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Connecticut Energy Policy: Critical Times – Critical Decisions

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Exactly ten years ago – on April 1, 1998 – the California Independent System Operator lurched into operation in California. The beginning in California was not auspicious. The California legislature, largely at the urging of Professor Bill Hogan of Harvard, had decided to abandon open wholesale markets where buyers and sellers could freely transact without rigid rules, mandated prices, and high levels of secrecy for a system of administered markets.

Like its successors in New England, New York, Pennsylvania, New Jersey, and Texas, the rules were dauntingly complex. Outside of a few insiders, few market participants understood the mechanics, and even fewer had access to the levels of proprietary information that allowed them to lobby for rule changes to raise prices in an advantageous fashion. While the proponents of administered markets have described this as "competitive", we now know that competition had little role in the complicated structure.

Enron, and a number of other major firms, immediately focused on how to take advantage of the secrecy and complexity. One group of consultants even began to market a "crime school" where they offered loopholes in the calculations to market participants for a fee.

Due to FERC's preference for settlements over enforcement, only one of the predators has ever been brought to justice. In Enron's case, a full investigation lasting six years finally went to trial and the facts were tested in an open hearing. Judge Cintron, in her order of June 21, 2007, held that:

> Enron violated its MBRA and the PX and Cal ISO tariffs throughout the Relevant Period by engaging in various gaming and market manipulation schemes throughout the Western interconnect. As a result, this Initial Decision orders Enron to disgorge $1,617,454,868.50 in unjust profits earned dur-

> ing the Relevant Period. Enron's M[arket] B[ased] R[ate] A[uthorization] is also revoked beginning January 16, 1997.[1]

It may seem odd that the mistakes of 1998 continue to provide us critical insights ten years later, but the sad truth is that California's mistakes were adopted by the Federal Energy Regulatory Commission (FERC) in the creation of Regional Transmission Organizations throughout half of the United States. There are mistakes so seductive that we make them again and again. High costs, market manipulation, and inefficiency have followed in California's wake from Texas to New England. All indications are that the situation will get worse before enough outrage has been generated to enact basic reforms.

A wise professor once counseled me that if you cannot explain something, you do not understand it very well yourself. In the case of electric restructuring, it is wise to apply this simple test rigorously. The alternative is to be led astray into thickets of nonsense disguised as abstruse mathematical proofs.

Question 1: *How well is the experiment with administered markets working in Connecticut and across the U.S.?*
Answer: Not just poorly, but very poorly. Relative prices are high, transparency is absent, and Enron-style scandals are frequent. See page 3.

Question 2: *How did we get here?*
Answer: We adopted California's faulty market structure and we are not sure how to turn back. See page 7.

Question 3: *Where do administered electric prices come from?*
Answer: We don't know. Electricity markets are not competitive, market interventions are common, and the usual explanations fail continuously. We do know that the prices paid by consumers are not correlated with natural gas prices. See page 10.

Question 4: *Does retail choice in electricity require an ISO/RTO?*
Answer: No. Some states have retail choice with free markets and some have administered markets without retail choice. Retail choice and administered markets are not tied together. See page 15.

Question 5: *Who is profiting from the replacement of open markets by administered markets?*
Answer: A relatively small group of companies that have purchased existing plant at low prices and are now reselling the same plants back to consumers at high prices. See page 15.

[1] Initial Decision, EL03-180 et al., Judge Carmen Cintron, June 21, 2007, p. 82.

Question 6: *Where is the next generation of electric capacity going to come from?*
Answer: Probably from traditional vertically integrated utilities and/or public power solutions. Their risk environment is superior and their incentives are much clearer. Most likely it will not be natural gas fueled, due to cost and supply issues. See page 18.

Question 7: *Why should Connecticut know about what happened in Illinois?*
Answer: Recent proposals in Connecticut would institute a similar approach that failed in Illinois. A poorly designed reverse auction cost ratepayers billions in potential overcharges. An active intervention by the Illinois Attorney General has resulted in a $1 billion settlement. See page 21.

Question 8: *Where do complex "NERA" style auctions fit into the future supply picture?*
Answer: They do not. The combination of artificial restrictions to entry and high degrees of secrecy has produced above-market prices in Maryland, New Jersey, and Illinois. See page 22.

Question 9: *Is a state power authority a good alternative?*
Answer: It appears to be the best of a series of bad choices that we have available. See page 28.

