Exhibit A

Affidavit of

Professor Peter Cramton

on behalf of DC Energy, LLC

UNITED STATES OF AMERICA

BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

DC Energy, LLC

Complainant

v. **EL07-67-000**

HQ Energy Services (US) Inc.

Respondent

Affidavit of

Professor Peter Cramton

on behalf of DC Energy, LLC

1 Summary

I have been asked by DC Energy, LLC (DC Energy) to analyze HQ Energy Services (U.S.) Inc.'s (HQ's) participation in the NYISO market during the spring of 2007 and determine whether HQ manipulated the market to its advantage. I have also been asked to assess the Affidavits filed before the Federal Energy Regulatory Commission (FERC) by Dr. Roy Shanker, Mr. Kevin Wellenius, Mr. Norman Lamothe, and Mr. Christian Brosseau, and HQ's Answer[1] to DC Energy's 10 June 2007 Complaint Requesting Fast-Track Processing (Complaint) and 25 June 2007 Amend Amendment to the Complaint ("Amendment") (collectively, "Amended Complaint") submitted in this proceeding.[2]

After reviewing the materials and data available to me, I find that HQ manipulated the NYISO market by acquiring nearly all of the transmission congestion contracts (TCCs) at the HQ Node in spring of 2007 and then enhancing its TCC position by profitably turning congestion on and off at will, thereby harming competitive suppliers and the TCC market and enhancing HQ's market power at the HQ Node.

HQ with its vast capacity at the HQ Node can unilaterally create congestion at the HQ Node by bidding a sufficient quantity of energy in the day-ahead market (DAM) at a price below the clearing price at the Marcy Node. HQ is unique in having this unilateral ability to create and relieve congestion at the HQ Node. HQ, because of its size, can turn congestion on or off on an hour-by-hour basis by unilaterally adjusting its energy offer. For example, I find that during peak hours when [redacted]

[1] Answer of H.Q. Energy Services (U.S.) Inc. In Opposition to Complaint (As Amended), Docket No. EL07-67 (July 23, 2007) ("Motion").
[2] DC Energy's June 10, 2007 complaint is referred to as the "Complaint"; DC Energy's June 25 amendment to the Complaint is referred to as the "Amendment"; the Complaint as amended is referred to as the "Amended Complaint."

[redacted].

I do not find fault with HQ's market power. *What I find fault with is HQ's use of the NYISO TCC market to expand its dominant position at the HQ Node, and its use of its energy market power to extend its TCC position.* As FERC recognized in the Energy Transfer Partners Show Cause Order: ". . . where a firm uses some combination of market power and trading activity, against its economic interest in one market, in order to benefit its position in another market by artificially moving the market price, the firm likely crosses the line into the realm of manipulation."[3] This is exactly what HQ did. HQ combined its market power in the energy market at the HQ Node with an overhedged TCC position. It then created congestion at will to further benefit its TCC position—that is, it reaped the benefit of TCCs held on energy that other bidders supplied.

A specific summary of HQ's manipulation follows: over a sequence of TCC auctions, HQ cornered the market in TCCs at the HQ Node, purchasing 1,500 MW of TCCs that settled at that node. The purchase of these TCCs, which covered May-October 2007 (and longer) mostly occurred at a time when HQ knew that its affiliate, HQ Distribution, was selling in at least two Calls for Tenders (CFT) up to 600 MW of energy at the HQ Node.[4] At the time of the CFT, the CFT bidders were not aware that HQ had cornered the market for TCCs. Nor were they in a position to protect themselves from congestion at the HQ Node, since they would not have been able to acquire TCCs at a profitable price, as I explain below, and in any event they had substantial information that congestion at the HQ Node would not be a problem: an HQ sponsored study posted at the time of the CFT solicitation stated that congestion was not expected at the HQ Node, and moreover, the low auction prices for TCCs covering the period further supported the market view that significant congestion was unlikely.

Beginning in May 2007, HQ, knowing that up to 600 MW of CFT energy would be sold into New York at the HQ Node, was in a substantially overhedged position as a result of its 1,500 MW of TCCs at the HQ Node. As a result, HQ could exercise market power in certain peak hours by offering substantial quantities at a low price. In this way, HQ would earn a high price through the TCC congestion rents, not only on the quantity of energy it sells into New York, but on the quantity of energy its competitors sell into New York as well.

Notice that this particular exercise of market power is especially troubling, because it is immune to the common countervailing competitive response. The typical exercise of market power is to withhold supply, increasing the energy price, which benefits competitors and encourages competitors to supply more. In this case, HQ lowers the price received by its competitors, and so the competitors are directly harmed and driven away. This is exactly what

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[3] Energy Transfer Partners, L.P., 120 FERC ¶ 61,086 at P. 41(2007) ("ETP").

[4] HQ knew it likely CFT winners would sell into the higher priced NYISO market. CFT winners could receive the energy at a different location, but only after approval from HQ and payment of additional charges. *See* Amendment, Exhibit F: Call for Tenders for the Sale of Firm Energy by HQ Distribution at 4-5, A/O 2007-01 (Issued March 9, 2007) ("[d]uring the term of the Transaction the [CFT winner] may from time to time, on a daily basis and at least thirty six (36) hours in advance, request that an alternate delivery point be used by providing the amount in $/MWh HQD shall benefit by agreeing to this change. The acceptance or refusal of such request shall be at HQD's sole discretion."). Furthermore, it bears note that although HQ states that HQE and HQD are separate divisions within HQ (see, Motion at 6-7) FERC has found HQ's divisions to be equivalent when analyzing HQ's market power. *See* Order Conditionally Accepting Proposed Tariff Revisions, 104 FERC 61,220, at P 27 (2003).

happened—competitors abandoned the NY market for more profitable opportunities elsewhere. Moreover, HQ can harm its competitors without harming itself or benefiting consumers. HQ created congestion during peak hours when the line likely would be at capacity in any event. Thus, the creation of congestion was simply a wealth transfer from HQ's competitors to HQ without a significant increase in the amount of power imported into NYISO. The size of the transfer was in fact quite large: from 1 May to 11 June 2007, HQ received approximately [redacted] in congestion rent for the 1,500 MW of TCCs it acquired. A significant portion of these revenues was accrued through energy supplied by HQ's competitors. Competitors are directly harmed and consumers do not benefit. In contrast, the typical predatory exercise of market power is to push the price down in order to harm competitors and encourage their exit, but this has a countervailing benefit for consumers who enjoy the lower price at least during the period of predation. Not in this case: HQ gains, competitors are harmed, and consumers see no short-run benefit from lower prices. Specifically, there is little or no increase in power supplied to NYISO, and the lower prices at the HQ Node benefit TCC holders—namely, HQ—and not consumers. Furthermore, consumers see a long-run harm from reduced competition at the HQ Node. HQ's manipulation is a sure win for HQ, and a sure loss for HQ's competitors and NYISO ratepayers.

A natural question to ask is why can't a competitor at the HQ Node purchase TCCs consistent with its supply position and thereby protect itself from any congestion at the HQ Node? Isn't this the purpose of the TCC market? The answer is yes—this is the purpose of the TCC market—but unfortunately no competitive supplier can profitably purchase TCCs when HQ has the unique ability to turn congestion on an off at will. HQ's dominant position in the market puts the competitive supplier in a catch-22 with respect to participation in the TCC market: if the supplier bids high and wins the TCCs at a high price, then HQ will not find it profitable to create congestion, since it is not overhedged, and the value of the TCCs will be low; if the supplier bids low and fails to win the TCCs, then the auction price of TCCs is low, HQ is overhedged, and it finds it profitable to create congestion.

Put simply, TCCs have "cornering value"—the value HQ derives from cornering the TCC market and then foreclosing competition at the HQ Node. Only HQ has this cornering value, since only HQ with its dominant position at the HQ Node can turn congestion on and off at will on an hour-by-hour basis. As a result, no other bidder can compete profitably with HQ in the TCC auctions. For a competing supplier, it is "heads you lose, tails HQ wins." Thus, even if a competing supplier correctly anticipated HQ's congestion manipulation strategy, that knowledge would not provide protection from the strategy. The supplier's only protection is to exit the market.

This "heads you lose, tails HQ wins" phenomenon applies with equally force to investors in the TCC market, such as DC Energy. If TCCs appear to have value because HQ caused substantial congestion, then it should send a signal for investors to purchase TCCs. If those investors are successful in capturing any volume, their investments will fail because HQ will no longer congest the HQ Node to Marcy Node (import) pathway. Periods characterized by low import pathway congestion from the HQ Node to the Marcy Node with some export congestion signal value for export pathway TCCs. If investors buy NYISO export TCCs from the Marcy to the HQ Nodes in any significant volume, then HQ turns on the congestion and their investments will fail.

Another question is why should we care if HQ dominates the HQ Node? Even if one thinks that it is inevitable that HQ will dominate the HQ Node, it does not excuse HQ's manipulation of the NYISO TCC and energy markets to eliminate competition when it does appear. In addition to the harm from a less competitive energy market, the long-term harm of HQ domination is that HQ, not the transmission owners, will capture the congestion rent on the HQ-Marcy line. In instances of a monopoly supplier along a radial line into a competitive market, the monopoly supplier will capture the congestion rent along the line. In such a case, TCCs[5] serve no purpose. ISO New England does not price congestion at the Phase I/II point where HQ imports into New England.

Once HQ acquired its overhedged position in TCCs (1,500 MW of the 1,500 MW capacity limit at the HQ Node), it began [redacted]. In its answer to Amended Complaint and in the accompanying affidavits, HQ contends that [redacted] was consistent with the rational decisions of a supplier adapting to changed circumstances. I agree with that claim. HQ's overhedged position gave it an incentive to manipulate the energy market to make its TCC position more valuable. [redacted]

To understand profit maximizing behavior for a hydro supplier in the energy market, it is helpful to envision a competitive market without transmission constraints, and then add the complexities of market power and transmission constraints.

In a competitive market, the price at the HQ Node is the opportunity cost of supplying energy for the marginal bidder. This opportunity cost may come from the opportunity to sell energy at a later date or into a different market. Given that the CFT winners did not have the opportunity to sell elsewhere or at a different time, at least not without HQ's approval, they were essentially price takers: their opportunity cost was low.[7] HQ then would likely be the marginal bidder and its opportunity cost would depend upon the reservoir state for its various resources as well as expectations of future inflows and outflows, based on climate and demand forecasts. [redacted] cannot be explained by competitive bidding absent transmission constraints. [redacted]

How does this change when we introduce market power, but still assume transmission constraints do not bind? In the presence of market power, the price at the HQ Node is still the opportunity cost of the marginal supplier provided the marginal supplier does not have market

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[5] Here and elsewhere I use "TCC" in a general sense to denote any instrument used to price congestion, such as a TCC or FTR.
[6] Answer of H.Q. Energy Services (U.S.) Inc. In Opposition to Complaint (As Amended) ("Motion").
[7] As I explain below, the fact that bidders other than HQ [redacted] is irrelevant to HQ's ability to manipulate the market.
Affidavit of Christian G. Brosseau (Brosseau) at P 5.

power. If, as in this case, the marginal supplier has market power, then the marginal supplier's opportunity cost is *below* its marginal bid. That is, a supplier with market power bids *above* its true opportunity cost, since it recognizes that its offer may impact the price and higher bids lead to higher prices.

The above is true when a supplier with market power has a long or balanced position in energy. If the supplier has a short position, then its market power incentive is that of a buyer: it *underbids* its opportunity cost, recognizing that doing so will lower the price (in expectation), which a short supplier likes, since the supplier is a buyer in the spot market.

