effects on uplift payments in the New York Market. The NYISO Day Ahead uplift payments show no clear trend in this Capability period; however the Day Ahead uplift payments due to virtual supply appear to be decreasing. Day Ahead virtual supply uplift payments are less than 2% of monthly total Day Ahead uplift payments.

The NYISO will continue to monitor virtual trading closely, and to refine its techniques for analyzing the effects of virtual trading as it continues to collect data and gain experience with the Virtual Trading market. Based on its experience in the first three Summer and Winter capability periods, the NYISO recommends continuation of its current Virtual Trading market.

2 Introduction

The Market Monitoring and Performance Department ("MMP") reviews the performance of virtual trading after each capability period to report the impact of Virtual Trading of Transactions ("Virtual Trading") on the New York energy markets. These reports are being filed in accordance with the Commission's October 25, 2001 *Order Accepting Virtual Bidding Proposal and Mitigation Measures, and Directing Compliance Filing*, issued in Dockets Nos. ER01-3009-000 and ER01-3153-000.

Virtual Trading was introduced to the NYISO market on November 7, 2001. The study reported herein covers the 2003 Summer Capability Period,[3] encompassing May 2003 through October 2003. This study compares the role Virtual Trading played in the convergence (or divergence) of prices between the Day Ahead and Real Time markets for the studied Capability Period to prior Capability Periods.

Measuring the impact of Virtual Trading on the degree of convergence between the Day Ahead and Real Time prices is a complex task. The source of this complexity includes the dynamic interaction between the Day Ahead and the Real Time markets. Virtual Trading affects the commitment in the Day Ahead market (and prices). Day Ahead market commitments, in turn, affect final Real Time dispatch and prices. To isolate the impact of Virtual Trading on prices, MMP would be required to simulate the energy market, both for the Day Ahead commitment as well as the final Real Time dispatch, but as discussed below simulation of the Real Time dispatch is not feasible.[4]

MMP can simulate the Day Ahead market and measure the impact of Virtual Transactions on the Day Ahead LBMP by re-running the saved Day Ahead solutions from the Security Constrained Unit Commitment ("SCUC") model. However, MMP is unable to fully simulate the real time market at this time because of a lack of study-mode capabilities in the current Security Constrained Dispatch ("SCD") model used to calculate real time prices. In addition, market changes and associated modeling changes in both the SCUC and SCD pose a major challenge to isolating the impact of Virtual Trading on the Day Ahead and the Real Time market prices from those due to other changes to the market (such as the change in the Load Pocket modeling).

MMP also analyzed the impact of Virtual Trading on market-clearing prices and uplift payments in the Day Ahead Market. The final section of this study reports on the credit requirement analysis.

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[3] Unless otherwise specified, capitalized terms used herein have the meanings specified in the NYISO Market Administration and Control Area Services Tariff.

[4] MMP did rerun the SCUC (Security Constraint Unit Commitment) to measure the impact of Virtual Trading on the Day Ahead market LBMP (see below).

3 Analysis

MMP reviewed several different metrics to determine the impact of Virtual Trading on the NYISO energy markets and, specifically, whether prices converged between Day Ahead and Real Time markets. Due to the complexity of NYISO energy markets, it is difficult to measure the impacts of Virtual Trading in isolation. The following is a summary of the different metrics used in this analysis.

1. Price difference between Day Ahead and Real Time markets.

   The price difference measured by the daily average difference in Day-Ahead and Real-Time prices across the entire New York Control Area and plotted as a twenty-eight day moving average.

   Price differences measured in dollars may not, however, be the best measure of convergence between the Real Time and Day Ahead markets because such differentials are sensitive to the overall price level.

2. Percentage Difference between Day Ahead and Real Time Markets.

   The percentage difference between the Real Time and Day Ahead markets as measured by the formula (Real Time/Day Ahead – 1). This is the percentage change in price from the Day Ahead to the Real Time markets for the same hour. The Market Mitigation Measures require this metric as an evaluation index for monitoring the impact of the virtual trading.

3. SCUC Simulations of the Day Ahead market.

   MMP used SCUC simulations to study the impact of Virtual Trading on the Day Ahead market by reproducing the LBMP without virtual trading for twenty-five study days during the Summer 2003 capability period.

4. Comparison of Price differences during hours with similar load conditions.

   MMP compared the price difference between Day Ahead and Real Time during hours with similar load conditions prior to and after introducing Virtual Trading.

3.1 *Day-Ahead and Real-Time Price Difference*

By introducing virtual transactions, the NYISO anticipated that market participants would use this tool for arbitrage, as they deemed appropriate, and that this would lead to price convergence between Day Ahead and Real Time prices. To measure the convergence between the markets, MMP analyzed and compared the daily average difference in Day Ahead and Real Time prices using a twenty-eight day moving average.

Figure 1 depicts the daily average price difference between the two markets over the three most recent Summer Capability Periods using a twenty-eight day moving average. The graph also shows that, for 2003, the average price difference measured in dollars was generally lower for the majority of the period than in the prior year. The 2003 peak average was also lower than the 2002 peak average. Finally, this metric was lower for both Summer Capability periods after the introduction of Virtual Trading than it was during the Summer 2001 Capability Period prior to the introduction of Virtual Trading.

The slightly lower price differences in Summer 2003 compared to Summer 2002 are partly attributable to lower price volatility. While prices were slightly higher, on average, in Summer 2003, there were far fewer significantly high prices that could result in large price differentials. For example, in the day-ahead market for 2003, there were only five days where at least one zonal LBMP exceeded $150, while in 2002 there were twenty-two days where at least one zonal LBMP exceeded $150.

Figure 2 depicts the average price difference between the two markets and is the basis for the moving average shown in Figure 1. The graph illustrates the volatility of the price differences between the two markets, but also shows that there were slightly fewer spikes in the price difference than the previous year. Table 1 below quantifies the volatility of the prices differences using the standard deviations.

Table 1: Summary of Standard Deviations of Price Differences between Day Ahead and Real Time Prices over Capability Periods

Summer of	Standard Deviation of Price Differences
2001	$48.11/MWh
2002	$31.85/MWh
2003	$21.83/MWh

The table confirms that price difference volatility was significantly lower in 2003 than in the year before and much lower than in 2001, a period in which there was no virtual trading available to market participants.[5]

[5] It is also important to note that the Northeast blackout on August 14, 2003 affected New York's energy markets. One result of this was that day-ahead prices were substituted for real-time prices for three consecutive days, and therefore there was no price difference on these days. The price substitution did not have a significant impact on the data used in this report.