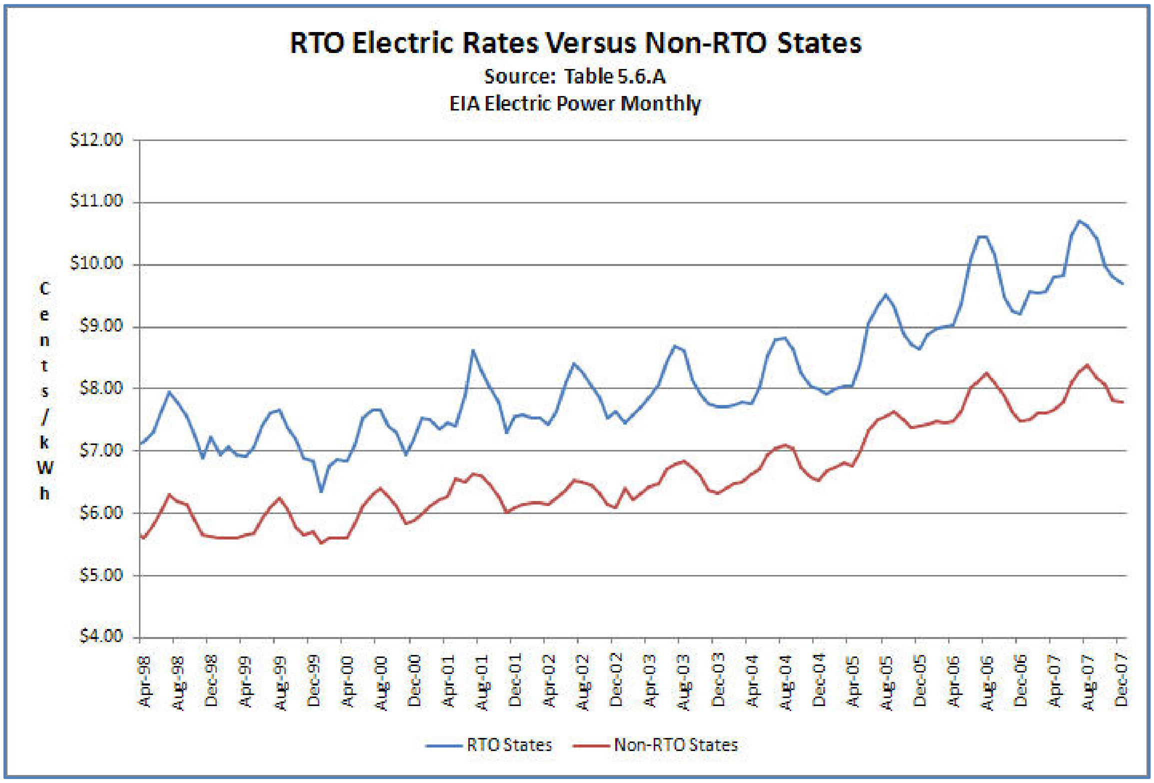
Question 10: *What is going to happen next?*
Answer: Unless we establish motivated and independent market enforcement for administered markets, the prognosis is negative. We need an immediate return to transparency and FERC-mandated benchmarks to see what is happening. Put colloquially, right now we are driving ahead of our headlights. See page 28.

Question 1: How well is the experiment with administered markets working in Connecticut and across the U.S.?

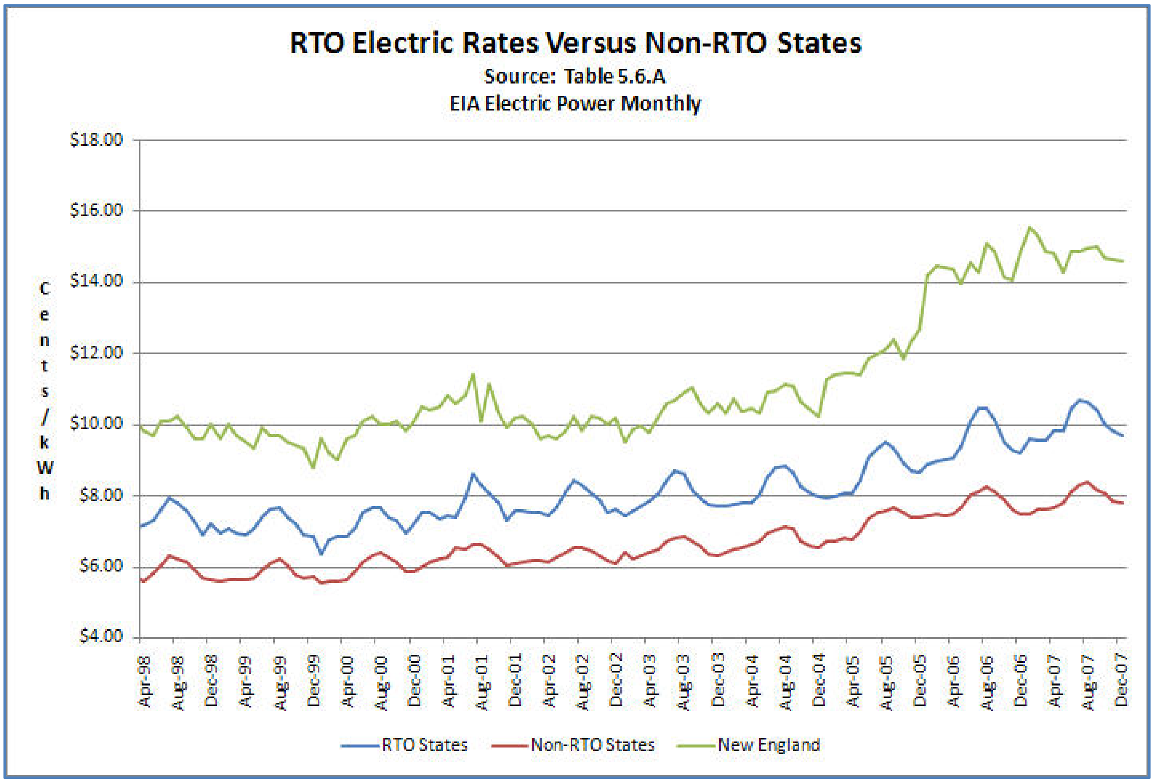
For the past 24 months, the average consumer rates in states served by RTOs have increasingly diverged from states where wholesale markets reflect transactions made between willing buyers and sellers.[2] The following chart shows the situation since April 1998. The num-