Everything above holds when we introduce the possibility of binding transmission constraints, except now with respect to market power we must ask whether the supplier is long, balanced, or short in the TCC market relative to the quantity it is offering to supply. For quantity that would give the bidder a short or balanced position of TCCs, everything I say above holds. For quantity that would give the bidder a long position in TCCs (that is an overhedged supplier), then the supplier can exercise market power by creating congestion and enjoy the high congestion price. This is done by bidding a large quantity (but less than its TCCs) at a low price. Whether it will be more profitable to exercise market power by creating congestion or by withholding energy depends upon the supplier's residual demand curve—the demand curve minus the supply offered by all other suppliers. When the residual demand curve is further to the right (i.e., peak hours), it is easier to create congestion, so creating congestion is more often the best strategy.

The reason for [redacted] is explained by the simple intuition above. For HQ, it is actually a somewhat difficult calculus to estimate the residual demand curve in the hour and then determine whether it is better off exercising market power by creating congestion or by increasing the energy price. The key inputs in the calculus are: (1) HQ's estimated residual demand curve, (2) HQ's opportunity cost, aggregated across all its resources, [redacted] and (4) its TCC position. These factors interact to determine an optimal (profit maximizing) hour-by-hour offer curve. In particular, in peak hours where it is optimal for HQ to sell a sufficient quantity that the line will be congested, then HQ in an overhedged position, maximizes profits by creating congestion, [redacted] In contrast, in most off-peak hours, it is optimal for HQ not to fill the line, and so it optimally chooses to exercise market power by [redacted].

HQ and its experts claim that one explanation for [redacted] No rational supplier that is not engaged in market manipulation seeks to balance its position on an [redacted] basis. Rather, a rational, non-manipulative supplier seeks to maximize profits by buying at low prices and selling at high prices (the famous buy low, sell high strategy). Across a month or a year, [redacted]

Since July 2007, there has been a change in the way that the congestion rents at the HQ Node are calculated. This has had the effect of providing short-term relief to the immediate problem of HQ's overhedged position. However, it certainly does not solve the problem, since in future TCC auctions HQ can again corner the TCC market for the relevant constraints.

It is important that FERC address HQ's gaming strategy as it has in ETP and Amaranth Advisors, L.L.C., 120 FERC ¶ 61,085 (2007), two recent rulings addressing market manipulation ("Manipulation Orders").[9] If HQ's market manipulation goes unpunished, it can be expected to be repeated in New York and indeed proliferate in other FERC regulated markets. Obvious spots would be other interfaces with a dominant import supplier where congestion is priced. More generally, this type of manipulation can occur at any load pocket with a dominant supplier. For example, a major supplier in a constrained area may underbid its energy ahead of a long-term auction in an attempt to devalue TCCs so that it can obtain them at a lower price. In this example, congestion raises prices and the dominant supplier's underbidding causes congestion to stop, as opposed to the other way around as with HQ. Despite the difference in specifics, the same fundamental problem exists. For example, there could be load pockets where dominant suppliers could manipulate the TCC and energy markets to create abnormal congestion patterns ahead of the TCC auctions, creating considerable uncertainty around TCC values to their pockets. Then based on the outcome of the TCC auction, the dominant supplier can adjust its bidding strategy in the energy market to discourage competition in the TCC market.

2 Qualifications

My name is Peter Cramton. I am Professor of Economics at the University of Maryland and Chairman of Market Design Inc. Over the last 20 years, I have published research on auction theory and practice in the leading peer-reviewed economics journals. During the last 12 years, I have applied this research in the design and implementation of auction markets worldwide, especially in North America and Europe. I have led the design and implementation of dozens of high-stake electricity auctions in the United States, France, and Belgium, as well as gas auctions in France and Germany. I have advised several energy companies on auction strategy in major energy and capacity auctions in the United States and Canada. I have advised telecommunications firms on bidding strategy in more than 27 spectrum auctions.

Since 1998, I have advised ISO New England on electricity market design. I was a lead expert retained by the ISO to design the forward capacity market in New England. I also led the design of the firm energy market adopted in Colombia in 2006. I am currently designing Colombia's energy contract market, both for regulated customers and nonregulated customers. In the New Jersey Basic Generation Service (BGS) auction, I served as an advisor to PSEG Power in each of the first four years that the BGS auction took place. Since 2001 I have been involved in the design and implementation of the virtual power plant auctions used by Electricité de France to sell 6,000 MW of electricity—approximately 10 percent of France's capacity. I was also involved in the design and implementation of the virtual power plant auction used by Electrabel in Belgium. I designed and implemented the Alberta auction for power purchase arrangements, which first occurred in August 2000.

I have advised the U.S. Federal Communications Commission, Industry Canada, and the Telecommunications Authority of Trinidad and Tobago on spectrum auction design. I am

[9] Energy Transfer Partners, L.P., et al., 120 FERC ¶ 61,086 (2007) and Amaranth Advisors, L.L.C., et al., 120 FERC ¶ 61,085 (2007).

currently advising Ofcom in the United Kingdom on the design and implementation of its next-generation spectrum auctions.

I have published dozens of scholarly articles in peer-reviewed economics journals, including *Econometrica*, *Journal of Law and Economics*, *Journal of Economics and Management Strategy*, *European Economic Review*, *Journal of Regulatory Economics*, *Journal of Economic Literature*, *Review of Economic Studies*, *American Economic Review*, and *Electricity Journal*. With Yoav Shoham and Richard Steinberg I was editor of *Combinatorial Auctions*, a comprehensive research book on combinatorial auctions published by the MIT Press in 2006.

I received my B.S. in Engineering from Cornell University and my Ph.D. in Business from Stanford University. My curriculum vita, which includes a list of my publications and other experience, is attached.

3 HQ used the New York energy and TCC markets to enhance its existing market power during the spring of 2007

HQ has market power at the HQ Node.[10] The import limit into NYISO through the HQ Node, including transmission "Wheel Through" transactions,[11] is 1,500 MW. Because HQ has market power at the HQ Node, it can create congestion in one of three (similar) ways. First, it could bid, in a given hour, 1,501 MW of energy at prices it believes will clear. Second, if it had high expectation that other suppliers would be offering *X* MW of energy at a price below *Y*, then it could create congestion by offering to supply 1,501 – *X* at a price of *Y*; that is, just more than the residual the market will bear. Finally, and similarly to the second method, HQ could submit bids in separate blocks so that it would create congestion but would also be the marginal bidder.[12]

Because HQ has the ability to create congestion between the HQ and Marcy Nodes, it can significantly affect the value of TCCs between those nodes. Below, I show that between July 2006 and April 2007, HQ cornered the market for TCCs that settled at the HQ Node. HQ then created significant congestion at the HQ Node. Because of its TCC position, HQ was immune to the congestion it caused. I begin the section with an example that illustrates the basic incentives and the manipulation.

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[10] Comments of the New York Independent System Operator, Inc., Docket No. EL07-67 (July 23, 2007) ("NYISO Comments"), Attachment I: Affidavit of Dr. David Patton ("Patton"). Dr. Patton states: "the high concentration of load and supply likely confer substantial market power on HQ related to its real-time imports and exports at the HQ Generator Bus(es)." Patton at P 16. Dr. Patton also found that HQ has significant market power in Québec: "I define the relevant geographic area for purposes of calculating the market concentration of supply to be the province of Quebec. Based on this definition, roughly 91 percent of the generating capacity is owned or controlled by HQ." *Id.* at P12.

[11] "Wheel Through" transactions under the NYISO Open Access Transmission Tariff are wheels from another control area through the NYISO control area to another control area, such as wheeling from HQ through NYISO to PJM or ISO New England. In addition, imports into the New York Control Area (NYCA) in the NYISO day-ahead market (DAM) cannot exceed 1,200 MW.

[12] For example, suppose that the LMP at the Marcy Node is $55, and that other bidders have collectively offered 500 MW at a price of $45. HQ could offer 900 MW at a price of $20 and 200 MW at a price of, say $50. HQ would have created congestion and would also have set the price.

3.1 An example illustrating HQ's incentives and the form of the manipulation

An example will help clarify the profitability of creating and relieving congestion on an hour-by-hour basis. Suppose:

- HQ cannot impact the Marcy price; that is, its sale or purchase of energy is too small to have a significant impact on the New York Reference Bus energy price, as opposed to the NYISO price at the HQ Node. This simplification is consistent with the HQ's Motion as well as the NYISO Comment and Dr. Patton's affidavit.
- The on-peak New York (Marcy) price is P_{NY} = \$60/MWh.
- HQ has an energy opportunity cost of C = \$40/MWh. Energy opportunity cost is HQ's relevant marginal cost of supplying energy, recognizing its opportunities to supply in another market or at a different time by holding its energy in reserve.
- HQ has an on-peak forward energy contract at P_F = \$50/MWh, delivered to New York (Marcy).[13] This can either be a financial contract-for-differences or a physical contract in which deviations are settled at the New York (Marcy) price; both are equivalent.
- Competitive suppliers, such as the CFT winners, offer 600 MW at \$0, both on and off peak. The price-taking \$0 offer is not important. The same conclusion is reached regardless of whether HQ or the competitive suppliers set the price in a particular hour.
- [redacted]

I now determine HQ's best (profit-maximizing) bidding strategy as a function of its forward contract position, which HQ alleges to be based on forward financial transactions (an alleged justification of HQ's bidding strategy), and its TCC position. This is of interest, because if HQ was not, as it claims, bidding energy based on its forward bilateral contract position, but, instead, was bidding energy to depress prices at the HQ Node to create congestion to the Marcy Node, then it demonstrates that HQ's alleged business justification is not valid and that HQ was manipulating the market.

Table 1 calculates HQ's congestion profit, energy profit, and total profit for various forward energy positions and TCC positions. Let Q_F be HQ's forward position, Q_{TCC} be HQ's TCC position, and Q_{HQ} be HQ's day-ahead energy schedule into New York. By assumption, Q_{HQ} = 900 MW. Then we calculate HQ's congestion profit, its energy profit, and its total profit from the following formulas:

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[13] By "forward energy contract involving delivery to Marcy" I mean that the contract must settle *financially* at Marcy. [redacted]

For a graphical depiction and a discussion of the calculation of residual demand, see Peter Cramton, "Competitive Bidding Behavior in Uniform-Price Auction Markets," Proceedings of the Hawaii International Conference on System Sciences, January 2004, available at: http://www.cramton.umd.edu/auction-papers.htm.

$\text{Profit}_{TCC} = (P_{NY} - P_{HQ})\times(Q_{TCC} - Q_{HQ})$,

$\text{Profit}_{E} = (P_F - P_{NY})\times Q_F + (P_{NY} - C)\, Q_{HQ} = P_F\times Q_F + P_{NY}\times(Q_{HQ} - Q_F) - C\times Q_{HQ}$, and

$\text{Profit} = \text{Profit}_{TCC} + \text{Profit}_{E}$.

The TCC profit is just the difference between the NY and HQ day-ahead prices times the quantity of TCC's held by HQ less its day-ahead energy schedule. It is necessary to subtract HQ's day-ahead energy in the calculation, since it must pay the congestion charge on its actual energy into New York, so on net, HQ only earns a congestion profit on its TCC quantity less its energy into New York—it gets the rent on the full quantity, but the day-ahead quantity requires an equal and opposite rent payment. HQ's energy profit is simply the standard contract-for-differences calculation: HQ is paid for its forward sale at the forward price and then any deviation is settled at the New York price.

From these equations it is easy to see that if it is profitable to create congestion, it is most profitable for HQ to lower the HQ price all the way to $0, the energy offer of the competitive suppliers. Similarly, if it is profitable to relieve congestion, it is most profitable to push the HQ price all the way up to $60, the New York (Marcy) price. Hence, in Table 1, I just consider three strategies:

1. *Competitive*: HQ offers 900 MW at its opportunity cost of $40/MWh. This is the optimal strategy of a supplier without any market power at the HQ Node.
2. *Relieve congestion*: HQ offers 900 MW at $60/MWh.
3. *Create congestion*: HQ offers 901 MW at $0/MWh.