Figure 1: 28-Day Moving Average Day Ahead & Real Time Price Differences

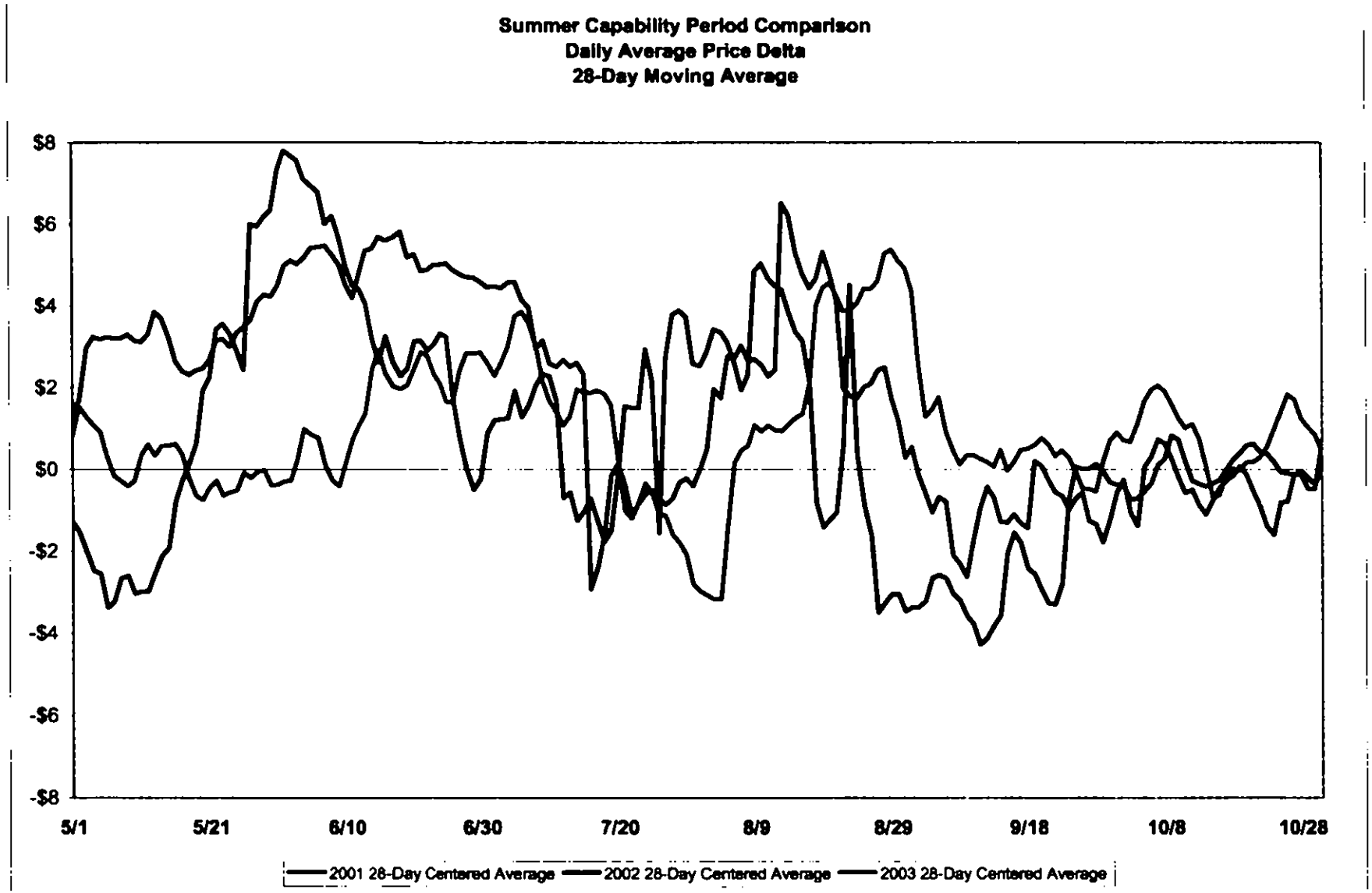
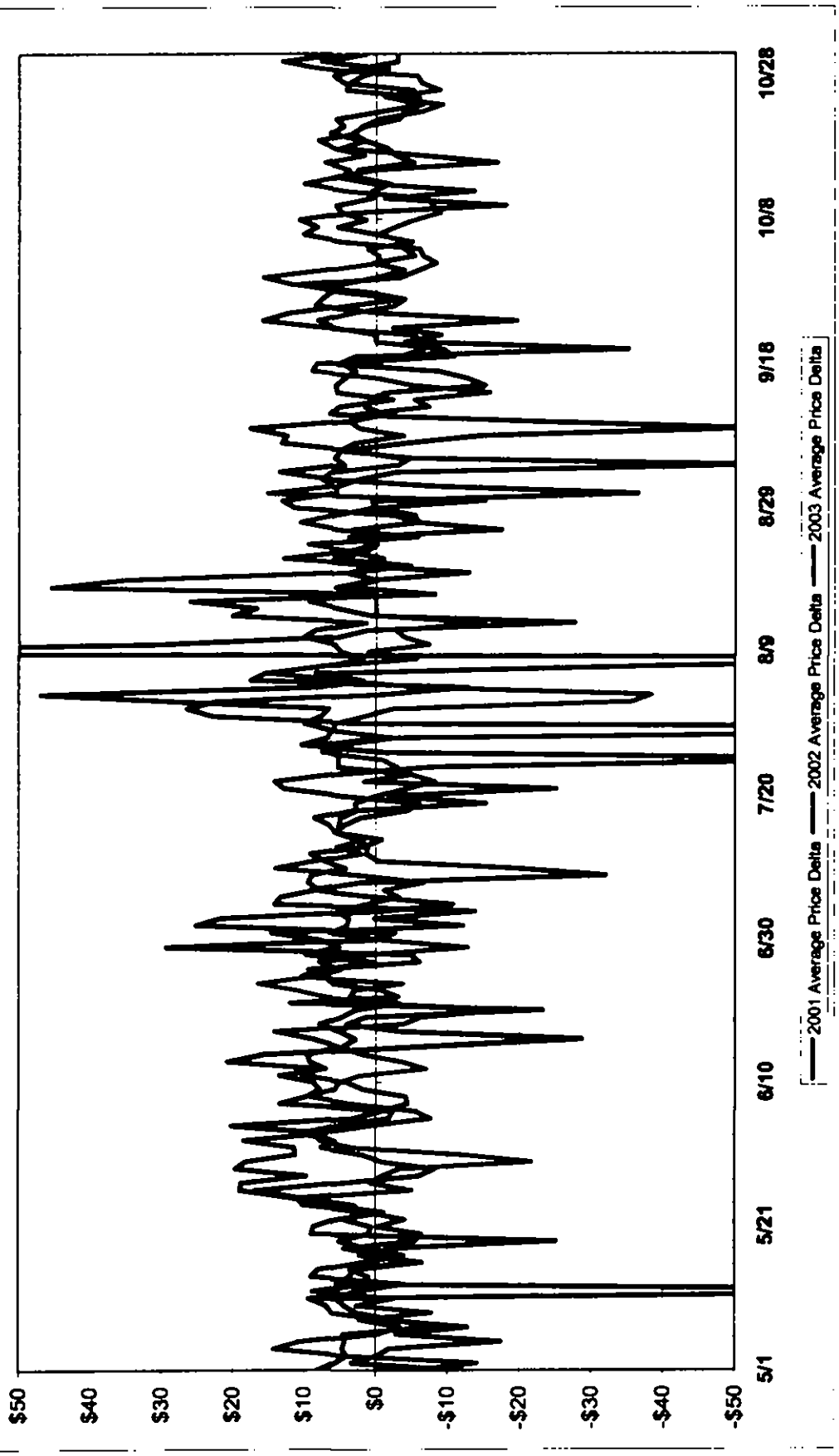


