Update of the 2004 Report, “Impact of Virtual Transactions on New England’s Energy Market”

Internal Market Monitoring Unit
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Executive Summary

This report updates the previous ISO New England Inc. (ISO) study, "Impact of Virtual Transactions on New England's Energy Market" (2004 report).[1] The 2004 report detailed the effect of virtual transactions on the New England energy markets with particular emphasis on convergence between the real-time (RT) and day-ahead (DA) prices. The 2004 report addressed questions on this topic, as listed below, which the Federal Energy Regulatory Commission (FERC) posed to the ISO in a March 25, 2004, order:[2]

- What is the effect of virtual transactions on the energy markets the ISO administers?
- Have virtual transactions led to price convergence between the real-time and day-ahead markets?
- Has virtual trading led to price discovery, liquidity, and trading options, without adding any appreciable costs?
- What other factors, if any, are potentially driving price convergence?

In its December 30, 2004, order, FERC requested to the ISO to:

> "file another report in its 2006 budget filing, addressing the same virtual trading issues outlined in the March 25 Order."[3]

The 2004 report period spanned 18 months, from the beginning of Standard Market Design (SMD) in March 2003 through August 2004. The present report period spans 11 months, from September 2004 through July 2005.

To respond to FERC, the ISO used the New England benchmark model, which simulated the day-ahead and real-time prices that could have been observed with and without virtual transactions.[4] This modeling allowed the direct computation of the impact of virtual transactions on convergence and the market price of risk (MPR). The results of this modeling for the latest report period indicate that with simulated real-time prices and under the conditions of high volatility, the presence of virtual transactions in the model led to increased convergence in 8 out of 11 months.

A more sophisticated measure of market efficiency than convergence is the computed market price of risk based on the benchmark model results. The results of this computation were that, consistent with financial theory, the computed market price of risk was lower with virtual transactions than without them in 10 out of 11 months of the report period. The results of the simulation model suggest that virtual transactions continue to improve day-ahead real-time price convergence and reduce the market price of risk.

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[1] ISO New England Inc., 2004, "Impact of Virtual Transactions on New England's Energy Market," available at <http://www.iso-ne.com/pubs/spcl_rpts/2005/vrtl_trns/index.html>.

[2] FERC Docket No. ER04-121-000, March 25, 2004, "Order Addressing Issues Raised at Technical Conference," p. 11, available at <http://www.iso-ne.com/FERC/orders/ER04-121-000_3-25-04.pdf>.

[3] FERC Docket No. ER05-134-000, December 30, 2004, "Order Accepting, Suspending, and Rejecting Tariff Revisions in Part and Establishing Expedited Hearing Procedures," p. 12, available at <http://www.iso-ne.com/regulatory/ferc/orders/2004/dec/er05-134-000_12-30-04.doc>.

[4] The ISO has used the benchmark model for broadly determining the efficiency of New England's energy markets, as well as efficiency changes over time. For more information about the model, see the 2004 report.

The report also reviewed the total number of transactions submitted and cleared during the report period, as well as the amount of submitted and cleared virtual transactions in MWh, and mean and median volumes of cleared and submitted virtual transactions. The availability of virtual transactions during the report period continued to increase participation and, hence, liquidity in the New England electricity market and expand trading options. A rule change that decreased the charges associated with cleared virtual transactions appears to have increased the volumes of submitted transactions, but too little data are available to reliably evaluate the effect of the rule change on price divergence. Virtual transactions have not added appreciable identifiable costs to the implementation or operation of the New England market. Virtual trading did not hamper the price discovery that is a feature of the ISO-administered energy market.

Section 1
Introduction

This report provides data on virtual transactions in the New England power markets and evaluates the impact virtual transactions have on the relationship between real-time and day-ahead electricity prices. The ISO prepared the report in response to a FERC requirement for the ISO to include in its 2006 budget filing a follow up report to a 2004 report, “Impact of Virtual Transactions on New England’s Energy Market.”[5,6]

The 2004 report addressed the following issues the FERC posed to the ISO in a March 25, 2004, order:[7]

- What is the effect of virtual transactions on the energy markets the ISO administers?
- Have virtual transactions led to price convergence between the real-time and day-ahead markets?
- Has virtual trading led to price discovery, liquidity, and trading options, without adding any appreciable costs?
- What other factors, if any, are potentially driving price convergence?

The report period for the 2004 report was 18 months, beginning at the onset of Standard Market Design in March 2003 and spanning until August 2004. The present report extended the results of the 2004 report by 11 months and covers September 2004 to July 2005.

In addition to the Executive Summary and Introduction, the report contains the following sections and information:

- Section 2—reviews the virtual-transaction activity during the report period, describing the changes in market participation and the total number and volumes of submitted and cleared virtual transactions.

- Section 3—provides data on the convergence between the day-ahead and real-time prices in the New England market during the report period.

- Section 4—discusses the results of simulations of the effect of financial virtual transactions (FVTs) on price convergence during the report period. The ISO used a benchmark model to directly estimate the impact of financial virtual transactions on day-ahead prices by comparing the modeled day-ahead prices to modeled “counterfactual” day-ahead prices excluding financial virtual transactions. After estimating the day-ahead prices that excluded

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[5] FERC Docket No. ER05-134-000, December 30, 2004, “Order Accepting, Suspending, and Rejecting Tariff Revisions in Part and Establishing Expedited Hearing Procedures,” p. 12, available at <http://www.iso-ne.com/regulatory/ferc/orders/2004/dec/er05-134-000_12-30-04.doc>.

[6] ISO New England Inc., 2004, “Impact of Virtual Transactions on New England’s Energy Market,” available at <http://www.iso-ne.com/pubs/spcl_rpts/2005/vrtl_trns/index.html>.

[7] FERC Docket No. ER04-121-000, March 25, 2004, “Order Addressing Issues Raised at Technical Conference,” p. 11, available at <http://www.iso-ne.com/FERC/orders/ER04-121-000_3-25-04.pdf>.

financial virtual transactions, the ISO then calculated the effect of these transactions on the market price of risk using simulated real-time prices generated by the same model.

- Section 5—summarizes the conclusions of the investigation of the questions posed by the commission for this report period. The main conclusions are that, in general, virtual transactions continue to increase price convergence and lower the market price of risk. During the report period, virtual transactions continued to improve and expand liquidity and trading options without imposing additional costs on the ISO.

- An appendix to the report reviews the impact of recent rule changes regarding the allocation of real-time second-contingency protection charges on virtual trading.[8]

[8] Generators dispatched out of merit for a portion of their full minimum run time, as determined by the applicable nodal locational marginal price in relation to their offer data, or generators dispatched above their self-scheduled amounts, may be eligible for additional compensation through Net Commitment Period Compensation ("NCPC"). NCPC ensures that generators providing energy or reserves that experience overall revenue shortfalls or, in some cases, opportunity costs, are made whole for any expenses not recovered through the sum of daily energy market payments. Second-contingency protection credits are paid to generators are operated in order to provide protection against a second contingency in a local area.