[2] The RTO states are: California, Connecticut, Delaware, District of Columbia, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, South Dakota, Texas, Vermont, Virginia, West Virginia, and Wisconsin. The non-RTO states are: Alabama, Alaska, Arizona, Arkansas, Colorado, Florida, Georgia, Hawaii, Idaho, Kansas, Kentucky, Louisiana, Mississippi, Montana, Nevada, New Mexico, North Carolina, Oklahoma, Oregon, South Carolina, Tennessee, Utah, Washington, and Wyoming.

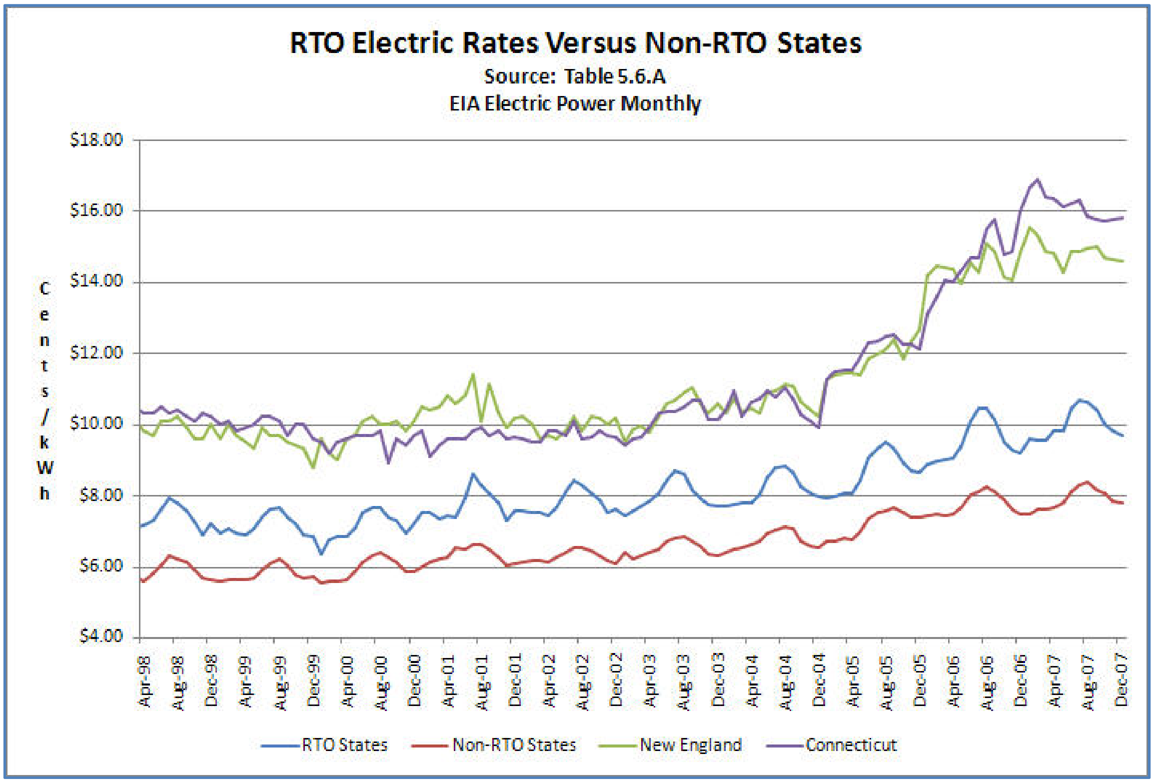
bers in this chart are taken directly from data in the Energy Information Administration's Electric Power Monthly periodical. These are the prices as closely as we can measure them that actual customers pay for electricity.