Figure 2: Day Ahead & Real Time Price Differences



3.2 *Percentage Change between Day Ahead and Real Time*

Price differences measured in dollars may not be the best measure of convergence between the Real Time and Day Ahead markets since this metric is sensitive to the overall price level. That is, the same percentage price difference would result in a higher dollar difference at high price levels as compared to lower price levels. A better measure may be the percentage difference between the Real Time and Day Ahead markets as measured by the formula RT/DA – 1[6]. Negative values indicate that, on average, Real Time prices were below Day Ahead prices.

Figure 3 depicts the relationship between Day Ahead and Real Time prices since the beginning of 2000. The plotted line represents a 28-day trailing average of the average absolute daily price difference between Real Time prices and Day Ahead prices, expressed as a percentage. The expected range of price difference between Day Ahead and Real Time has decreased every year since the implementation of NYISO markets. There have been no days of extreme Day Ahead/Real Time price difference since the start of virtual trading, as there were in 2000 and 2001. Both the mean average price divergence and the expected range of price divergence decreased significantly in 2002 from 2001. These decreases coincide with the implementation of virtual trading near the end of 2001. This trend has continued through October 2003, though annual decreases in price divergence have been more gradual since the initial implementation of Virtual Trading.

Figure 4 shows the (RT/DA – 1) ratio over the recent Summer Capability periods (using a 28 day centered average). The percentage price differences over the Summer 2003 Capability Period are more closely centered around zero than in the previous two Summer Capability periods, especially in the months of May and June. The Summer 2003 figures also have smaller absolute divergence from zero. This suggests that prices are converging and that there is a more consistent relationship between the Real Time and Day Ahead prices.

Averaging over each Capability Period indicates that, by this measure, prices during the two Summer Capability periods since the introduction of Virtual Trading have been converging compared to the Summer just before the implementation of virtual trading. This most recent Summer period had the lowest average price difference of the past four Summers. Similarly, prices during Winter Capability periods have been converging since the introduction of Virtual Trading. These trends are reflected in Table 2.

[6] This is the metric specified for measuring price convergence in Attachment H of the NYISO Services Tariff, the Market Mitigation Measures.

Table 2: Summary of Percentage Difference between Day Ahead and Real Time Prices over Capability Periods

Winter	Winter Average Price Difference	Summer Average Price Difference	Summer
2000-2001	-5.7%	-1.2%	2000
2001-2002	-4.3%	-11.6%	2001
2002-2003	-0.6%	-3.7%	2002
2003-2004	N/A	-0.2%	2003

3.3 *Percentage Change Comparison between Peak and Off-Peak Hours*

Table 3 below uses the same percentage measurement but differentiates between peak and off-peak hours during Summer Capability Periods.

Table 3: Summary of Percentage Difference between Day Ahead and Real Time Prices during Summer Peak and Off-Peak Hours

Capability Period	Average Price Difference Peak Hours	Average Price Difference Off-peak Hours
Summer 2001	0.4%	-22.0%
Summer 2002	-2.5%	-4.5%
Summer 2003	-1.5%	0.9%

The table reveals that the convergence trend is particularly significant during off-peak hours, exhibiting an average price difference of less than 1% in the most recent Summer period.

The percentage difference trend for peak hours is not as clear. There was convergence compared to the previous Summer, but it is not at the level demonstrated in Summer of 2001, before Virtual Trading was introduced. However, it is important to note that overall, this percentage difference (Summer peak hours) has never shown a large price divergence, leaving less possibility for improvement when compared to other periods (i.e. off-peak Summer as well as on- and off-peak Winter).