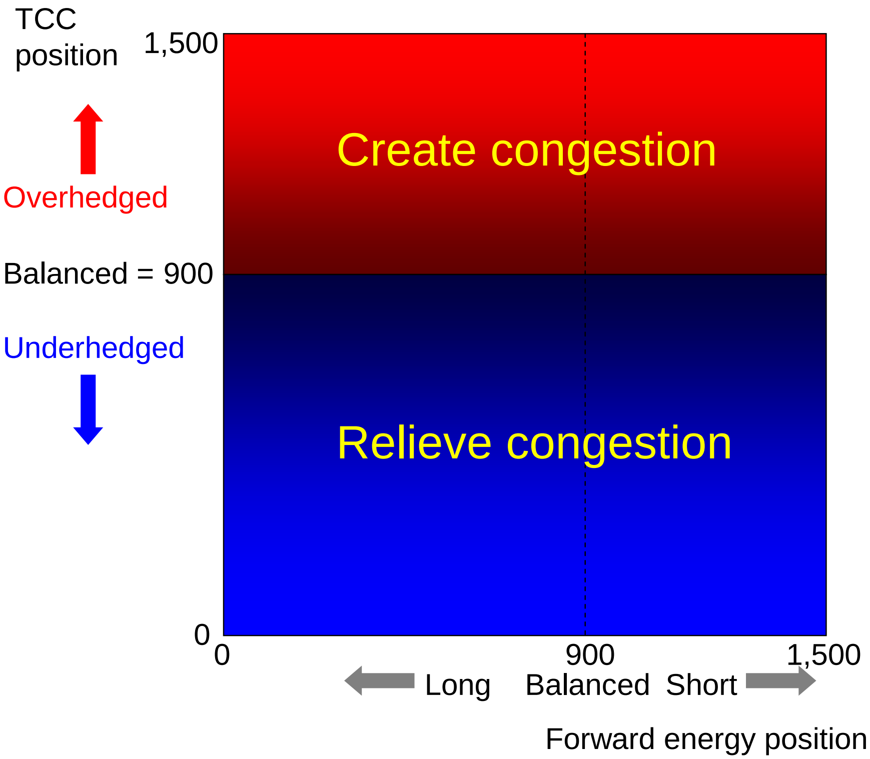
Table 1. HQ's best strategy given its forward energy position and TCC position in on-peak hour

Forward energy position		TCC position			Competitive (offer 900 MW at $40)				Relieve congestion (offer 900 MW at $60)				Create congestion (offer 901 MW at $0)				
Case	Qty	Case	Qty	Energy quantity	HQ Node price	Congest profit	Energy profit	Total profit	HQ Node price	Congest profit	Energy profit	Total profit	HQ Node price	Congest profit	Energy profit	Total profit	Best strategy
Balanced	900	Balanced	900	900	40	0	9,000	**9,000**	60	0	9,000	9,000	0	0	9,000	9,000	Competitive
Balanced	900	Underhedged	0	900	40	-18,000	9,000	-9,000	60	0	9,000	**9,000**	0	-54,000	9,000	-45,000	Relieve congestion
Balanced	900	Overhedged	1,500	900	40	12,000	9,000	21,000	60	0	9,000	9,000	0	36,000	9,000	**45,000**	Create congestion
Long	0	Balanced	900	900	40	0	18,000	**18,000**	60	0	18,000	18,000	0	0	18,000	18,000	Competitive
Long	0	Underhedged	0	900	40	-18,000	18,000	0	60	0	18,000	**18,000**	0	-54,000	18,000	-36,000	Relieve congestion
Long	0	Overhedged	1,500	900	40	12,000	18,000	30,000	60	0	18,000	18,000	0	36,000	18,000	**54,000**	Create congestion
Short	1,500	Balanced	900	900	40	0	3,000	**3,000**	60	0	3,000	3,000	0	0	3,000	3,000	Competitive
Short	1,500	Underhedged	0	900	40	-18,000	3,000	-15,000	60	0	3,000	**3,000**	0	-54,000	3,000	-51,000	Relieve congestion
Short	1,500	Overhedged	1,500	900	40	12,000	3,000	15,000	60	0	3,000	3,000	0	36,000	3,000	**39,000**	Create congestion

Notes: Assumes HQ's residual demand is 900 MW for all prices from $0-60; HQ's energy opportunity cost is $40; NY enery price is $60; HQ's NY forward price is $50.

Since by assumption it is optimal for HQ to sell 900 MW into New York during the on-peak hour, filling the line into New York, the only question that remains is which of the three strategies above should HQ pursue? Table 1 shows clearly that HQ's best choice only depends on its TCC position. When HQ has a balanced TCC position (its TCC quantity equals its day-ahead energy), then competitive bidding is optimal; if it is underhedged (its TCC quantity is less than its day-ahead energy), then it is best to relieve congestion; and if it is overhedged (its TCC quantity is greater than its day-ahead energy), then it is best to create congestion. In particular, HQ's best strategy does not depend on HQ's forward position from bilateral transactions—it makes no difference whether HQ is balanced (its forward energy position equals its day-ahead energy into New York), HQ is long (its forward position is less than its day-ahead energy), or HQ is short (its forward position is greater than its day-ahead energy). This conclusion is illustrated in Figure 1.

Figure 1. HQ's decision to create or relieve congestion in an on-peak hour depends on its TCC position



Only when HQ's TCC position is perfectly balanced does HQ have an incentive to bid competitively. The strength of HQ's incentive to create congestion increases as it becomes more overhedged (it holds more TCCs or it schedules less energy into NY). Similarly, the strength of HQ's incentive to relieve congestion increases as it becomes more underhedged (it holds few TCCs or it schedules more energy into NY).

There is nothing special about this example. The result summarized in Figure 1 is robust to changes in the assumptions. The picture would change somewhat if we relaxed the assumption that HQ does not have market power in NY. If HQ's market power extended beyond the HQ Node to the overall NYISO system, then the tradeoffs would be more complex and the decisions would depend somewhat on HQ's forward energy position. However, the picture above would still approximate the best strategies, unless HQ had extreme market power in NY, which is implausible given the size of the line (1,500 MW) relative to the size of the NY market.

Table 1 also illustrates the substantial profits that HQ can enjoy from holding all the TCCs. In all cases, the extreme overhedged position is the most profitable. Hence, it is not surprising that HQ bid for and won TCCs covering the entire 1,500 MW limit. Moreover, the TCCs are worth more to HQ than anyone else, since HQ and only HQ can turn congestion on and off based on the specific hourly circumstances that HQ faces. By turning congestion on and off to maximize HQ's profits, HQ makes the TCCs more valuable to HQ and less valuable to HQ's competitors. This means that HQ will be able to acquire the vast majority of the TCCs at a low price, since the TCC price is set by the value of the TCCs to others, not by HQ's value. Ratepayers, in particular, do not benefit, even in the short-run, from HQ's manipulation. Since the TCC auction price cannot reflect HQ's inflated value, as described below. Further, as the example illustrates, HQ's manipulation does not lead to increased energy schedules to New York.

The situation becomes even more problematic when we recognize HQ's "cornering value"—the value HQ derives from cornering the TCC market and then foreclosing competition at the HQ Node. This value is large, since it allows HQ to capture all the energy and congestion rents at the HQ Node and drives the price HQ has to pay for the TCCs down to zero. Notice that this cornering value is not social value, but HQ's private value. Indeed, it is a value that comes entirely at the expense of HQ competitors and ratepayers. HQ competitors are denied any profits at the HQ Node and ratepayers are harmed from both the absence of competition at the HQ Node and the loss of all (or nearly all) the economic value of the TCCs from HQ to Marcy Nodes.

Finally, lets consider a typical off peak hour. For concreteness, in addition to the assumptions above, I assume:

- The off-peak New York (Marcy) price is $30/MWh.
- It is not profitable for HQ to congest the line off peak.

In this case, the off-peak analysis is easy. Since the New York (Marcy) price ($30) is less than its opportunity cost ($40), HQ's best strategy is to *buy* energy from New York at the $30 price.

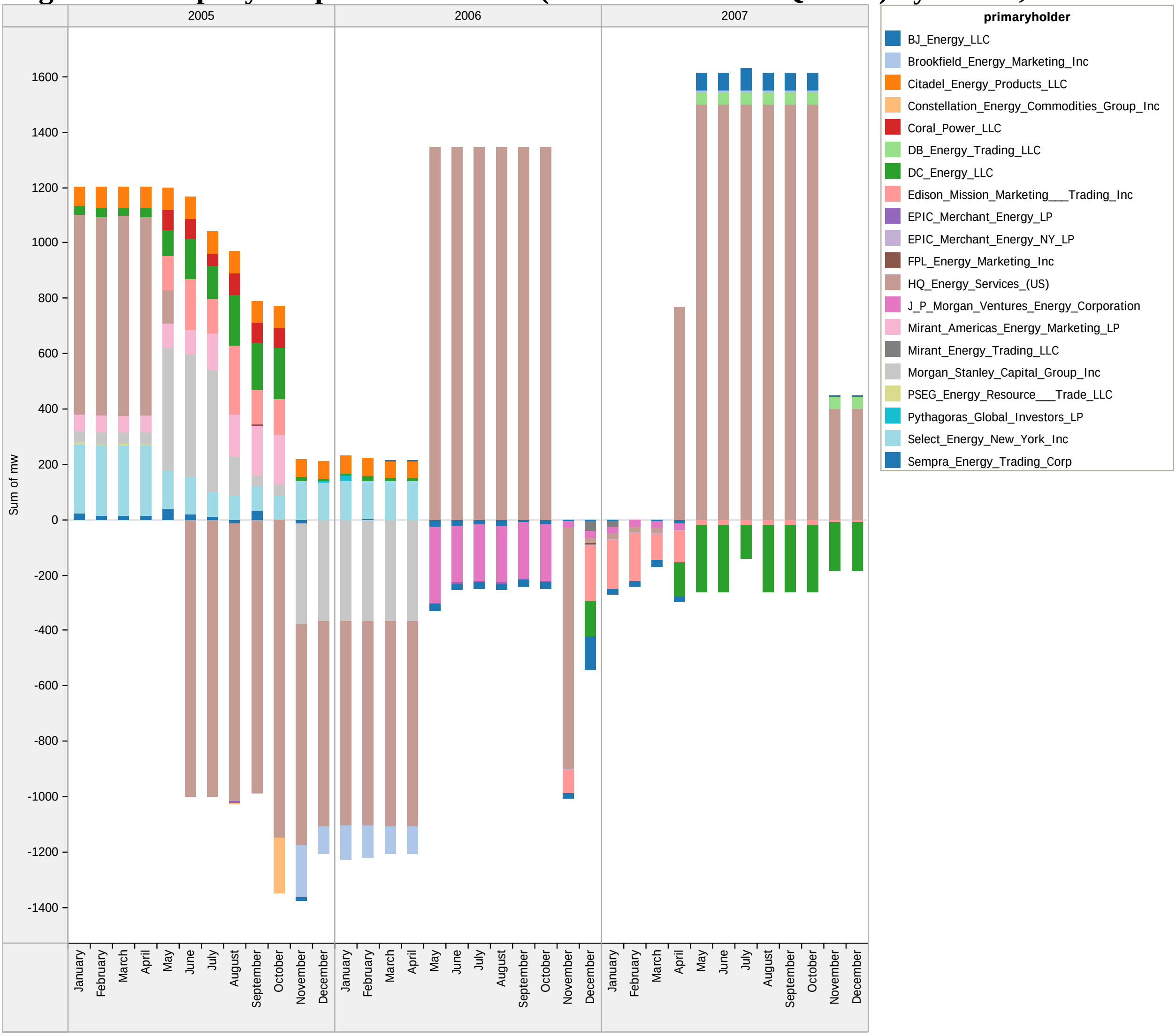
With more complicated assumptions, such as an upward-sloping opportunity cost curve, HQ will increase its purchase of energy until the point where the price that it pays to buy energy just *equals* its opportunity cost. Thus, HQ's *buy* price is its opportunity cost, and since that opportunity cost curve does not change much within the day, we can assume that HQ's willingness to purchase off peak is a reflection of its on peak opportunity cost. Thus, buying at a high price off-peak and offering at a low price on-peak is a further sign of market manipulation.