Section 2
Virtual Transactions during the Report Period

This section examines the change in the number of market participants engaged in virtual trading over the report period with a separate emphasis on pure financial participants that do not own generation or serve load. The section also reports on the monthly changes in the total numbers of submitted and cleared virtual transactions, the total MWh volumes of submitted and cleared virtual transactions, and the mean and median volumes per submitted and cleared transactions.

2.1 Participation in the Virtual Transactions Market

Figure 1 shows the total number of participants that submitted virtual transactions in each month of the report period. For comparison, it also shows the number of participants that primarily participate in the New England market through virtual transactions (i.e., those participants that do not own generation or serve load).

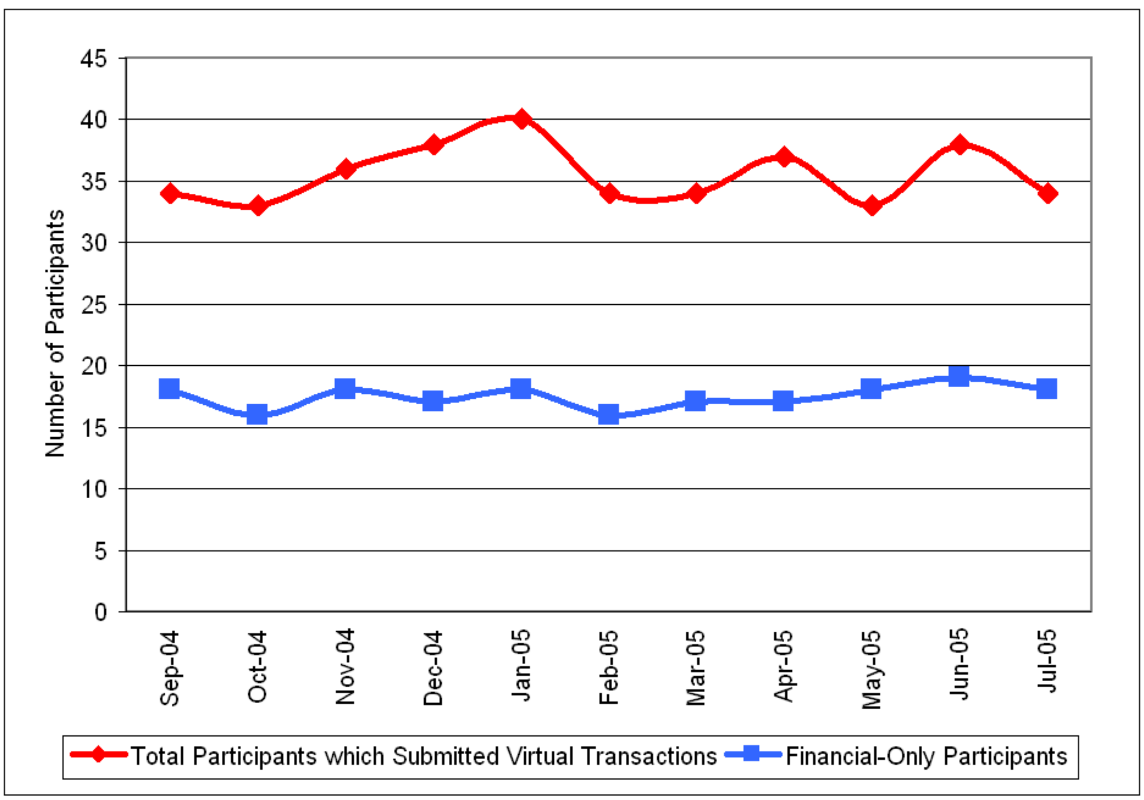

Figure 1 Number of participants in the virtual-transactions market, September 2004 to July 2005.

The number of participants has been relatively stable since the beginning of SMD. In the peak participation month, January 2005, 40 participants actually submitted virtual offers and bids, out of

265 participants eligible to participate in the virtual transactions market.[9] Participants that primarily engage in financial trading represent about half that number.

Compared to the 2004 report period, total participation increased slightly on average, and total financial participation decreased slightly on average during this report period (cf. Figure 1 in the 2004 report). Financial participation may have decreased slightly because some participants, such as those serving load, entered into the physical market and became marketers in addition to being virtual traders, moving some financial participants into the total participation category. The increase in total participation suggests that market participants are becoming more comfortable using virtual transactions as part of their trading strategy. The continued presence of financial participants indicates that virtual transactions have increased market participation.

2.2 Number of Transactions

Figure 2 shows the total number of virtual offers ("incs") and virtual bids ("decs") submitted and cleared during each month of the report period (cf. Figure 2 of the 2004 report).[10] The dashed line shows cleared virtual offers and bids as a percentage of submitted transactions. The figure shows that the number of submitted virtual transactions decreased in 2004, rose in March 2005 through June 2005, and then fell back to the pre-March 2005 levels. Cleared virtual transactions showed no discernable trend, remaining at the levels seen during the 2004 report period.

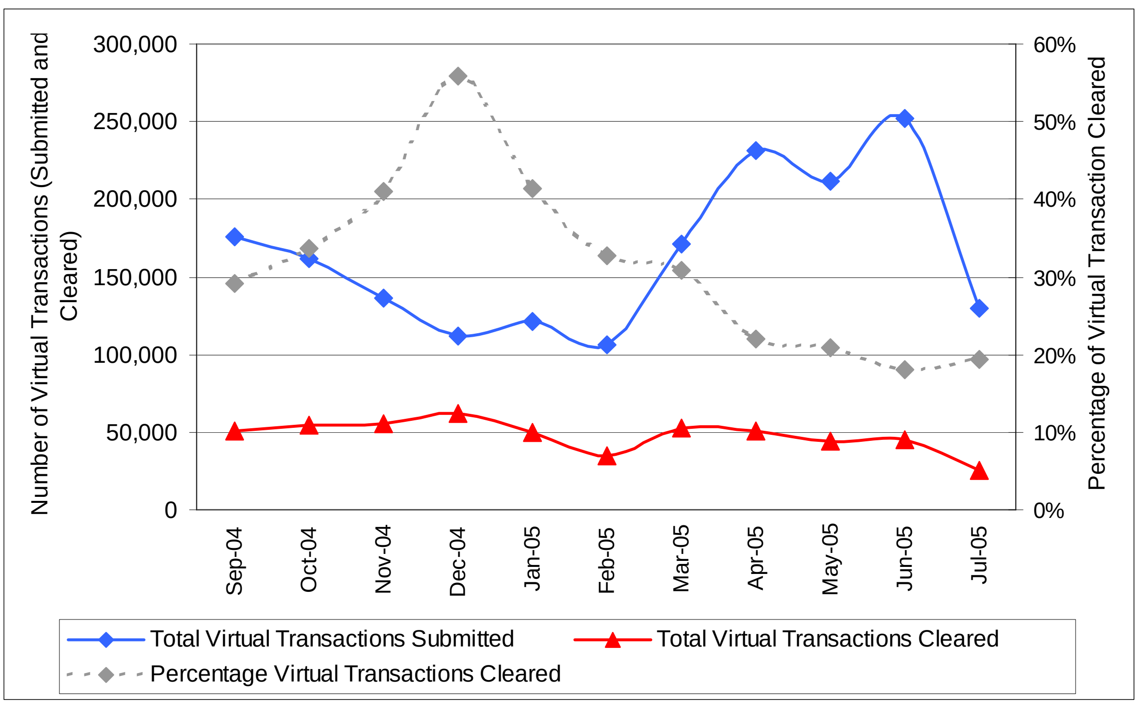

Figure 2 Total number of virtual transactions submitted and cleared, September 2004 to July 2005.