Figure 3: Absolute Percentage Price Difference between Day Ahead & Real Time

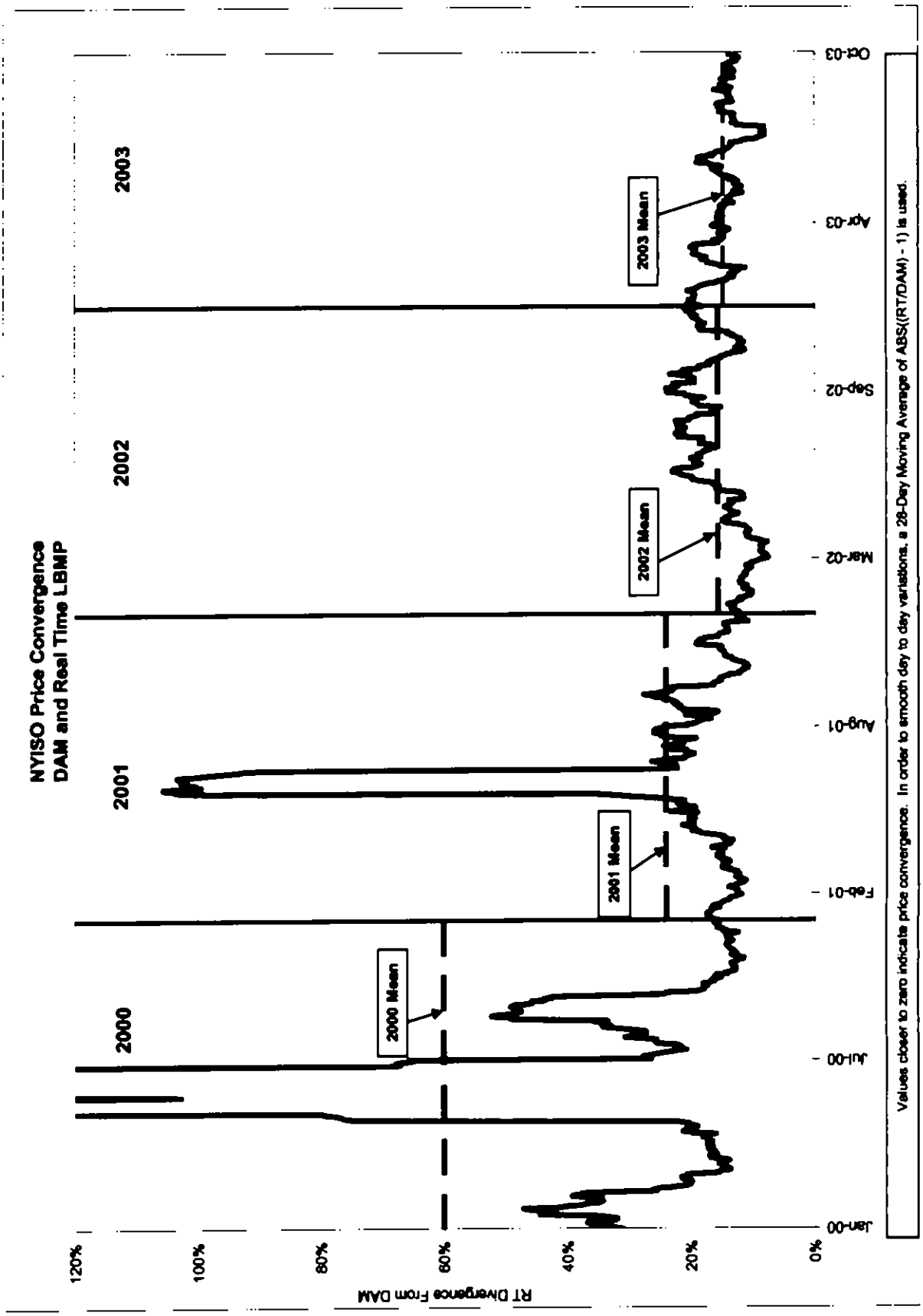
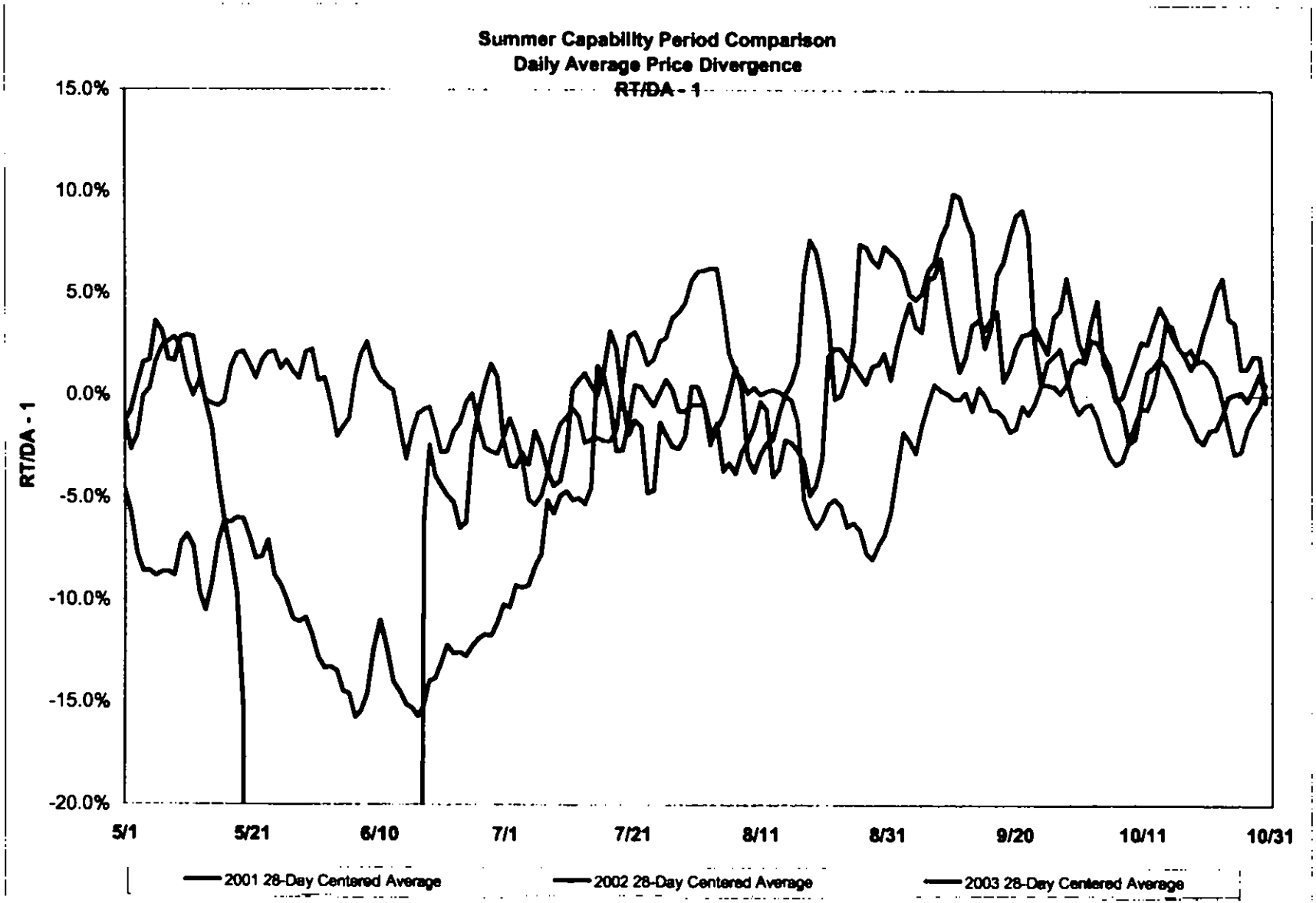


Figure 4: Percentage Price Difference between Day Ahead & Real Time



3.4 *SCUC Simulations of the Day Ahead Market*

The solution for the Day Ahead commitment is affected by Virtual Trading activities. This in turn affects Real Time dispatch. As such, Virtual Trading not only affects Day Ahead prices, but Real Time prices as well. To measure the impact of Virtual Trading on price convergence, the NYISO would have to simulate the solution for both the Day Ahead and Real Time and compare the price difference for these two scenarios with and without Virtual Trading. Unfortunately, due to constraints within SCD, simulating the Real Time solution is not feasible. Because of this constraint, the following reports the results on the Day Ahead and Real Time convergence based on altering the Day Ahead solution only.