I urge FERC to study this example, as it clearly illustrates the economic harm that is caused by HQ's market manipulation. HQ's cornering the TCC market and then turning congestion on and off on an hour-by-hour basis to maximize its profits, harms not only HQ's competitors, but also the ratepayers, who are denied the benefits of competition as well as the economic value of the HQ-Marcy transmission line.

3.2 HQ cornered the market for TCCs in the spring of 2007

Figure 2 presents a breakdown of ownership of TCCs with a Point of Injection (POI) or Point of Withdrawal (POW) at the HQ node that were active during a particular month between 2005 and 2007.

Figure 2. Company net position of TCCs (POI or POW at HQ Node) by month, 2005-2007

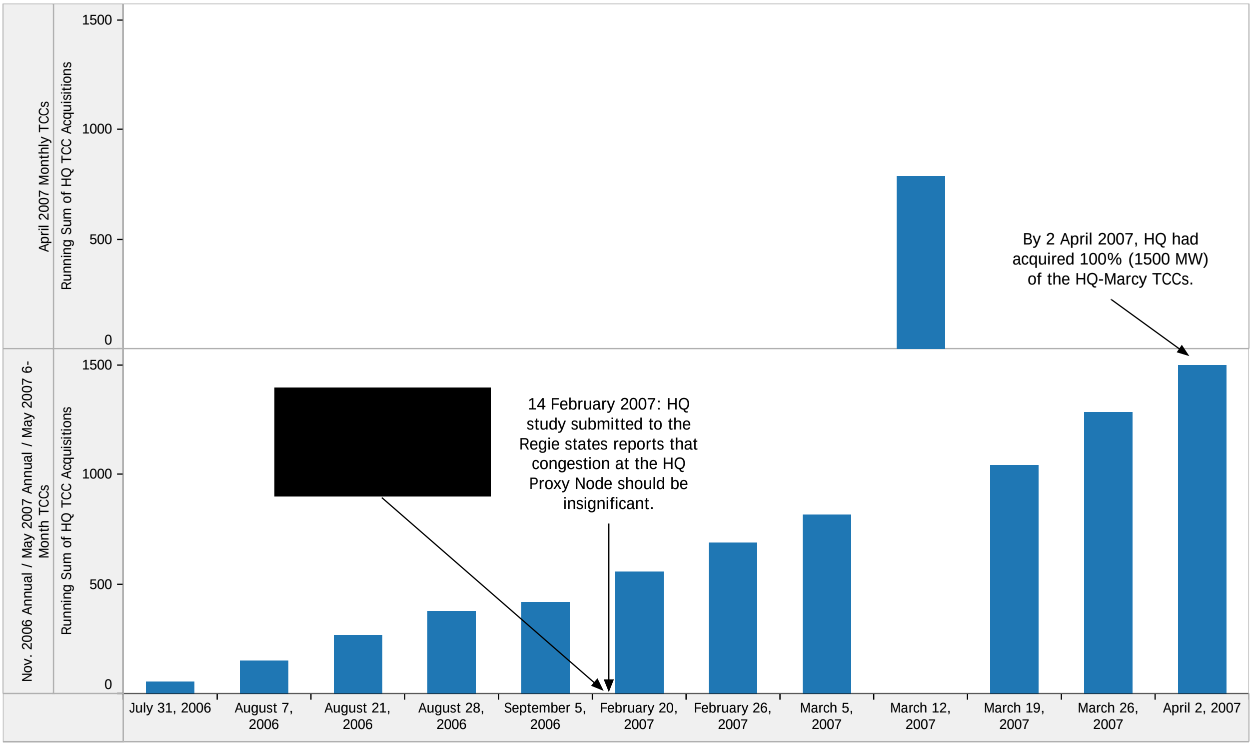


Sources: NYISO Cleared TCCs, available at: http://www.nyiso.com/public/webdocs/products/tcc/general_info/tcc_summary1.CSV

Figure 2 shows that HQ had begun to hold a significant long position at the HQ Node as early as May 2006. HQ held a long position of 1,347 MW between May and October 2006. In May 2007, however, HQ, held 1,500 MW of TCCs for congestion flowing into NYISO between May 2007 and October 2007. As I show below, although HQ's [redacted]. Because HQ profited through congestion credits on other bidder's energy, it was overhedged.

Figure 3 shows the timeline over which HQ acquired its TCCs at the HQ Node during the Fall 2006 annual auction (covering November 2006 through October 2007), the spring 2007 annual auction (covering May 2007 through April 2006), and the spring 2007 six-month auction (covering May 2007 through October 2007).

Figure 3[Partially redacted in public version]. Cumulative HQ TCC acquisitions at HQ-Marcy import pathway and HQ import wheel in Fall 2006 Annual and Spring 2007 NYISO TCC auctions



Sources: NYISO Cleared TCCs, available at: Source: http://www.nyiso.com/public/webdocs/products/tcc/general_info/tcc_summary1.CSV; Energy Security Systems, Inc., Impact of HQ Distribution Exports on the New York Markets, submitted on 14 February 2007; Affidavit of Mr. Lamothe, at ¶ 11.

As Figure 3 shows, beginning in July 2006, HQ gradually acquired 1,500 MW of TCCs from the HQ Node to or through the Marcy Node covering the period May 2007 to October 2007 or later. However, HQ's acquisitions of TCCs that became effective 1 May 2007 were concentrated between late February 2007 and April 2007. Of particular interest is an analysis performed for HQ Distribution by Energy Security Analysis, Inc. and submitted to the Régie de l'Énergie du Québec ("Régie") on 14 February 2007 in the proceeding that resulted in the CFT.[15] The CFT proceeding concerned the auction by HQD of up to 600 MW of energy produced by HQP, the parent of HQ Energy. The analysis HQD submitted to the Régie stated that the injection of 600 MW of energy sold in the CFT process into New York would not cause significant amounts of congestion at the HQ Node.[16] HQ purchased more than 1000 MW of

[15] See Letter from Energy Security Analysis, Inc. to HQ Distribution Re: Impact of HQ Distribution Exports on New York Markets, *Annex to Complément De Résponse D'Hydro-Québec Distribution À L'Engagement Numéro 5, Demande*, R-3624-2007 [Hydro-Quebec Distribution's Amended Response to Commitment No. 5] (February 14, 2007) ("ESAI Analysis"). For the Régie decision that resulted in the CFT, see *Décision finale: Demande d'approbation d'une entente visant la suspension de deux contrats d'approvisionnement en base et cyclable intervenue entre Hydro-Québec Distribution et Hydro-Québec Production* [Final Decision: Request for Approval of an Agreement to Suspend the Two Contracts for Base and Variable Supply Between Hydro Québec Distribution and Hydro-Québec Production], D-2007-13, R-3624-2007 (February 26, 2007) ("Final Decision"). DC Energy attached a translation of the Final Decision as Exhibit E to the Amendment. The original French language version of the Final Decision is available at http://www.regie-energie.qc.ca/audiences/decisions/D-2007-13.pdf.

[16] ESAI Analysis at 1, stating "The price declines at the Massena bus (proxy for Zone M) appear to be consistent with price declines in the North and Mohawk Valley zones. There is no apparent depression of the Massena bus

TCCs (beginning 1 May 2007) that settled at the HQ Node after its affiliate released the study that found congestion at that node would be insignificant. In addition, HQ purchased 789 MW of TCCs for the month of April 2007 after this study was presented to the Régie.

HQ held 1,500 MW of TCCs from the HQ Node (POI)[17] to or through the Marcy Node or ISO-NE (POW).[18] The TCCs to ISO-NE effectively go through Marcy to get to New England, so all of the TCCs were effective hedges against congestion differentials between HQ and Marcy. HQ was able to secure this position at relatively low cost because historically HQ did not create congestion on the HQ-Marcy line, so the TCCs did not have much perceived value in the market place. HQ is the only entity that could ensure congestion would exist—that is, HQ is the only entity that owns or has control of 1,200 MW of energy at or behind the HQ Node.

3.3 HQ exercised market power in the New York energy market

Once HQ had procured sufficient TCCs to make itself immune to congestion at the HQ Node, HQ began to create congestion.

3.3.1 Significant congestion was created at the HQ node

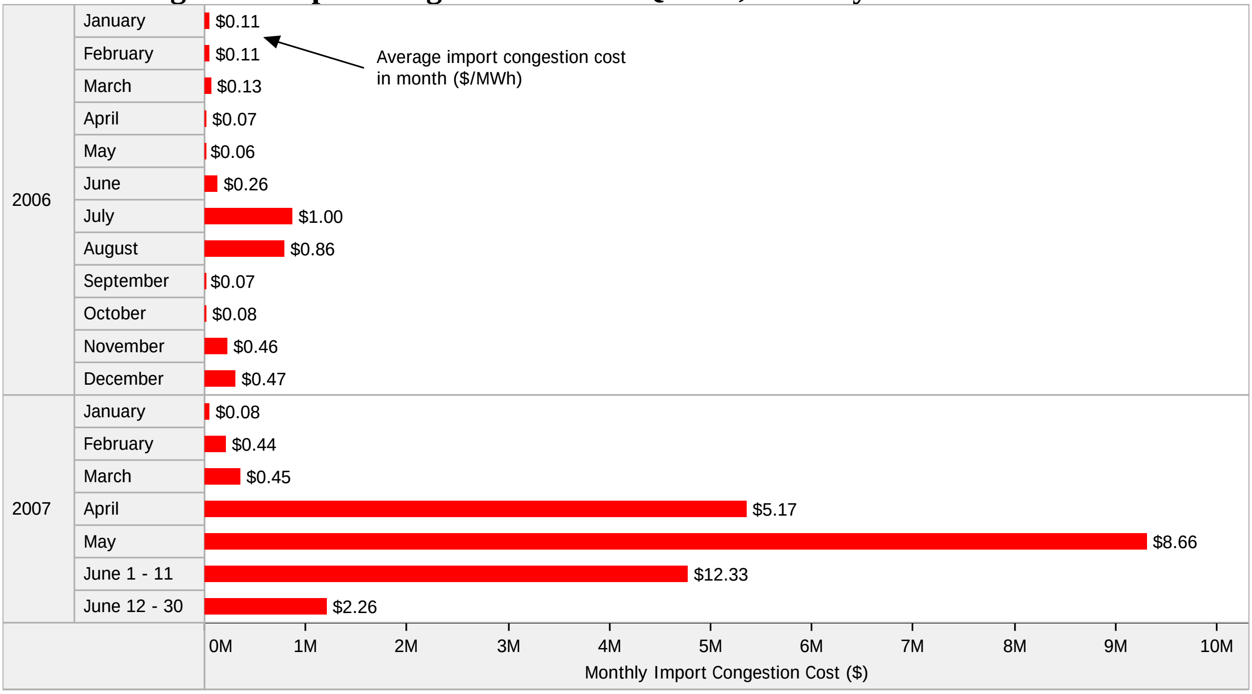
Between January 2006 and March 2007, there was little or no congestion at the HQ Node. Beginning in April 2007, significant congestion began to appear. Figure 4 displays the sum of congested MW at the HQ Node and the average price of congested hours between January 2006 and June 2007.

relative to adjacent zones." Thus, HQ Distribution's study that it submitted to the Régie concluded that there would be no price differential between the HQ Node and other adjacent nodes and, hence, no congestion.

[17] The point of injection for the TCCs was either the HQ Node (Id 61844) or Wheeling (Id 23651).

[18] The point of withdrawal occurred at location IDs 24008 or 24062.