[9] A total of 265 participants were eligible to submit virtual transactions as of August 1, 2005.

[10] The adopted terminology is identical to 2004 report. Throughout the report, virtual supply is also called increment or virtual offers, or incs; virtual demand is also called decrement or virtual bids, or decs.

2.3 Volumes of Virtual Transactions

Figure 3 presents the total volume of submitted and cleared virtual transactions in MWh. Overall, the levels of submitted and cleared virtual transactions remained relatively stable during the report period, characterized by much lower volatility of MWh volumes of submitted virtual transactions compared to the 2004 report period (cf. Figure 3 in 2004 report).[11] The downward trend in the percentage of MWh cleared during the report period appears to reverse the upward trend of the 2004 report period. However, the overall percentage of cleared MWh remains above the average level of the 2004 report period.

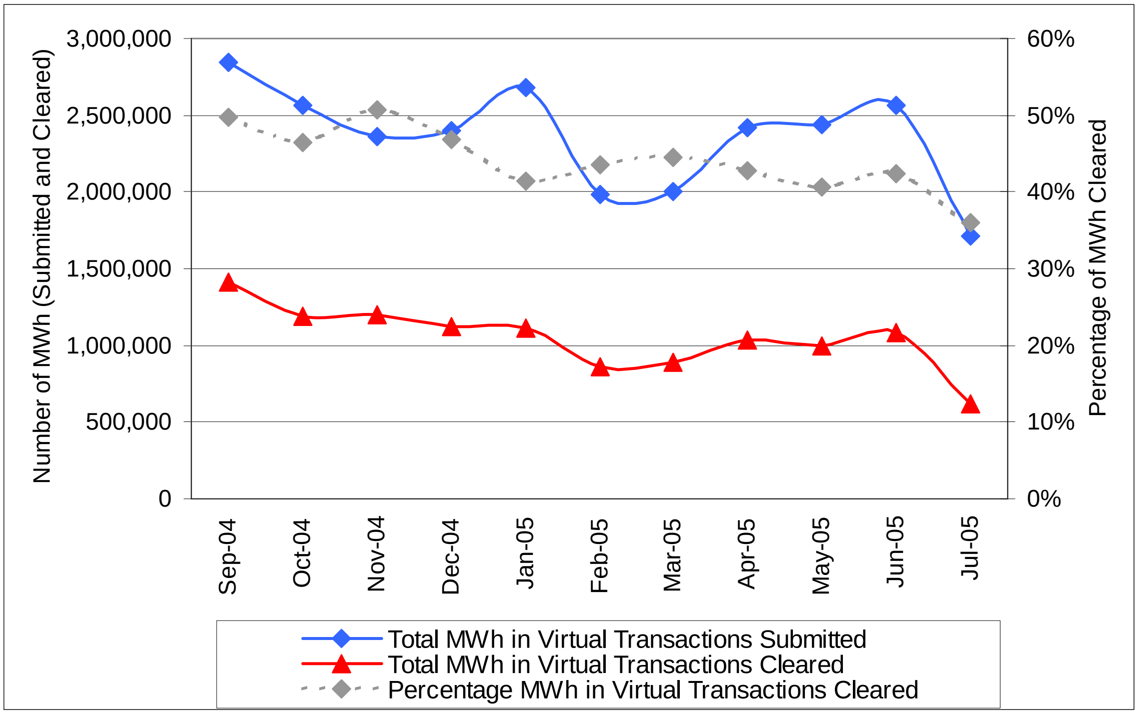

Figure 3 Total submitted and cleared virtual transactions in MWh, September 2004 to July 2005.

2.4 Volumes per Transaction

Figure 4 shows both the mean and median MWh per submitted and cleared transaction. The mean MWh submitted per transaction decreased during the report period compared to the 2004 report period (cf. Figure 4 in 2004 report), while the mean MWh cleared remained at the same level as the mean MWh cleared during the last few months of the 2004 report period. The median level of submitted virtual transactions suggests that during the period of this report, many small volumes were submitted. The mean cleared MWh per transaction during the report period remains above the mean submitted MWh per transaction, suggesting the fraction of small-volume virtual transactions that did not clear was disproportionately large, similar to the results for the 2004 report period.

[11] In 2003, the volatility of MWh volumes of submitted virtual transactions was much higher than during the current report period. In 2004, the volatility of MWh volumes of submitted virtual transactions was comparable to the volatility during the current report period.

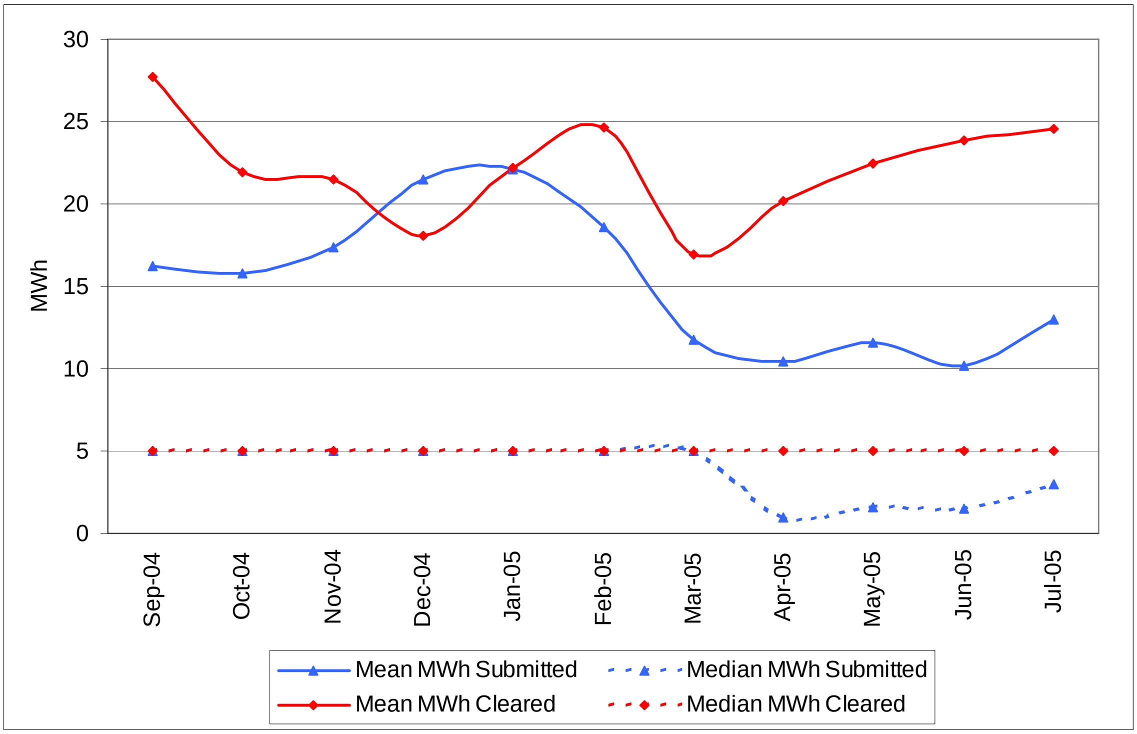

Figure 4 Mean and medial submitted and cleared MWh per virtual transaction, September 2004 to July 2005.