To address the effect of Virtual Trading on Day Ahead LBMP, the MMP recomputed *pro forma* results for twenty-five market days during the capability period with and without virtual bid inputs. The NYISO's Day Ahead Market optimization software, SCUC, was used for this study. The SCUC simulation study runs were usually conducted once per week and, occasionally, more often depending on resources and SCUC study mode availability.

Figure 5 plots the actual daily weighted average LBMP for the DayAhead market and Real Time market across all zones, as well as the LBMP produced by SCUC simulations without virtual trading, for twenty-five study days in 2003. The plots show that the Day Ahead LBMP without Virtual Trading is generally less than the Day Ahead LBMP with Virtual Trading. The New York City zone, which generally schedules net virtual load, usually sees the largest decrease in Day Ahead LBMP when virtual bids are removed from the market in the simulations. However, as the SCUC studies are not able to evaluate the Real Time price impact, MMP's ability to draw conclusions from these studies addressing whether Virtual Trading is leading to any convergence between Day Ahead and Real Time prices is limited. Because Day Ahead prices are, in general, higher than Real Time prices, the limited results from the SCUC simulations appear to imply that Virtual Trading may cause additional divergence, assuming no offsetting change in Real Time prices. However, MMP has not discovered any hard evidence supporting this postulate.

The total cost of LBMP energy in the New York market also tends to be higher with Virtual Trading. LBMP energy cost in the SCUC study runs for the Day Ahead market were, on average, over 9% higher with Virtual Trading included. However, as noted previously, this analysis is limited to the Day Ahead market only and has isolated only one variable (e.g. Virtual Trading) in the SCUC simulations. Because other factors (changes in market design, etc.) may be partially responsible for the identified price increase, MMP is not able to determine the relationship between Virtual Trading and increases in Day Ahead prices.

Virtual Trading had no negative effects on uplift payments in the New York Market during the studied periods. Figure 6, below, shows virtual transaction uplift payments

for the Summer 2003 Capability period. The NYISO Day Ahead uplift payments show no clear trend in this period; however Day Ahead uplift payments to virtual suppliers appear to be decreasing. Moreover, Day Ahead virtual supply uplift payments are less than 2% of monthly total Day Ahead uplift payments, indicating that virtual supply uplift payments have a *de minimis* effect on the market.

Figure 5: SCUC Simulation Results

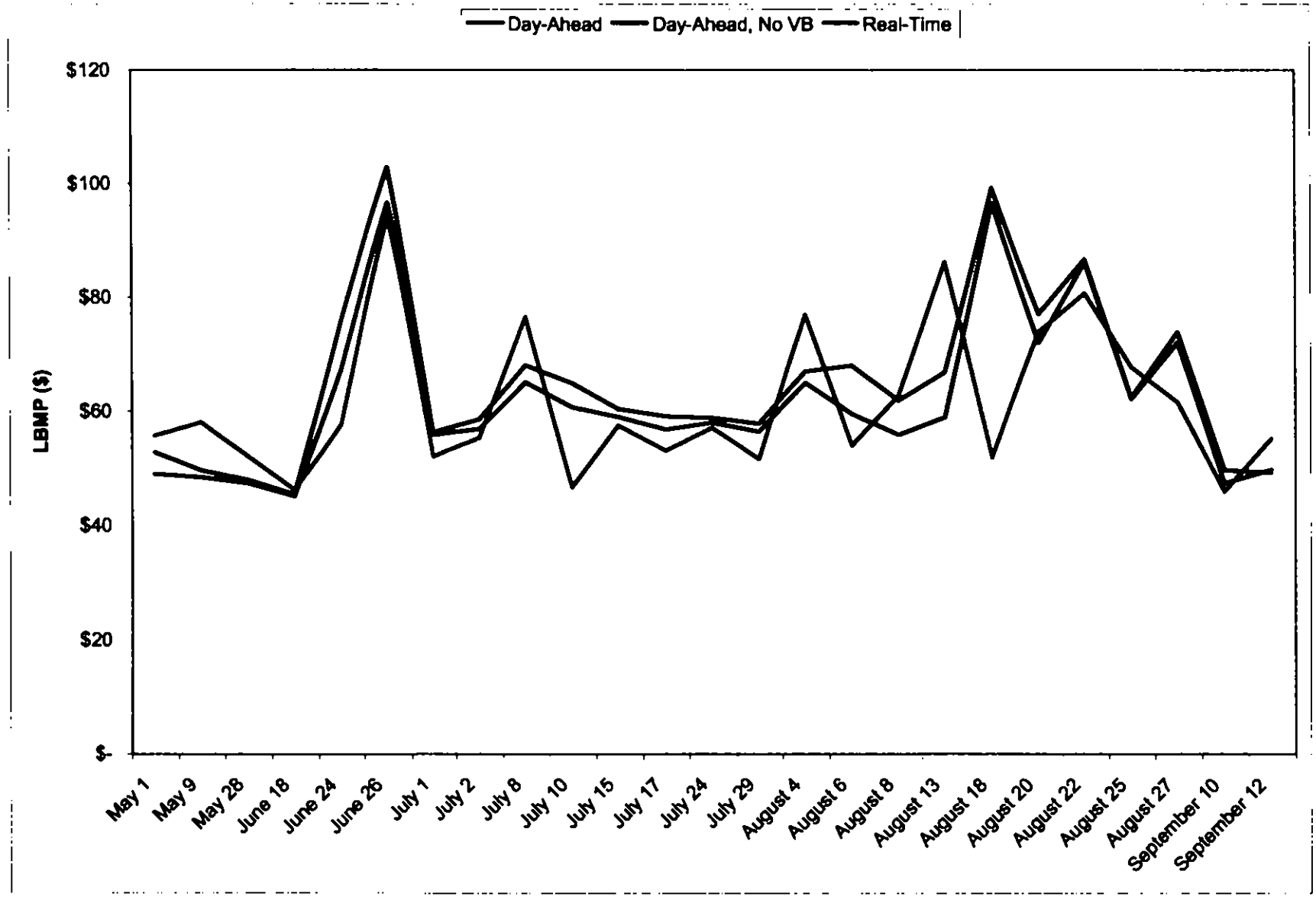
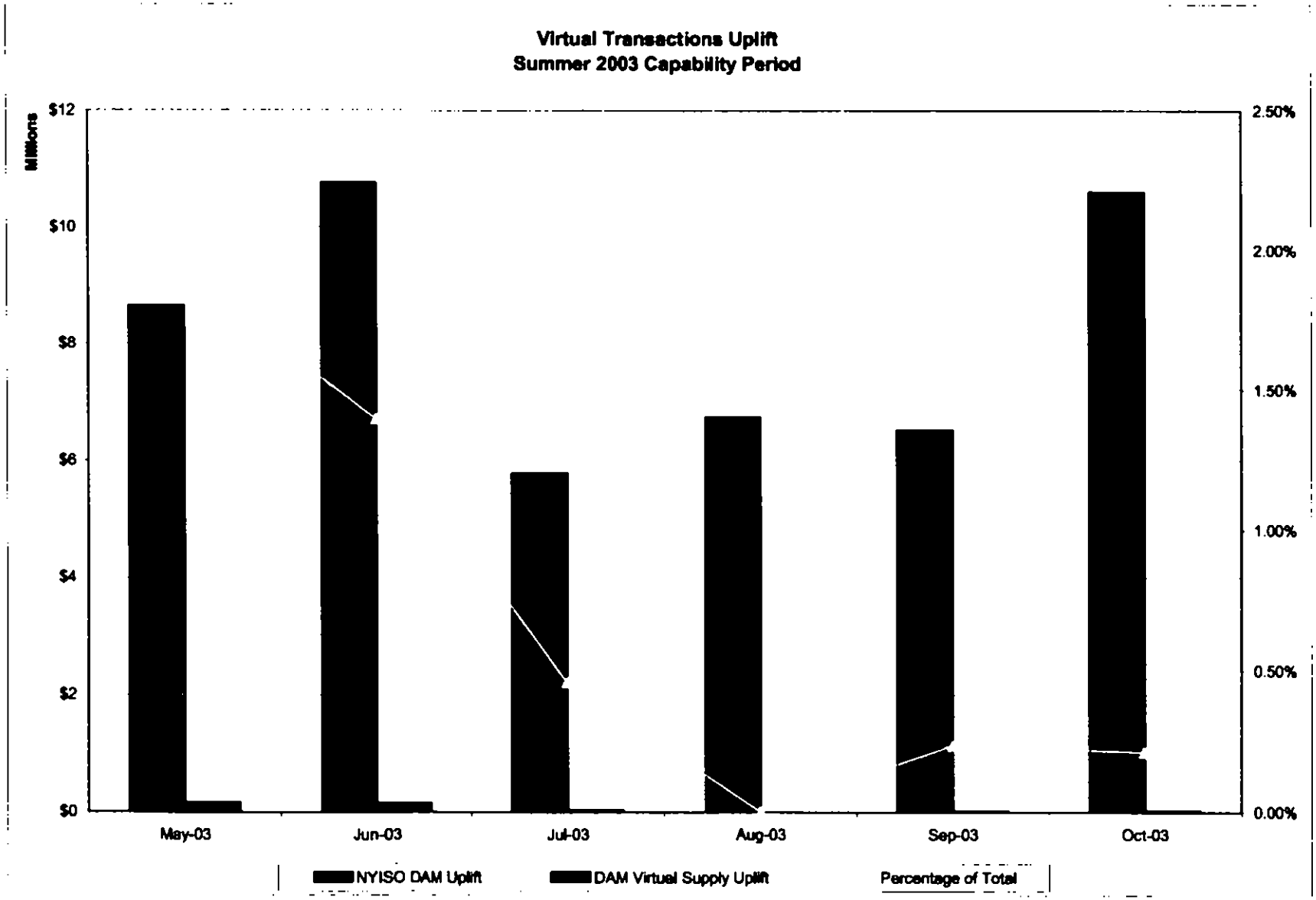