Figure 4. Import congestion at the HQ node, January 2006 – June 2007



Source: NYISO Daily Energy Reports, available at: http://www.nyiso.com/public/market_data/reports.jsp; NYISO LMPs, available at: http://mis.nyiso.com/public/csv/damlbmp/yyyymmdddamlbmp_zone.csv.

In 2006, aside from the peak summer months of July and August, there was little or no congestion at the HQ node. For example, in July and August 2006, there was some congestion, but the average cost of that congestion was less than $1 per MWh. By contrast, congestion became significant in April 2007, but only after the final sell round for the NYISO long-term TCC auction. For example, congestion during May 2007, the first month in which HQ was overhedged, was extremely high with an average hourly congestion cost of $8.66 per MWh. Because of its TCC position, HQ benefited from this congestion.

3.3.2 HQ bid to create congestion at the HQ Node

Figure 4 shows that significant amounts of congestion occurred at the HQ Node in April, May, and June of 2007. However, those same months in 2006 experienced almost no congestion at all. Dr. Patton, advisor to the NYISO, has established that HQ has significant market power at the HQ Node, and therefore HQ was almost certainly the source of this congestion. Figure 5 confirms this. [redacted]

Figure 5[Redacted in public version]. HQ average DAM offers for import congested and other hours, 1 April – 15 June 2007

[redacted]

Figure 5 shows that in congested hours[19] during the spring of 2007, HQ [redacted] in the DAM. For example, at a price of [redacted], HQ's average net offer in the DAM was [redacted] during uncongested hours; during congested hours HQ was [redacted] At a price of [redacted] HQ's average net offers in the DAM were [redacted] in uncongested hours and [redacted] in congested hours. If Wheeling transactions are included in the calculus, HQ's offer in uncongested hours was [redacted] in congested hours. Therefore, for a large range of prices that encompasses the

[19] I consider "congested hours" to be those with import congestion into NYISO. Further, I omitted ramping congestion from the congested hour offer curves in this analysis. "Other hours" refers to all other hours. That is, hours with congestion due to ramping, hours with no congestion, or hours with export congestion from NYISO.
[20] This result holds generally for prices up to [redacted] which exceeds the average LMP that occurred during this time period at the HQ Node [redacted]

average LMP at the HQ Node, HQ was [redacted].

Although wheeling transactions are typically small relative to imports into NYISO, it is appropriate to consider those transactions as they can cause congestion at the HQ Node. Furthermore, HQ was authorized to purchase and did purchase TCCs for congestion between the HQ Node and Zone N, for wheeling transactions into New England.[21]

If Wheeling transactions are added to the offer curves in Figure 5, [redacted] Specifically, at a price of [redacted] HQ [redacted] (on net) in the DAM. In congested hours, HQ was [redacted] at a price [redacted]. Therefore, if one adds wheeling transactions to the offer curves, one finds that HQ [redacted] of energy [redacted] in congested hours. [redacted] was more than sufficient to turn on and off congestion at the HQ Node.

An important next step in analyzing the [redacted] during congested hours is to determine whether a reason other than market manipulation can explain [redacted]. Although HQ did not [redacted] in the same level of detail that I provide here and below, one must note that it did provide general business reasons that, according to HQ, justified its participation in the DAM. However, the business justifications that HQ provided do not explain [redacted]. As I explain below, legitimate business justifications for alterations in one's bidding generally correspond to changes in the marginal opportunity cost of providing electricity, which was not changing wildly within single days during the spring of 2007.

3.3.3 An hour-by-hour test for detecting HQ's ability to create and relive congestion

Figure 5 clearly shows that HQ was, on average, [redacted] to create congestion. However, a more detailed picture of HQ's actions can be developed through an hour-by-hour analysis of its bidding. As I show below, congestion during spring 2007 occurred during peak hours. I therefore develop a test for the extent of market manipulation based on [redacted] in a particular day during a particular on peak hour relative to the average [redacted] during all off peak hours during that day.

For example, suppose that on a hypothetical weekday HQ's net off peak offer at a price of $40 was 20 MW. Further suppose that during hour 10, HQ's net offer at $40 was [redacted] MW. For hour 10 at a price of $40, I would then record [redacted] HQ's offer. I perform this step for all price points between $10 and $80 on each individual on peak (weekday) offer curve, to encompass all LMPs at the HQ Node between April and early June 2007.

I then choose the point on the offer curve that is closest to that hour's HQ LMP. [redacted]

[21] Lamothe at P 13.

The results of this analysis are presented below [redacted]

Table 2. Congestion and HQ [redacted] exceeding [redacted] MW

	Uncongested Hours	Congested Hours	Percent Congested
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

Source: HQ Workpapers, "HQ-10_11 Bidding Analysis.xls."
Notes: Wheeling transactions excluded; weekend days excluded; ramping congestion excluded

Table 2 indicates that a [redacted] Put simply, HQ created congestion during peak hours by [redacted] during those hours.

For example, I find that between 1 April 2007 and 8 June 2007 there were a total of [redacted] during which HQ [redacted] relative to HQ's average off peak offer curve near the LMP. [redacted]. Therefore, during [redacted] of those hours, the HQ Node was congested.

Table 3. Congestion cost and HQ [redacted]

	Median Congestion Cost ($/MWh)
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

Source: HQ Workpapers, "HQ-10_11 Bidding Analysis.xls."
Notes: Wheeling transactions excluded; weekend days excluded; ramping congestion excluded

More important than just the frequency of congestion is the cost of congestion, which is shown in Table 3. Congestion cost increased significantly when HQ [redacted] For example, for [redacted], the median cost of congestion was approximately [redacted], the median congestion cost was nearly [redacted].

To graphically illustrate HQ's strategy, I now analyze its bidding practice on a day by day basis around key periods of congestion during the spring of 2007.

3.3.4 An analysis of HQ bidding in the Day Ahead Market, 2–4 April 2007

As I explain below, the first substantial spike in congestion at the HQ Node occurred on 4 April 2007. This date is important because the last sell round of the NYISO long-term TCC auction ended on April 2, 2007.[22] HQ waited until after it had cornered the TCC market to congest the HQ Node. As a result, HQ's bidding strategy was not revealed to competitors until after their opportunities to purchase TCCs settling at the HQ Node had disappeared.

Figure 6 shows HQ's average net offer curves on the three April days for import congested and other hours.

Figure 6[Redacted in public version]. HQ average DAM offers for import congested and other hours, 2-4 April 2007

[redacted]

[redacted]. As I explain in more detail below, this date marked the closing of the NYISO long-term, Spring 2007 TCC auction. On 3 April 2007,

[22] There was a reconfiguration round that took place on 9 April 2007, but that round included only 37 MW of TCCs.

HQ [redacted] during the single hour with import congestion. In particular, [redacted]

On 4 April 2007, HQ's strategy in the DAM [redacted] At prices between [redacted],[23] HQ [redacted] in import congested hours than it did in other hours. As a result [redacted], there was $312.18/MWDay of congestion at the HQ Node; import congestion occurred during 16 hours.[24] [redacted]

3.3.5 An analysis of HQ's participation in the Day Ahead Market, 7–9 May 2007

The three days 7-9 May 2007 also illustrate how HQ was able to create substantial congestion by [redacted]. The day 7 May 2007 was almost entirely uncongested. There were several hours of congestion on 8 May 2007, but that congestion was very moderate. By contrast, 9 May 2007 had numerous hours of substantial congestion. Figure 7 shows HQ's DAM net offers during both congested and uncongested hours on each day.

[23] The HQ LMP was between $24.9 and $55.14 on 4 April 2007. The LMP at the Marcy Node was between $36.91 and $66.58 during hours with import congestion.
[24] The congestion cost was between $0.45 and $35.21 during hours with import congestion.

Figure 7[Redacted in public version]. HQ average DAM offers for import congested and other hours, 7-9 May 2007

[redacted]

Figure 7 shows that between 7 May 2007 and 9 May 2007, [redacted]. On both 7 and 8 May 2007, HQ's net offer was [redacted] This offer was insufficient to create significant congestion given other bids in the market. Specifically, net congestion was a modest $40.02 on 7 May 2007. Furthermore, import congestion was only $23.78 during 8 May 2007. On 9 May 2007, [redacted] and congestion spiked to $587.22. [25]

The congestion spike on 9 May 2007 is explained by [redacted]

[25] Congested hours on 9 May 2007 were hours 7 through 22, which are all on peak. *See, e.g.*, HQ Workpapers, "HQ-10_11 Bidding Anlayisis.xls." [redacted].

[redacted]

[redacted]

4 HQ's TCC profits were derived from strategic market manipulation, not competition or chance

Above, I showed that HQ bid with the intent of creating congestion at the HQ Node. In this section, I extend that analysis to show that the profits that HQ derived from TCCs between April and June 2007 were achieved through manipulation of the TCC market and the exercise of market power, not through competition, economic efficiency, or chance. In particular, the timing of HQ's purchases of TCC that settled at the HQ Node, its knowledge of the delivery of CFT winners' energy, and the days on which it created congestion confirms that HQ planned to exercise market power and manipulate the market for congestion at the HQ Node to its advantage. Furthermore, [redacted] The important change in these time periods was HQ's position in the TCC market. In 2007, when HQ was overhedged, HQ profited from its position by creating congestion at the HQ Node.

4.1 The timing of TCC acquisitions, the delivery of energy from the CFT, and the creation of congestion

4.1.1 TCC acquisitions and the CFT

The Régie required that HQ sell 600 MW of energy to interested parties. As a result, on 9 March 2007, HQ Distribution issued a Call for Tenders ("CFT") for 350 MW of firm energy.[27] This firm energy was in 50 MW increments during all hours over a monthly period, from April 2007 to September 2007.[28] HQ Distribution closed the CFT on 15 March 2007, and granted the firm energy awards based on the bids it had received.[29] The remaining 250 MW was presumably sold under at least one other CFT process; it is my understanding, however, that information regarding that process is not in the public domain.

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[26] *Id.*
[27] Amendment at 9.
[28] *Id.*
[29] *Id.* at 9-10.

The NYISO Spring 2007 TCC auction for six-month and annual contracts began on 20 February 2007 and the last "sell" round occurred on 2 April 2007.[30] In addition, a separate TCC reconfiguration auction was held in March 2007 for the April 2007 settlement period. During these auctions, HQ was able to acquire 789 MW[31] of TCCs for April 2007 and achieve in total 1,500 MW of TCCs for the period 1 May 2007 to October 2007 or later.[32] HQ was thus able to hedge itself against much lower prices at the HQ Node relative to the prices at the Marcy Node.

It bears further emphasis that before it was overhedged against congestion at the HQ Node, HQ submitted a study to the Régie finding that the release of 600 MW of energy from the CFT would not result in lower prices at Zone M relative to the price at adjacent zones,[33] which means there would not be appreciable congestion between the HQ Node and the Marcy Node. As I showed in Figure 3 above, HQ went on to purchase approximately 1000 MW of TCCs that became effective on 1 May 2007 and 789 MW of TCCs that were effective on 1 April 2007 after it issued its analysis stating that congestion was not expected at the HQ Node.[34] Because the identity of winning bidders in the TCC auctions is not publicly available information, and because HQ waited until after the TCC sales to congest the HQ Node, a participant in the NYISO market would have been unable to determine HQ's intentions until after HQ had completed its TCC acquisitions. Specifically, the identities of bidders that win TCCs are not published until 1 May 2007. Participants monitoring the data ahead of that time could only have concluded that up to 100 different participants were purchasing TCCs for import congestion at a low price.[35] Because HQ procured these TCCs sequentially, a bidder viewing these auctions would only see that the market as a whole was purchasing import congestion TCCs at a low price.

4.1.2 HQ created congestion only after it was over-hedged through TCC acquisitions

Figure 8 shows daily congestion cost in $/MWh, January–June 2007.

[30] *Id*. at 11.