Section 3
Overview of Locational Marginal Price Divergence in the New England Market

The difference between day-ahead and real-time prices in any given hour or day is the absolute divergence, defined simply as real-time price minus day-ahead price.[12] Figure 5 presents the absolute divergence time series at the Hub during the report period (cf. Figure 5 in the 2004 report).[13] Most often, the prices in the day-ahead market were higher than in the real-time market, although divergence may have been positive or negative on any given day. Compared to the 2004 report period, fewer price spikes occurred during this report period in both the day-ahead and real-time markets.

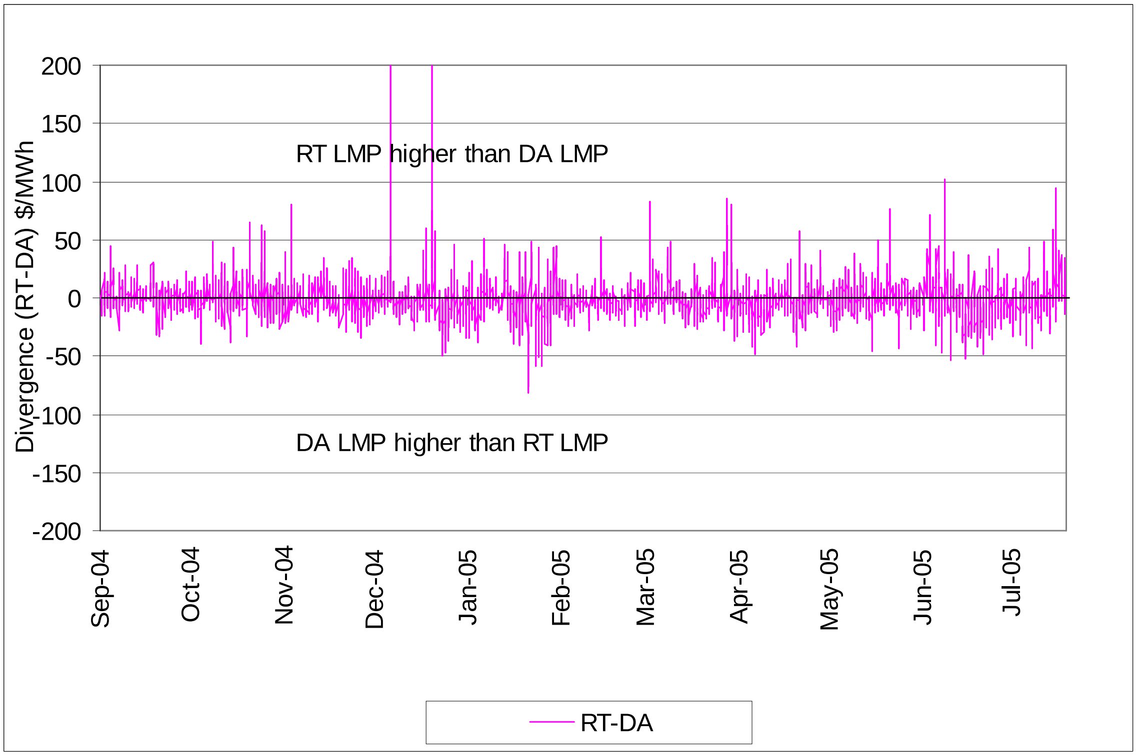

Figure 5 Absolute hourly divergence (RT – DA) at the Hub, $/MWh, September 2004 to July 2005.
Note: The scale is limited to ± $200/MWh.

[12] This report follows the convention adopted in the ISO's *2004 Annual Market Report* of defining the divergence as the RT price minus the DA price. If the RT price is higher than the DA price, the divergence is positive; if the RT price is lower than the DA price, the divergence is negative.

[13] The Hub is a specific set of predefined pricing nodes for which a locational marginal price (LMP) is calculated and which can be used to establish a reference price for energy purchases and the transfer of day-ahead load obligations and real-time adjusted load obligations and for the designation of Financial Transfer Rights. For additional information, see ISO Manual M-35, "Definitions and Abbreviations," available at <http://www.iso-ne.com/rules_proceds/isone_mnls/index.html>.

The non-normality of a financial time series is measured by how much the relative divergence deviates from normality.[14] Table 1 provides the descriptive statistics of the density function of relative divergence for September 2004 to July 2005. The data confirm that spikes in real-time slant the distribution towards the right, fat tail, resulting in a positive skew and high kurtosis.[15] And while the mean, median, and standard deviation are fairly close to the respective values contained in the 2004 report period (cf. Table 10 of the 2004 report), the values of skew and kurtosis are less than half of their 2004 report-period values, reflecting smaller asymmetric spikes.

Table 1
Statistics for Relative Divergence, September 2004–July 2005

Mean	Median	Std. Deviation	Skew	Kurtosis
-0.02	-0.03	0.24	6.24	203.97

The results for absolute monthly divergences at the Hub and load zones are presented in Figure 6.[16]

[14] The relative divergence is defined as the difference between the real-time price and day-ahead price, divided by the day-ahead price: [(RT – DA)/DA] or [(RT/DA) – 1].

[15] Skewness is a measure of a distribution's degree of asymmetry. If the left tail (i.e., the tail at small end of the distribution) is more pronounced than the right tail (the tail at the large end of the distribution), the function is said to have negative skewness. If the reverse is true, the function has positive skewness. If the two tails are equal, the function has zero skewness. Kurtosis is the degree of peakedness of a distribution. High kurtosis means fat tails in the distribution and evidence of price spikes. For more information, see Eric W. Weisstein's "Skewness" and "Kurtosis," from MathWorld—A Wolfram Web Resource, available at <http://mathworld.wolfram.com/Skewness.html> and <http://mathworld.wolfram.com/Kurtosis.html>, respectively.

[16] A load zone is an aggregation of pricing nodes within a specific area (also known as a zone). For additional information, see ISO Manual M-35, "Definitions and Abbreviations," available at <http://www.iso-ne.com/rules_proceds/isone_mnls/index.html>. "Load zone" and "zone" are used intermittently in the remainder of this report.