Figure 6: Virtual Transactions Uplift



3.5 *Similar Load Conditions*

An additional metric was developed to isolate the impact of Virtual Trading on price convergence by comparing the difference between the Day Ahead and Real Time prices for individual capability periods during hours with similar load levels.

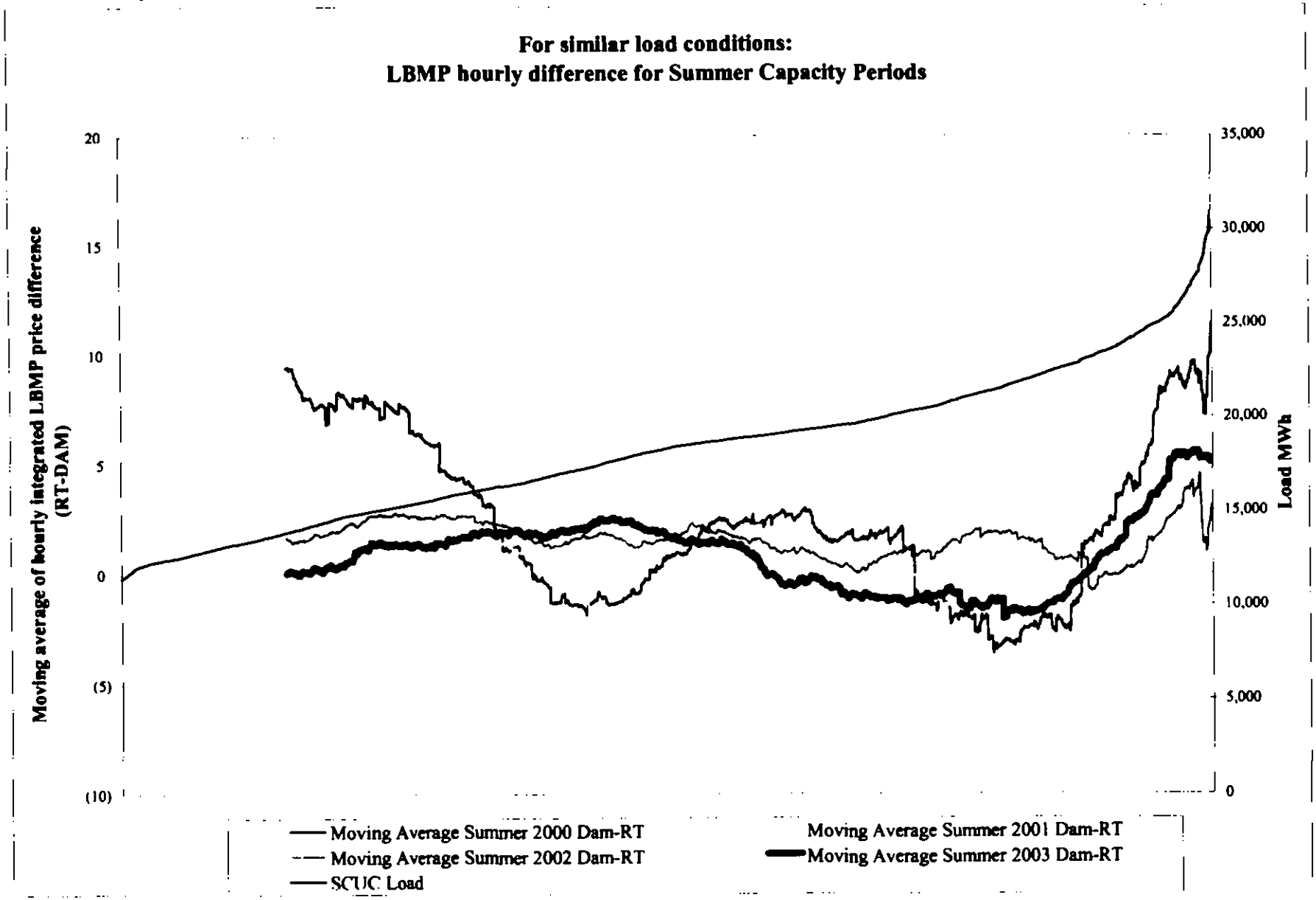
Figure 7 summarizes the Day Ahead to Real Time price difference comparison for the Summer Capability periods both prior to and following the introduction of Virtual Trading. This figure compares four different Capability Periods (2000, 2001, 2002, and 2003) and shows the average hourly 28-day moving averages of the Day Ahead to Real Time values for each Capability Period with similar load levels. This graph allows comparison between Capability Periods that controls for load level. Price differences at a given load in each time frame can then be compared.