[31] It bears note that the 789 MW of TCCs were purchased in a reconfiguration round in March 2007. This indicates that a significant quantity of TCCs went unsold in the long-term auctions for the period covering 1 November 2006 through 30 April 2007, which indicates that little congestion was expected during this period.

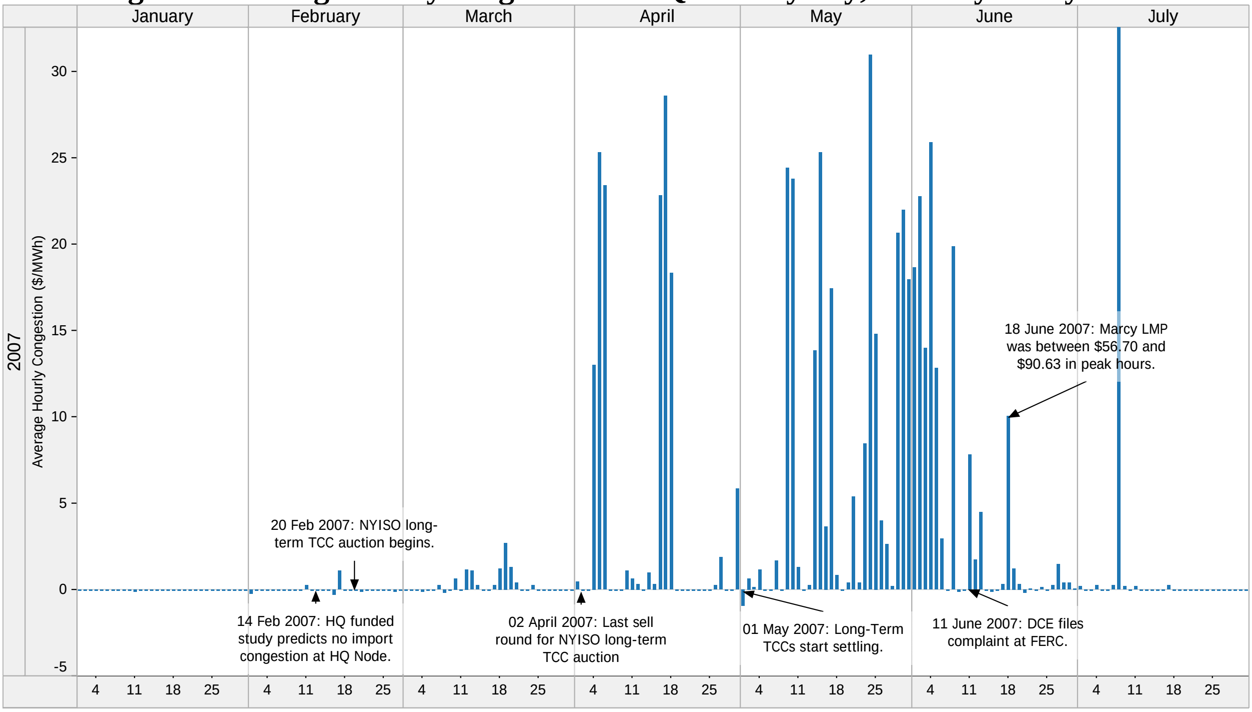
[32] Amendment at 12.

[33] See EASI Analysis.

[34] One must note that for the purposes of market power analysis, FERC has considered HQ's three divisions to be functionally equivalent. *See* n.2 *supra*.

[35] HQE Workpapers, "HQ-22 TCC Summary with TCC Cost.xls," [redacted]

Figure 8. Average hourly congestion at HQ node by day, January – July 2007



Sources: NYISO LMP Data, available at: Source: http://mis.nyiso.com/public/csv/damlbmp/yyyymmdddamlbmp_zone.csv; Energy Security Systems, Inc., Impact of HQ Distribution Exports on the New York Markets, submitted on 14 February 2007

In Figure 8, the first period of significant congestion began on 4 April 2007, just after the NYISO long-term TCC auction ended. It is worth noting that this first period of congestion lasted only three days. A reasonable explanation for this phenomenon is that HQ was not overhedged against congestion in April 2007. HQ's TCCs that settled in April at the HQ Node were purchased in the April Monthly TCC auction and covered 789 MW.

On 1 May 2007, HQ was overhedged against congestion costs at the HQ Node, as it controlled 1,500 MW of TCCs that settled at that Node. As a result, there are numerous days during May when HQ executed an offer strategy that involved the creation of congestion at the HQ Node. In several cases, the daily congestion cost during April–June 2007 was $25/MWh or more. Congestion continued until DC Energy filed its Complaint at FERC on 11 June 2007. The one exception in June was a congestion spike on 18 June 2007, which is explained by high prices at the Marcy Node during peak hours that day (between $56.70 and $90.63 per MWh).

4.2 [redacted] during the Spring of 2007 is inconsistent with its prior participation in the New York energy market

In Figure 5, I showed that HQ was bidding [redacted]. Figure 9 compares HQ's average net offer curve in the DAM in 2006 to its average net offer curve for 2007 in both congested and uncongested hours. The days analyzed are those between April 1 and June 15 for both years.

Figure 9[Redacted in public version]. HQ's average DAM offers for import congested and other hours, 1 April – 15 June 2006 and 1 April – 15 June 2007

[redacted]

[redacted]

4.3 [redacted] in the spring of 2007 can only be explained by market manipulation

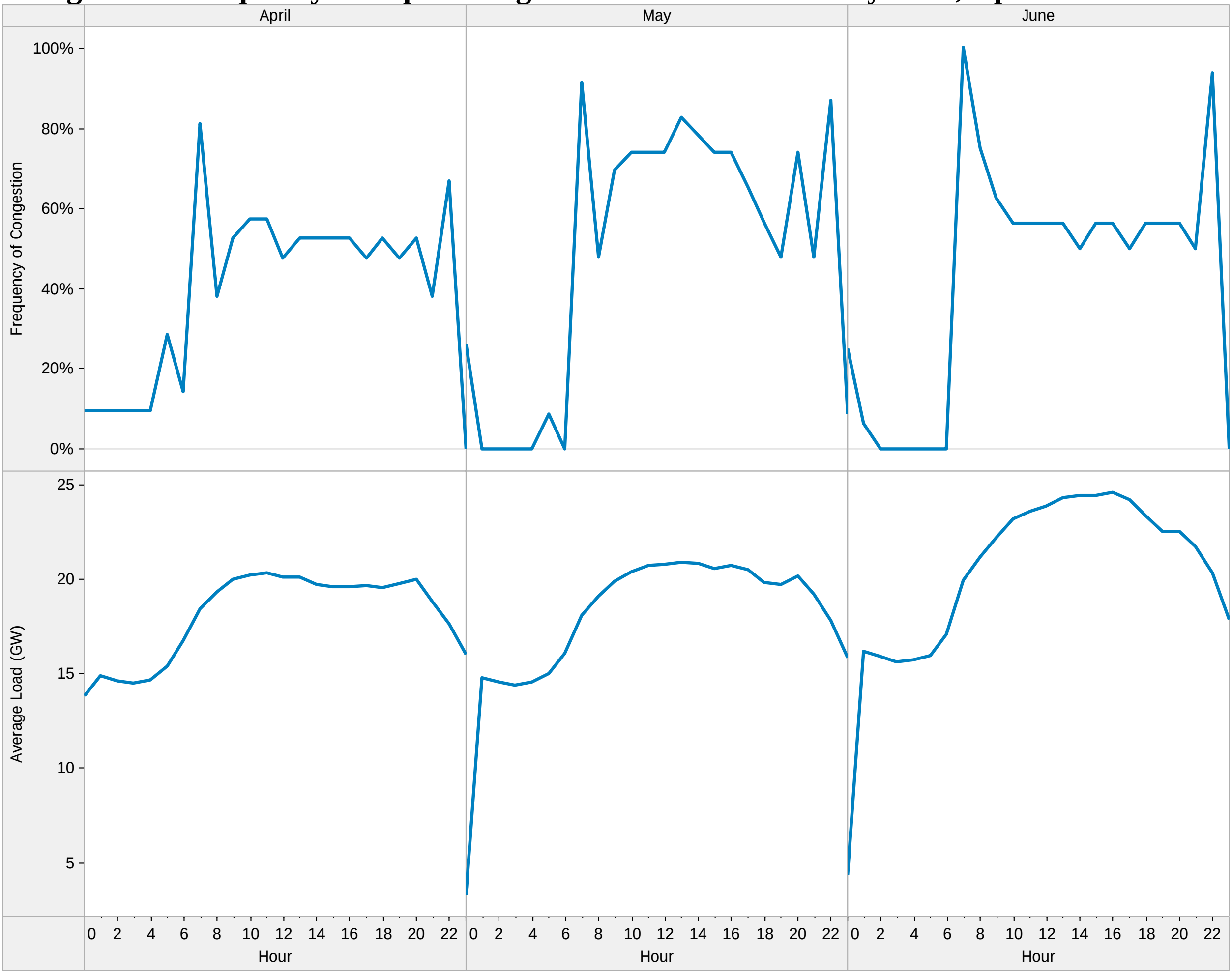
The [redacted] that occurred during the spring of 2007 are only consistent with manipulative behavior and cannot be rationalized as behavior of a non-manipulative hydro supplier. A non-manipulative bidding strategy of a hydro supplier would be based on the hydro supplier's opportunity cost of providing energy. This opportunity cost will vary for each of the supplier's resources and is primarily based on reservoir levels, long-term water forecast availability and demand forecasts. Thus, the opportunity cost, in particular, does not change dramatically within the day. Hence, a hydro supplier not engaged in gaming behavior should bid an offer curve that is stable throughout the day.

[redacted]

Figure 10 shows the frequency of congestion and the average load by hour and month. This illustrates that congestion occurred during peak hours, not off-peak hours. Over the three-month period, during the peak hours (07-22), congestion occurred 62% of the time; in the off-peak hours, congestion occurred just 7% of the time. These amounts are consistent with HQ creating congestion when it was profitable to do so.

36 [redacted]

Figure 10. Frequency of import congestion and NYISO load by hour, April–June 2007



Source: NYISO Daily Energy Report, available at: http://mis.nyiso.com/public/csv/damenergy/yyyymmddDAM_energy_rep.csv; HQE Workpapers, HQ-10_11 Bidding Analysis xls.
Notes: Ramping congestion excluded. Weekend days are excluded. No private HQ data was used to generate this figure. Only congestion, ramping congestion, date, and hour fields were extracted from the HQE Workpapers.

A hydro supplier not engaged in HQ's gaming strategy would decide to sell energy based on price by bidding its opportunity cost, which should not change significantly during the day. [redacted] in peak hours to create congestion and obtain revenues from its TCCs on both its own scheduled supply and its rivals' supply.[37]

HQ lists three main justifications for its [redacted] during the spring of 2007. [redacted] Third, HQ states that it was not the marginal bidder during most hours and that competition therefore existed at the HQ Node.[40] Although I respond in detail to

[37] As I show below, there were numerous hours in May where HQ was able to cause congestion, but where it was not the only supplier scheduled in the DAM.
[38] Brosseau, at P 36.
[39] Brosseau, at P 38; Lamothe, at P 14-15.
[40] Affidavit of Dr. Roy Shanker ("Shanker"), at P 98; Affidavit of Paul Wellenius ("Wellenius"), at P 17-21.

these points below, it bears note that none of these justifications explain HQ's [redacted] in the DAM during the spring of 2007.

[redacted]

[redacted]

Finally, the fact that HQ was not the marginal bidder during numerous hours of spring 2007 only serves to solidify the fact that it manipulated the market. Specifically, by not being the marginal bidder, HQ was consistently able to earn congestion rents on other bidder's energy, which is precisely the definition of an overhedged strategy. Therefore, the fact that HQ was not the marginal bidder during many hours with high congestion cost is even more indicative of the fact that it manipulated the market.