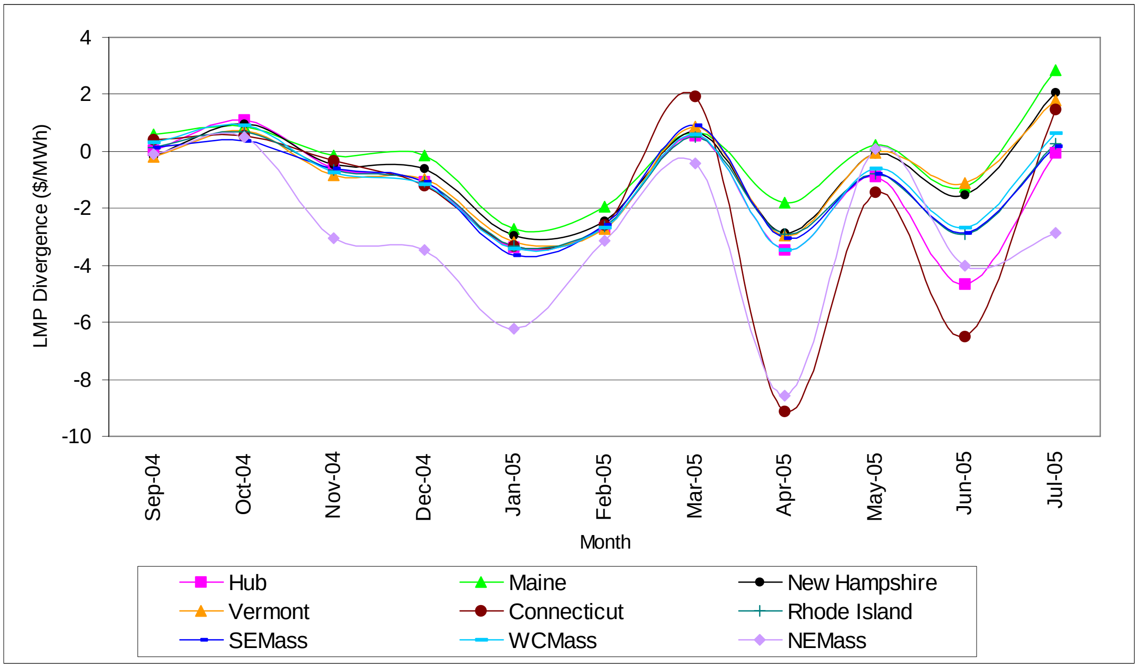

Figure 6 Absolute monthly divergence (RT – DA) for the Hub and zones, $/MWh, September 2004 to July 2005.

The average divergence for most zones appears to be correlated throughout the report period. Those points that appear to be outliers are for zones that generally experience the most congestion due to import constraints. In many months of the report period, NEMass divergence was larger (in absolute value) than in most other zones. This divergence could be caused by a variety of reasons. For example, second-contingency commitments depress LMPs in real-time due to a number of units operating on their economic minimum, most significantly during the on-peak hours. Connecticut, which is another import-constrained zone, accounted for the remaining outliers. Divergence oscillated month-to-month during the report period but did not exhibit any trends, although it was more often negative than positive.

Section 4
Effects of Virtual Transactions on Divergence and the Market Price of Risk

This section evaluates the effect of virtual transactions by comparing modeled day-ahead prices to modeled "counterfactual" day-ahead prices reflecting the removal of purely financial virtual transactions in the New England energy market with modeled real-time prices as a benchmark.[17]

4.1 Hedging and Financial Virtual Transactions

Virtual transactions are separated into hedging and financial categories, depending on the type of participant that submitted the virtual trade and where that virtual trade cleared. The following virtual transactions are deemed to be hedging transactions:

- If the participant that submitted the inc or dec is the lead participant of the generator where the virtual transaction was submitted
- If the participant submitted the inc or dec at a pricing node or zone and has either a real-time load obligation or an adjusted real-time load obligation at that node or zone[18]
- All virtual transactions at the Hub[19]
- Some additional virtual transactions submitted by intermediaries (such as merchant energy companies and banks) at the load zones. These intermediaries place the virtual transactions for hedging as a service to some market participants.
- Some virtual transactions submitted at external nodes that are known to be hedging

The remaining virtual trades at nodes or zones are considered financial virtual transactions.[20]

Figure 7 presents the total amount of cleared hedging and financial incs and decs in MWh during the report period. The amount of cleared MWh hedging incs declined, and the amount of cleared MWh hedging decs grew overall throughout the report period, each curve characterized by high volatility. The overall increase in the amount of cleared MWh financial incs and the decrease in the amount of cleared MWh financial decs are consistent with report-period divergence that was more negative than positive.

[17] For rationale behind this comparison, see the 2004 report, Section V, "Effects of Virtual Transactions on Divergence and Market Price of Risk."

[18] This classification item has changed compared to the 2004 report due to the inclusion of additional nodes to the nodes where the physical load is submitted.

[19] This is a new bullet as compared to the classifications included in the 2004 report. Given the significance of the Hub as a receipt or delivery location for most bilateral contracts, this assumption is reasonable.

[20] Since the true intentions of participants placing virtual transactions are not always obvious or known, this classification, while attempting to create the adequate counterfactual market by using the available evidence, may not always accurately reflect a participant's strategy.

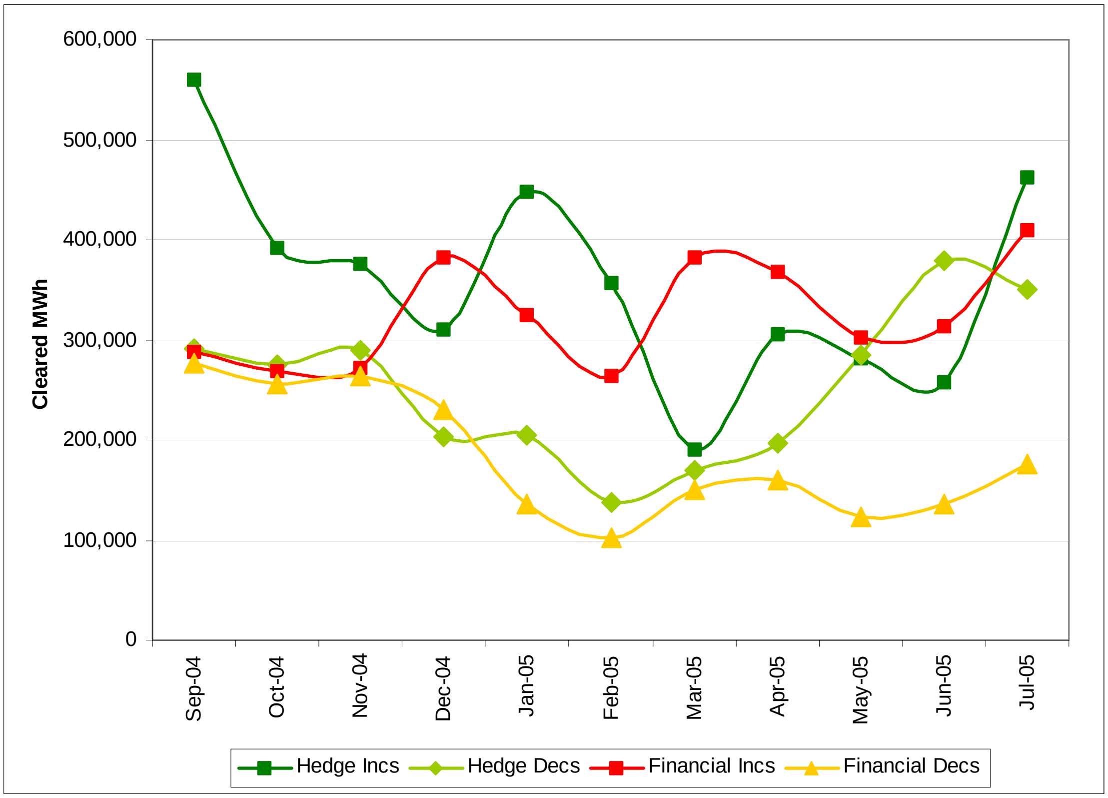

Figure 7 Cleared hedging and financial virtual transactions in MWh, September 2004 to July 2005.