Figure 7 shows different trends for the different load levels, as follows:

- For load levels below 17,500 MWh, price differences are for the most part lowest for the most recent Summer Capability period, and have decreased since the NYISO's inception. Real Time prices were almost always higher than Day Ahead prices for each capability period at this load level.
- For load levels between 17,500 MWh and 20,000 MWh, price differences have not demonstrated a clear trend for the past four Summer time frames. Real Time prices were generally higher than day-ahead prices in 2000 and 2002. During 2003, however, Real Time prices were higher than Day Ahead prices only until about the 18,000 MWh load level.
- Between 20,000 MWh and about 23,000 MWh, the 2003 Summer Capability period appears to show smaller price differences compared to the 2000 and 2001 Summer Capability periods.
- For very high and peak load levels, price differences for Capability Periods that featured Virtual Trading appear to be similar to or smaller than for the periods in which there was no virtual trading (especially compared to Summer 2000). Real Time prices were always higher than Day Ahead prices at these load levels with the exception of Summer 2001, when the opposite was true.

Overall, the figure indicates significant price convergence after the introduction of Virtual Trading when compared to the Summer 2000 period. However, the results are inconclusive when comparing Summer 2002 and 2003 to the Summer 2001 period.

Figure 7: Comparison of Price Differences for Similar Load



4 Summary of Virtual Trading Activity

The NYISO reviewed the extent of Virtual Trading activity that took place during the study period. In general, the volume of MWh authorized to bid in the NYISO virtual market increased from the volume levels observed during the Winter Capability period. While the trend of market participants not using the full volume of virtual trading they have collateralized has continued, there has been an increase in both the MWh offered and ultimately scheduled in both the Virtual Load and the Virtual Supply markets for the Summer Capability period.

4.1 *Virtual Trading Volumes*

During the 2003 Summer Capability period, virtual supply bid and scheduled averaged 34,469 MWh per day, and peaked in October with an average of 49,025 MWh per day (see Figure 8 below). The virtual load bid and scheduled averaged 47,027 MWh per day during this Capability Period, with a peak of 54,015 MWh per day during the month of July. These averages are increases over the Winter Capability period and the 2002 Summer Capability period.

In the May 2003-October 2003 period, the proportion of authorized megawatts bid into the market has been decreasing. This is not a result of decreased virtual market bid volumes, but rather a sharp increase in the volume of MWh authorized to bid in the NYISO market (as mentioned above, MWh offered actually increased, but not in proportion to the additional volumes that have been authorized to bid). Within the Summer 2003 Capability period, the percentage of authorized virtual MWh bid peaked in May at 49%. This percentage decreased to 34% in October, also more a result of the increase in MWh authorized than a decrease in bidding. The increase in MWh authorized from May to October was over 50%, from 222,265 MWh to 362,150 MWh.

Bid prices are aggressive, as a large majority of bids in both virtual load and virtual supply megawatts have been scheduled (see Figure 9 below). The overall percentage of virtual load and virtual supply scheduled in Summer 2003 was 82%, consistent with the 2002 Winter Capability period figure of 81%. The percentage of virtual load and supply scheduled by month within the Summer 2003 Capability period ranged from 77% in August to 87% in May.