5 HQ did not show that it refrained from market manipulation

In explaining HQ's participation in the NYISO market before and during the Spring of 2007, HQ and its expert make several points that they say are evidence that HQ did *not* manipulate the NYISO market:

- With [redacted], HQ was pursuing a general strategy of [redacted].
- When HQ has [redacted], its [redacted] is efficient.
- HQ was not "overhedged."
- HQ never [redacted]
- CFT winners could have bought TCCs and hedged against congestion risk, but failed to do so.
- HQ's competitors were offering energy at lower prices than the LMP and/or setting clearing prices at the HQ Node.
- HQ had entered into [redacted]

Below, I respond to each of these arguments and show why they are incorrect.

5.1 [redacted] was not [redacted], but involved turning congestion on and off at will at the HQ node

[redacted]

5.2 HQ was overhedged

Both HQ and Dr. Shanker state that HQ's bidding strategy during the Spring of 2007 was "efficient."[42] This assertion is incorrect because, as I explained above, HQ's market manipulation harmed and will continue to harm competition by forcing competitors to outbid HQ for TCCs whose value will decline in the event that they win. Because this has the effect of increasing the costs of HQ's competitors, HQ's strategy is not efficient.

If by "efficient" HQ and Dr. Shanker meant "profit maximizing for HQ," then they are most likely correct in that regard. I note, however, that it is undesirable to allow a dominant firm to enhance its market power through manipulation of the market.

Dr. Shanker argues that HQ was not overhedged through its acquisitions of TCCs. Specifically, he states that "[a]n over-hedged condition might be considered to exist if a party either holds more rights than the physical capability of a potential transfer and/or in the situation where a party holds more TCCs than energy it actually has sold in any specific situation."[43] He then states that HQ was not overhedged because it [redacted].[44] However, Dr. Shanker incorrectly interpreted his own definition.

HQ held 1,500 MW of TCCs that settled financially at the HQ Node beginning 1 May 2007. Furthermore, with HQ's competitors providing [redacted] of energy, on average, at the HQ Node,[45] HQ knew that it could congest the interface by bidding [redacted] at prices below the Marcy LMP. If HQ believed that CFT winners would divert some energy to other locations, then it might have to supply a bit more at a given price. It should therefore be unsurprising that [redacted]. Yet it held 1,500 MW of

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[41] Shanker, at P100 (describing general conclusions in the affidavits of Messrs. Brosseau and Lamothe).
[42] Answer at 32.
[43] Shanker, at P77.
[44] *Id.* at P 78.
[45] Shanker, at P123.

TCCs, which more than covered [redacted]

In plain English, an overhedged position simply means that HQ has more TCCs than it is selling energy into or wheeling through New York. [redacted] In hours in which HQ is overhedged its incentive is to create a high congestion price, which is exactly what it did during peak hours. The question is whether it is appropriate for a supplier with substantial market power to enhance its market power through the possession of TCCs sufficient to make on/off congestion gaming strategies profitable. The answer is that it is not.

5.3 *CFT winners faced enormous obstacles in purchasing TCCs to hedge their energy positions*

Dr. Shanker argues that HQ's competitors' failure to hedge themselves against congestion is proof that they undertook risky business strategies and not that HQ manipulated the market. Furthermore, in criticizing the Amended Complaint, Dr. Shanker states that DC Energy never explained why HQ's competitors would take a long position at the HQ Node without shielding themselves against congestion.[47]

However, Dr. Shanker fails to mention that an HQ sponsored study that HQ submitted to the Régie found that significant congestion would *not* occur at the HQ Node as a result of exporting the 600 MW of energy available through the CFT. Given that bidders interested in competing for the 600 MW of CFT energy were likely following HQ's filings in the proceeding, it would be reasonable for them to expect little or no abnormal congestion at the HQ Node. Combined with the fact that HQ had not previously offered in the DAM to create congestion at the HQ Node, competitors would be further justified in expecting limited congestion. Finally, low prices in the TCC auctions are consistent with the market belief that little or no abnormal congestion would occur at the HQ Node.[48]

In addition, I showed above that HQ's creation of congestion appeared to be geared towards ensuring that it was able to achieve a TCC position that was overhedged in many hours. Specifically, as I showed in Figures 6 and 9, HQ waited until 4 April 2007 to begin creating congestion at the HQ Node. At that time, HQ had already amassed 1,500 MW of TCCs that settled at the HQ Node, and the only remaining opportunity to acquire TCCs at the HQ Node was the 9 April 2007 reconfiguration auction. The reconfiguration auction, however, did not substantially release additional TCCs, as it, for the most part, only involved the reconfiguration of TCCs already sold in prior rounds.

HQ's dominant position in the market puts the competitive supplier in a catch-22 with respect to participation in the TCC market: if the supplier bids high and wins the TCCs at a high price, then HQ will not find it profitable to create congestion, since it is not overhedged, and the value of the TCCs will be low; if the supplier bids low and fails to win the TCCs, then the auction price of TCCs is low, HQ is overhedged, and it finds it profitable to create congestion.

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[46] HQ Workpapers, "HQ-08 Accepted Net Vol Duration Curve.xls," [redacted]

Shanker, at P 115.

[48] HQE Workpapers, "HQ-22 TCC Summary with TCC Cost.xls," [redacted]

For a competing supplier, it is "heads you lose, tails HQ wins." No competing supplier can win this game. Thus, even if a competing supplier correctly anticipated HQ's congestion manipulation strategy, that knowledge would not provide protection from the strategy. The supplier's only protection is exit from the market.

Market participants should not be required to bid in anticipation of market manipulation. This will lead HQ's competitors to either overbid for TCCs on the expectation that HQ will congest the HQ Node or, more likely, will cause them to exit the market. Neither outcome is efficient, and both of them are harmful to competition.

5.4 HQ's competitors (the CFT winners) were largely price-takers and marginal bidders in the DAM

Dr. Shanker argues that HQ could not have manipulated the market because other bidders were supplying energy during congested hours, which means that some bidders had marginal costs below the LMP at the HQ Node. However, HQ and Dr. Shanker fail to provide the relevant analysis that would determine whether this statement is correct. A fact that Dr. Shanker ignores is that HQ's competition in the DAM during the Spring of 2007 would have come from bidders that won energy through the CFT. My understanding is that a CFT winner needed to get HQ's permission and possibly pay additional charges to supply energy to a market other than New York.[49] Thus, HQ knew that the CFT winners were effectively price-takers at the HQ Node, until the CFT winners arranged with HQ to sell the energy elsewhere. Unless HQ depressed the LMP so dramatically and so consistently that it made sense for them to have the energy delivered elsewhere, the losses of CFT winners may have been minimized by price-taking at the HQ Node.

As I showed in Figure 11 above, low prices at the HQ Node ultimately induced the CFT winners—that is, HQ's competition—into exiting the New York market during June 2007. Dr. Shanker ignores this fact too. After NYISO changed the TCC settlement rules on 1 July 2007 and provided temporary relief from HQ's market manipulation, competition again returned to the HQ Node. If, however, this relief is only temporary, as currently there is nothing that would prevent HQ from acquiring sufficient TCCs in the next auctions to continue this manipulative activity. Therefore, competition will be harmed as long as HQ is able to manipulate the market in this manner and as long as regulators refrain from constructing a permanent solution to sway HQ from this practice. It is not in New York's interest to have these alternate suppliers leave the market and sell elsewhere.

Both Dr. Shanker and Mr. Wellenius state that it was HQ's competitors—namely, the CFT winners—and not HQ who tended to be the marginal bidder in the DAM.[50] However, this fact does not refute HQ's ability to manipulate the market. The important data to analyze is the TCCs that HQ held relative to the energy it supplied in congested hours. HQ held 1,500 MW of TCCs, but [redacted] between 1 April 2007 and 23 June 2007. Therefore, HQ was overhedged. Put simply, this is proof that HQ made profits on energy supplied by other bidders.

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[49] *See* n.2, *supra*.
[50] Shanker, at P 98; Wellenius, at P 18-20, stating that between 1 April 2007 and 23 June 2007, HQ was the marginal bidder in at most 34 percent of the on peak congested hours.
[51] HQ Workpapers, "HQ-08 Accepted Net Vol Duration Curve.xls."

For example, 15 May 2007 was a day with considerable congestion. Congestion costs ranged from between $21.03 per MWh to $45.00 per MWh during peak hours that day. HQ's accepted bids in the DAM were between [redacted] during those hours. Therefore, HQ was overhedged by between [redacted] Furthermore, according to Mr. Wellenius, HQ was the marginal bidder in [redacted] Therefore, 15 May 2007 serves as an excellent example of how being the marginal bidder is unrelated to HQ's ability to game the market.

5.5 HQ's bilateral contracts provide no justification for its market manipulation

[redacted]

One must note, however, that neither HQ, Mr. Lamothe, Mr. Brosseau, nor Dr. Shanker perform any analysis to show that [redacted] in any way impeded HQ's ability to manipulate the market. Rather, they simply conclude that [redacted] is proof that HQ did not engage in market manipulation. This conclusion is wrong for two fundamental reasons.

[redacted]

[redacted] When

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[52] HQ Workpapers, "HQ-10_11 Bidding Analysis.xls," including a column in his workpapers that highlights whether or not HQ was the marginal bidding during a particular hour.

[53] Lamothe, at P14-15; Brosseau, at P38.

[54] HQ Answer, at 17.

[55] Shanker, at P 52-53.

[56] Lamothe, at P 14 (emphasis added).

[57] *Id.* (emphasis added).

HQ is overhedged through 1,500 MW of TCCs, its incentives are distorted from the efficient outcome. Specifically, it has the incentive to create congestion and then earn economic rents that exceed monopoly rents from TCC revenues on *other bidders' energy*.

[redacted]

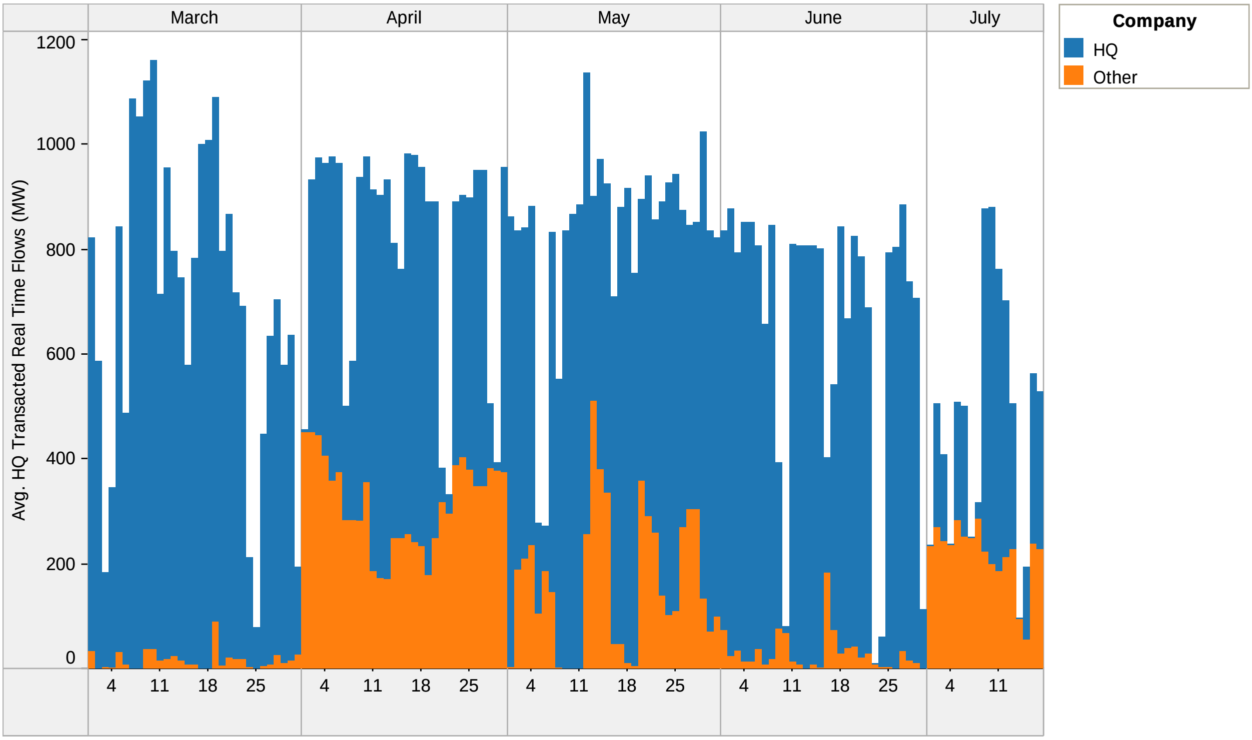
6 Competition and ratepayers are harmed by HQ's manipulation of the New York TCC and energy markets

6.1 HQ's market manipulation harms competition in NYISO electricity markets

The HQ Node is an essential input for suppliers seeking to import electricity into NYISO. By itself, and without an overhedged TCC position, it is not in HQ's immediate interest to block entry into NYISO at the HQ Node. However, through its acquisition of 1,500 MW of TCCs and subsequent market manipulation, HQ monopolized the essential input (the HQ Node) and was shielded from any congestion caused at that node.[58] Figure 11 illustrates the consequences of HQ's market manipulation to competition at the HQ Node.