This report uses this empirical information on financial virtual transactions to model the impact these transactions have on the divergence between day-ahead and real-time prices.

4.2 Benchmark Model Application

For this report, to assess the impact financial virtual trades have on the market, the ISO calculated prices for markets in which all cleared financial increment offers (cleared financial offers) and cleared financial decrement bids (cleared financial bids) were included and removed.[21] Figure 8 compares the divergence with and without financial virtual trades. The left axis shows divergences between the simulated day-ahead and real-time prices. The difference in divergences is due to the change in the benchmark day-ahead price after the financial virtual transactions had been removed. The right axis on the graph shows a rescaled difference between the absolute values of divergence with and without financial virtual transactions. The model results suggest that financial transactions decreased divergence in 8 out of 11 months. The three months of higher divergence in the presence of financial virtual transactions may by attributable to an unstable and highly volatile pattern of divergence during these months, as discussed in the 2004 report, Figure 8 (cf. 2004 report, Figure 8 and its

[21] For a brief description of the benchmark model and its application, see the 2004 report, Section V.B, "Benchmark Model Application."

explanation).[22] These simulation results suggest that the overall effect of virtual transactions continues to be one that drives the day-ahead price toward the real-time price, thus decreasing the divergence.[23]

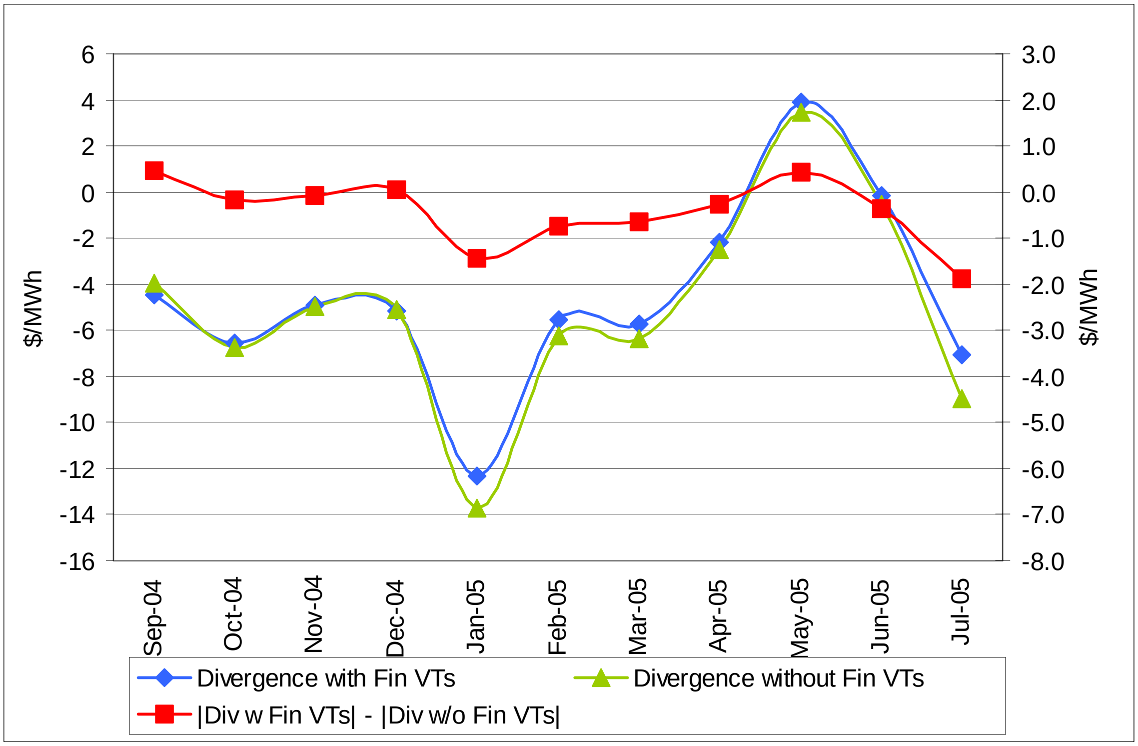

Figure 8 Divergence with and without financial virtual transactions, $/MWh, September 2004 to July 2005.

4.3 Financial Virtual Transactions and the Market Price of Risk

Another measure of the impacts financial virtual transactions have on the market is the market price of risk. This measure is a more sophisticated computation of efficiency and impact on the market, with divergence being just one component. The market price of risk not only considers the expected reward for submitting a virtual transaction, but also the risk associated with that reward. The market price of risk is the ratio of the expected relative change between the day-ahead and real-time prices to

[22] Virtual trades may increase the divergence when the sign of divergence frequently switches between positive and negative due to the inability of traders to systematically use incs or decs to obtain profit. Under these conditions, financial virtual trades may result in increased divergence.

[23] The divergences in Figure 8 reflect simulated day-ahead and real-time clearing prices, which may differ substantially from divergences based on actual day-ahead and real-time prices. The reader should bear in mind that the simulations reflect a purely economic dispatch of units to meet hourly loads. Unlike actual prices, these simulated prices reflect neither particular unit characteristics (e.g., minimum run times) nor operational considerations, such as redispatch requirements for local reliability, regulation, and voltage control. Therefore, the report highlights the directional changes in divergence in the benchmark model rather than specific numerical values.

its volatility.[24] The market price of risk is a more appropriate measure of market efficiency than simple divergence and thus of the impact financial trading has on the market, since for any financial position, the uncertainty of expected profits is as important as the expected profit itself. If the uncertainty varies over time, a measure such as divergence, which ignores uncertainty, will ignore an important variable. Comparing the market price of risk for the two instances of the benchmark model in the previous subsection (for day-ahead benchmark prices with and without financial virtual transactions versus real-time benchmark prices) produces a metric useful for assessing the effect of financial virtual transactions on the market.[25]

The left-hand axis of Figure 9 plots the market price of risk for the daily average on-peak price (hour ending 8:00 to hour ending 23:00) with and without financial virtual transactions, as simulated by the benchmark model. Their difference is plotted on the larger scale on the right-hand axis.