Figure 8: Average Virtual Trading MWh per Month

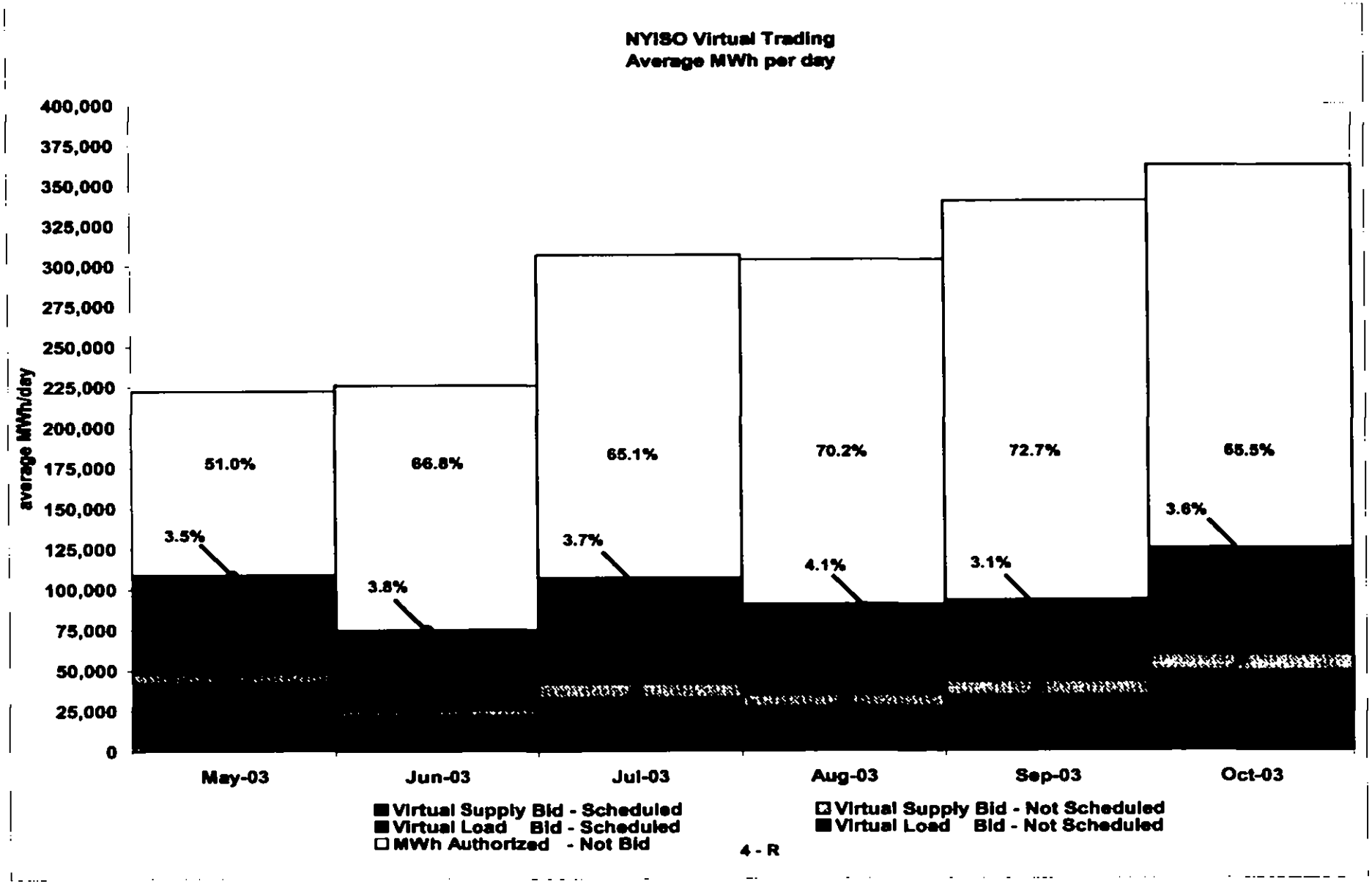


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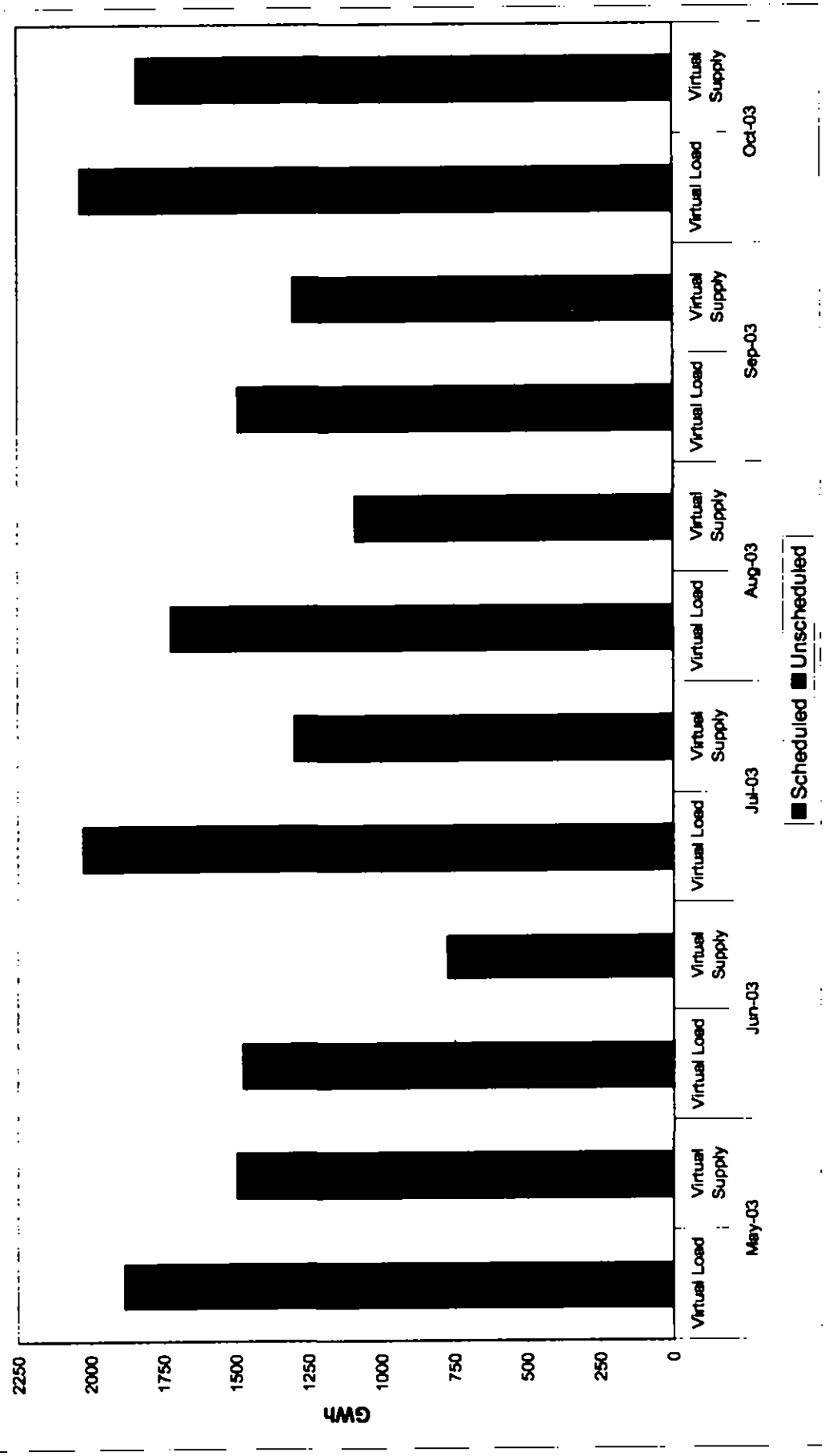
Figure 9: Scheduled vs. Unscheduled Monthly Virtual Transactions



5 Credit Requirements Analysis

To date, the NYISO has not incurred any bad debts attributable to Virtual Trading. The NYISO continues to believe that the credit requirements for Virtual Trading provide an important protection against the risks associated with this market feature.

The credit policies applicable to Virtual Trading do not appear to impede entrance into this market. As of October 31, 2003, there are 45 customers registered and authorized to engage in a total of 362,150 MWh of Virtual Trades each day. This is a substantial increase over the previous Summer and even over the most recent Winter Capability period. As recently as April 30, 2003, there were only 35 customers authorized to engage in a total of 209,619 MWh of Virtual Trades each day. Furthermore, an average total of 193,671 MWh of Virtual Trade authorizations were unused each day during the 2003 Summer Capability Period, suggesting that the credit requirements did not impede the Market Participants' ability to enter into economically desirable Virtual Trades.