[58] A formal discussion of the exertion of market power through the blocking of an essential input can be found in Peter Cramton, Andrej Skrzypacz, and Robert Wilson, "Revenues in the 700 MHz Spectrum Auction," University of Maryland Working Paper, 27 June 2007, available at: www.cramton.umd.edu.

Figure 11. Average real time flows at the HQ Node, March-July 2007



Source: NYISO Balancing Market Advisory, available at: http://mis.nyiso.com/public/csv/hamenergy/yyyymmddHAM_energy_rep.csv; HQT Scheduled and Transacted Flows, available at: http://www.transenergie.com/oasis/hqt/html/en/html_sd?&path1=HQT-MASS.

Figure 11 uses transacted real time flows to illustrate the decrease in competition that occurred at the HQ Node. As Figure 8 showed, congestion spikes in April were limited to only a handful of days. Consequently, bidders other than HQ—namely CFT winners—supplied a significant amount of energy to NYISO through the HQ Node during April 2007.[59]

In May, the amount of energy supplied by bidders other than HQ began to decline. By June, HQ was practically the only bidder with transactions in the real time market. By July, when the NYISO changed the rules that determined TCC settlements, HQ's competitors were temporarily shielded from HQ's manipulative practice. As a result, competition at the HQ Node increased substantially. Therefore, Figure 11 shows one of the consequences of allowing HQ to manipulate the market through an overhedged TCC bidding strategy: the flight of competition from the HQ Node. Further evidence of this harm appears in the graphical analysis of the DAM scheduled flows presented in Figures 12 and 13.

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[59] See also Attachment E to the Amendment, which used real-time bids to approximate the amount of supply provided by CFT winners between April and June 2007.

Figure 12[Redacted in public version]. Scheduled net imports at the HQ Node during on-peak hours in the DAM, April–June 2007

[redacted]

Figure 13[Redacted in public version]. Scheduled net imports at the HQ Node during off-peak hours in the DAM, April–June 2007

[redacted]

Figure 12 shows scheduled net imports in the DAM between April 2007 and 23 June 2007 during on peak hours for both HQ and all other suppliers. Figure 12 shows that in both April and June, HQ's competitors were, on several days, scheduling [redacted] Therefore, HQ's market manipulation was harmful to competition at the HQ Node during peak hours.

Another important point that should be made is that HQ's competitors left the HQ Node [redacted]. Figure 13 presents scheduled net imports in the DAM for off peak hours (both weekday off-peak and all weekend hours). Although HQ [redacted] Therefore, HQ's market manipulation harmed imports into NYISO through the HQ Node during *all* hours.

6.2 A lack of competition for TCCs harms consumers

HQ's ability to manipulate the market through the exercise of market power and an overhedged TCC position causes problems in the TCC auction itself. Now that HQ has revealed its ability to enhance its market power by being overhedged against congestion at the HQ Node, suppliers wishing to compete against HQ must hold TCCs. However, TCCs that settle at the HQ Node are worth far more to HQ than to other bidders, because of HQ's market power at that node. That is, TCCs have "cornering value" to HQ (and only HQ) that is achieved when HQ corners the TCC market, and then forecloses competition by turning congestion on and off at will. Consequently, the sale of TCCs that settle at the HQ Node suffers from a basic problem: a single dominant bidder places far greater value on those TCCs than any of its competitors.[60]

Competitive suppliers wishing to win TCCs that settle at the HQ Node are faced with a dilemma. If they do not bid for TCCs, then HQ can win enough to manipulate the market as it did during the Spring of 2007. If they condition their bids on the belief that HQ will create congestion and then win TCCs, those TCCs become less valuable, because HQ will no longer have sufficient TCCs to be overhedged and execute its manipulative scheme successfully. The end result is that HQ's ability to manipulate the market increases its competitors' costs and therefore will harm competition at the HQ Node. When faced with these choices, competitors will likely respond by submitting low bids for TCCs, hoping that HQ does not win them all, and avoiding the HQ Node if it does. The result is that HQ, rather than ratepayers, profits from the value of TCCs.

If HQ wins sufficient TCCs to become overhedged, the value of those TCCs should be equal to the cost of congestion at the HQ Node multiplied by the number of MW of TCCs held by HQ. Had those TCCs been correctly priced in an auction unencumbered by manipulation, those revenues would go to ratepayers through the transmission service charge.[61] However, because the value of those TCCs decreases when they are not held by HQ, competitors are unlikely to bid aggressively for them.[62] The end result is that HQ, rather than ratepayers capture the value of congestion created through HQ's manipulation of the market.

By contrast, if HQ had been unable to manipulate the market, competition would have occurred at the HQ Node. For example, during June, the CFT winners would have supplied energy to NYISO in general, and in particular on days when load was particularly high. On such days congestion would naturally occur, which means that TCCs would have had value. Looking forward, the value of TCCs should be based on congestion that naturally occurs during peak summer hours. Consumers should get the revenue from the value of these TCCs, something that cannot occur if HQ is allowed to manipulate the market.

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[60] Professors Skrzypacz, Wilson, and I discuss the basic economic pitfalls of conducting such an auction. *Id.* at 3-4, 11-13. One of those pitfalls is competition flight and a resulting decrease in auction revenues. *Id.* at 4-6. One must note that although our paper discussed dominance in spectrum auctions, the same analysis applies to TCC auctions with a dominant bidder. In spectrum auctions incumbents' dominance harms competition because bidding is costly. If competitors feel they have little chance of winning, they tend not to bid rather than incur the large costs of bidding in a high stakes auction. However, it is not necessary that bidding in a TCC auction is costly for competition to be harmed by HQ's ability to manipulate the market. As I explained above, TCCs only have monopoly value in the hands of HQ, who can manipulate the market through possession of a sufficient number of TCCs. If a small bidder outbids HQ for those TCCs, then the value of those TCCs decreases. Therefore, it is likely that HQ's competitors will simply bid low and then avoid importing through the HQ Node if those low bids do not net them a sufficient number of TCCs.

[61] Answer at 42-44.

[62] *Id.*

6.3 *NYISO's change to TCC settlements is a temporary solution and failure to adopt a permanent solution could result in a proliferation of manipulation*

As I noted earlier, NYISO changed the way TCCs settled on 1 July 2007 by creating a new node.[63] This measure improved competition during July 2007 because it neutralized HQ's overhedged position. However, this change only provides a temporary solution. In particular, HQ will, in future auctions, be able to corner the market on TCCs at the new node. By achieving an overhedged position at the new node, HQ will be able to manipulate the market as it did during spring 2007 and dramatically impede any competition that might exist at the HQ Node. Therefore, the NYISO's measure is insufficient to deter HQ from manipulating the market in this manner in the future.

It bears further note that if regulators fail to curtail HQ's ability to manipulate market at the HQ Node, they set a bad example for other market participants that are in a potential position to engage in this practice. For example, this type of manipulation could occur at load pockets with dominant suppliers. A dominant supplier in a constrained area could underbid its energy ahead of a long-term auction in an attempt to devalue TCCs so that it could obtain them at a lower price; FERC should deter this type of manipulative conduct.

7 Conclusion

During the spring of 2007 HQ engaged in market manipulation at the HQ Node at Massena. The details of HQ's manipulation are as follows: over a sequence of auctions, HQ cornered the market for TCCs from the HQ Node, purchasing 1,500 MW of TCCs that settled financially at the HQ Node starting 1 May 2007 and covering through at least 31 October 2007. Meanwhile, HQ Distribution was selling in at least two CFTs up to 600 MW of energy at the HQ Node.

Given the CFT winners' sales into New York, this course of business put HQ into an overhedged TCC position. HQ then began to exploit this overhedged position, [redacted] Not only was HQ able to affect the frequency of congestion at the HQ Node, but more importantly, it was also able to affect the cost of congestion at that node. Through its overhedged TCC position, and by creating significant congestion costs, it was able to earn significant congestion rents on both the energy it supplied and the energy supplied by its competitors.

To summarize, HQ exploited its market power at the HQ Node to corner the market for TCCs, and then used its overhedged position in the TCC market and its extreme market power at the HQ Node to unilaterally create congestion. The congestion directly harmed the competitive suppliers, forcing their exit. HQ's market manipulation also harmed certain TCC holders, including DC Energy, and consumers. Consumers did not benefit from HQ's high volume of low-priced offers; it did not enable any more inexpensive power to flow into NYISO and it was HQ that received nearly all the congestion rent these offers created through low prices at the HQ Node. Instead consumers were harmed from the loss in competition and the long run discount in TCC auction revenue relative to the true value of congestion at the interface.

[63] NYISO, Transactions at the New York-Hydro Quebec Interface at Chateauguay, Technical Bulletin 158, 23 July 2007, available at: http://www.nyiso.com/public/webdocs/documents/tech_bulletins/tb_158.pdf.

In HQ's response to the Amended Complaint, HQ listed several justifications for its behavior in the NYISO DAM during the spring of 2007. For [redacted] I reject HQ's assertions that [redacted] is indicative of a profit-maximizing company that is *not* engaged in market manipulation. Were HQ *not* engaged in market manipulation and only interested in generally offering more energy, [redacted]

HQ's market manipulation is troubling because it harms competition in the TCC market and the energy market at the HQ Node covering all imports from Quebec to the NYISO market. Specifically, it reduces the auction price of TCCs because HQ's competitors are faced with a catch-22 situation. If HQ's competitors or market investors bid high and win TCCs at a high price, then HQ will not find it profitable to create congestion, since it is not overhedged. If other market participants bid low and fail to win the TCCs, then the auction price of TCCs is low, HQ is overhedged, and it finds it profitable to create congestion. For other market participants, it is "heads you lose, tails HQ wins." No competitor can play this game, and the only rational response is to exit the market.

HQ's market manipulation also harms the energy market because it is immune to the countervailing response of competitors when a dominant supplier merely exercises market power. Typically, the exercise of market power involves withholding supply to raise price, which encourages entry. HQ's market manipulation depresses price, which drives its competition away. However, unlike typical predatory behavior, in which consumers benefit from the artificially depressed prices, in this case consumers do not benefit, as HQ captures all the price reduction as congestion rent on its TCCs. This form of manipulation is particularly troubling because there is no competitive response and consumers do not benefit.

It is important that FERC promptly address HQ's market manipulation as it did in the Manipulation Orders. Allowing HQ's manipulation to go unpunished may extend beyond a lack of competition at the HQ Node. This gaming strategy could proliferate to other interfaces under FERC jurisdiction where congestion is priced and a dominant supplier exists. I urge FERC to address HQ's market manipulation promptly.