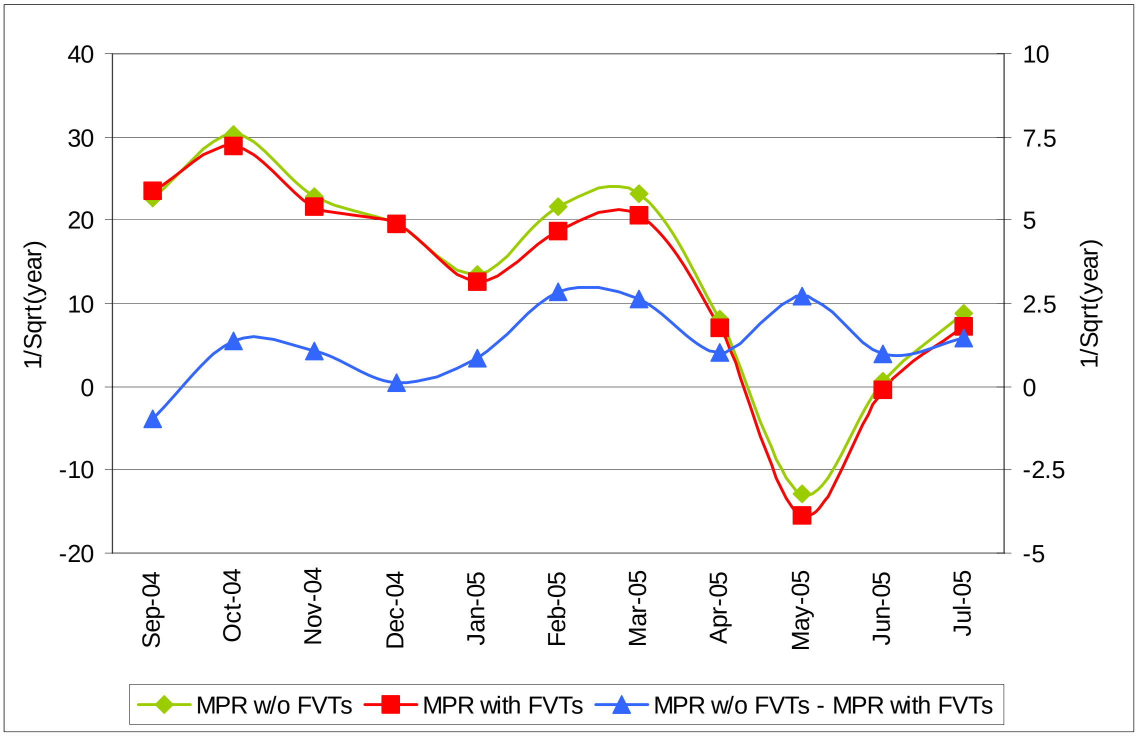

Figure 9 Daily on-peak market price of risk, with and without financial virtual transactions, and their difference, September 2004 to July 2005.

These results are consistent with earlier findings of the influence of financial virtual transactions on divergence. The market price of risk decreased during the report period in 10 out of 11 months due to virtual trading activity. This suggests that financial virtual trades can successfully exploit divergences and their volatilities, given the cost of placing virtual transactions. Whether this action successfully erases some market power, removes other market inefficiencies, or drives the market price of risk

[24] The reader will recognize the so-called Sharpe ratio for securities from the CAPM and Arbitrage Pricing Theory. Since this report deals with the forward positions, the ratio is the expected rate of change rather than its premium over the risk-free rate (as in the case of securities) that must be divided by the volatility.

[25] See the 2004 report-period results and additional theoretical consideration about the market price of risk.

below the level that would be observed in a market comprised of just energy producers and consumers remains an open question.

Section 5
Conclusions

This report addressed the evolution of virtual trading and its potential impact on the market during the report period. The following are the main conclusions of this report:

- Benchmark model results suggest that virtual transactions decreased the market price of risk during the report period. Given the nature of financial virtual trades, this effect of virtual transactions on the energy market is consistent with expectations of financial theory.
- The results from the benchmark model suggest that virtual transactions decreased the divergence between real-time and day-ahead prices in most months during the report period.
- Virtual trading continues to attract participants into the market that do not have physical generation or load obligations, and it has increased the number and volumes of submitted offers and bids. In this sense, the liquidity in the energy market is higher in the presence of virtual transactions.
- Virtual transactions continue to offer additional trading options to participants, as they are not bound by the limitations on physical trades. Participants extensively used virtual transactions for hedging physical transactions. Virtual trades also enabled financial market participants to engage in statistical arbitrage between day-ahead and real-time prices.

This report also provided responses to the commission's additional questions and made further comments and observations about virtual transactions, as follows:

- The volume of virtual transactions did not require an upgrade in hardware and/or new software during the report period.
- During the report period, virtual transactions have not hampered the ability of the SMD software to produce the day-ahead prices. In this sense, virtual trading has not interfered with the price discovery that is a feature of the ISO-administered energy market.

Appendix A
Impact of Second-Contingency Protection Cost Allocation Rule Change in Import-Constrained Areas

In its March 7, 2005, order, “Order Accepting Tariff Revisions for Filing,” FERC accepted the ISO’s proposal concerning the allocation of real-time second-contingency protection charges.[26,27] The ISO proposed to change the then current methodology for allocating the real-time second-contingency protection charges from one that allocated charges to real-time deviations to one that allocates charges to real-time load obligations adjusted for any applicable bilateral transactions. In developing its proposal, the ISO noticed that one consequence of the then-current allocation system was that financial virtual transactions that arbitrage the day-ahead real-time divergence were disproportionately penalized, which inhibited virtual trading, potentially leading to higher levels of divergence. The commission agreed with the ISO, stating:

> “[the ISO’s] revised allocation methodology will, among other things, encourage greater price convergence between ISO-NE’s Day Ahead and Real-Time energy markets, while minimizing the associated inequities attributable to ISO-NE’s currently-effective cost allocation methodology.”

The new allocation methodology became effective on March 1, 2005. In evaluating the impact the allocation rule change has on virtual transactions, this report concentrates on two import-constrained areas, Connecticut (CT) and NEMass (NEMA), which incur most of the real-time second-contingency costs. Table 2 shows that operating-reserve charges paid by virtual transactions decreased sharply in these areas after the rule change.

Table 2
First and Second-Contingency Charge Rate for Report Period, $/MWh

Year	First -Contingency Rate		First and Second-Contingency Rate		First and Second--Contingency Rate (NEMA)	
	INC	DEC	INC	DEC	INC	DEC
Sep 04–Feb 05	1.00	1.02	8.73	3.02	15.19	10.53
Mar 05–Jun 05	1.95	2.33	2.08	2.94	1.36	0.86

Note: The numbers represent quantity-weighted averages that account for specific days on which the respective virtual transactions have been placed.

The biggest decrease in NCPC came from the elimination of second-contingency protection charges in CT and NEMA beginning in March 2005. Before that time, since many financial virtual transactions are 100% deviations, they constituted a large share of the overall deviations to which second-contingency protection charges were allocated, and thus the rate was high. In comparison, the first-contingency protection charges are allocated to the net positions, of which virtual trades are a

[26] FERC Docket No. ER05-439-000, March 7, 2005, “Order Accepting Tariff Revisions for Filing,” p. 12, available at <http://www.iso-ne.com/regulatory/ferc/orders/2005/mar/er05_439_03_07_05.doc >.

[27] Second-contingency protection charges were formerly referred to as “Daily RMR” charges.

small proportion. Therefore, the first-contingency protection rate is small compared to second-contingency protection rate.

The subsequent subsections examine the change in the number of cleared virtual transactions and the amount of MWh these transactions represent before and after the rule change.

A.1 Impact of Second-Contingency Cost Allocation Rule Change in Connecticut

Figure 10 shows that the cleared MWh of financial virtual transactions in Connecticut increased after the rule change. These results should be viewed as preliminary as more data are required to draw any definite conclusions about the impact of the rule change.

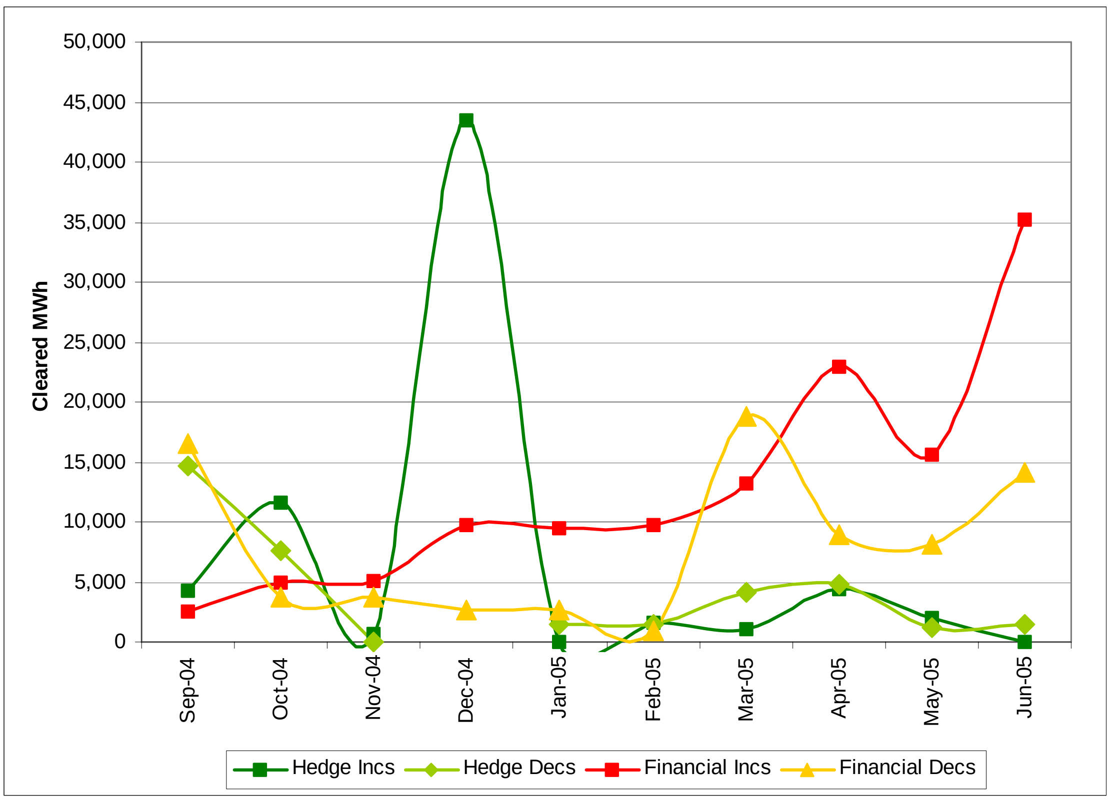

Figure 10 Cleared MWh of hedging and financial virtual transactions in Connecticut, September 2004 to July 2005.

A.2 Impact of Second Contingency Protection Cost Allocation Rule Change in NEMA

A similar review of the cleared MWh (Figure 11) of hedging and financial virtual transactions in NEMA does not suggest a marked impact of the rule change on virtual trading activity in this area. Whether other factors have a significant impact on virtual trading activity aside from second-contingency protection charges remains an open question.

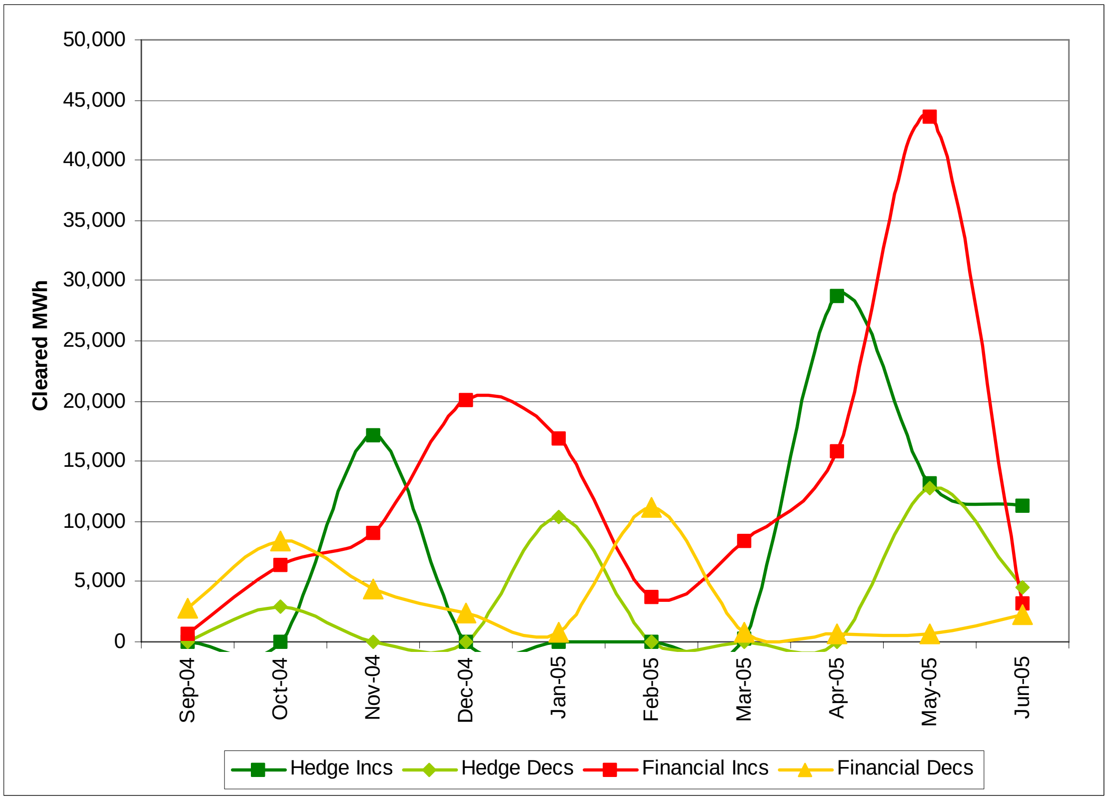

Figure 11 Cleared MWh of hedging and financial virtual transactions in NEMA, September 2004 to July 2005.