Overall, the results have not been positive. Ratepayers in states formed by RTOs now pay $.022 more per kWh today than they did in 2002. While the proportion of natural gas generation in non-RTO states is roughly comparable to that in RTO states, the increase has not been shared in states with open markets. New England has fared worse than the average. The following charts show relative consumer prices in New England compared to nationwide prices in RTO states and non-RTO states.

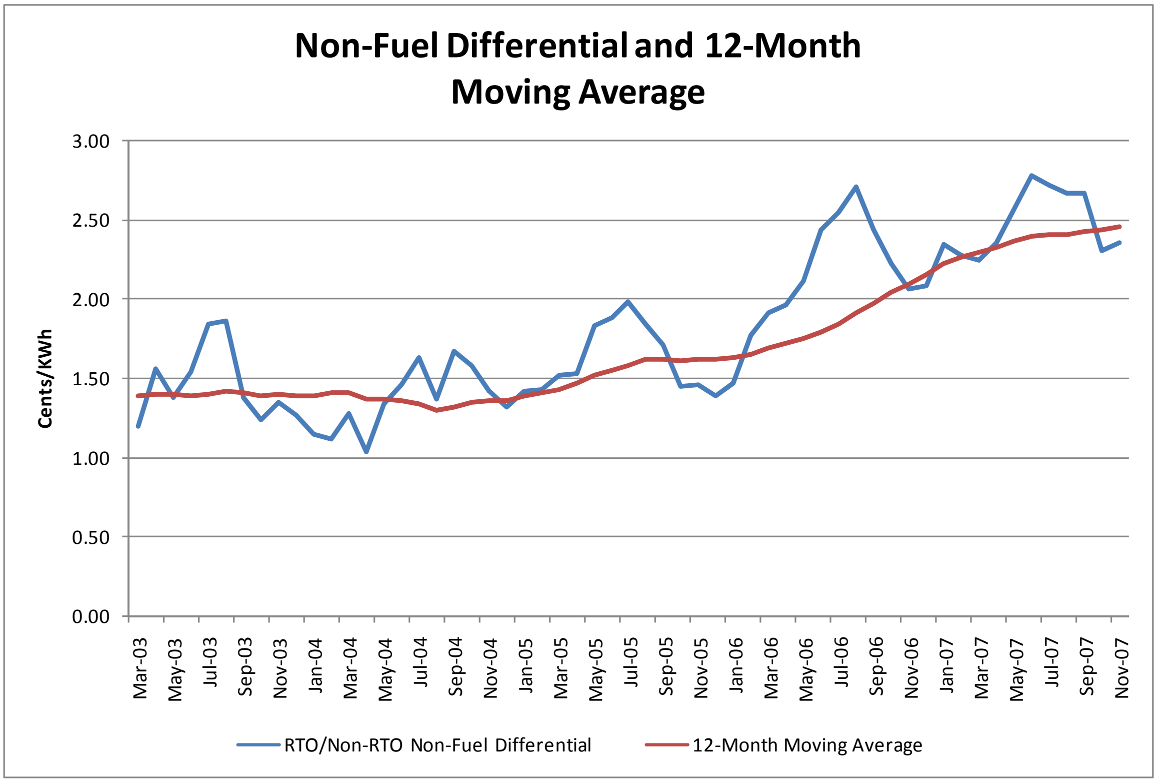


Over the past year, Connecticut has even diverged from the general dismal performance in New England. The differential in Connecticut is now an additional 5 mills $.005/kWh higher than the New England average.



It is common for advocates of administered markets to blame their failure to serve consumers in a cost-effective fashion on natural gas prices. Unfortunately there is no statistical relationship between natural gas prices and the RTO/non-RTO differential. The following chart shows the differential with all fuel prices removed. Surprisingly, the differential is even higher when only non-fuel charges to consumers are considered.

Contrary to those who believe that high oil prices are impacting only on states with RTOs, the fact is that dependence on natural gas is relatively comparable between states with and states without an RTO.



Question 2: How did we get here?

In 1981, the Bonneville Power Administration (BPA), one of the nation's largest utilities, initiated a market experiment. It began sales of a large block of electricity (some years as high as 6,000 megawatts) on a free-market basis. This simple innovation took the industry by surprise. BPA's wholesale customers litigated against this experiment for years until it was obvious to everyone that this was the right answer.

FERC gradually turned around and approved open wholesale markets for the entire West Coast on an experimental basis in 1987 and on a permanent basis in 1991. This market, the nation's largest, is called the Western Systems Power Pool and is still in operation today. It is completely transparent, requires no massive bureaucracy to administer, and allows everyone to directly buy and sell electricity on their own initiative. The experiment proved so successful that open market prices fell to a fraction of the retail prices in California. In 1992, BPA allowed its major industrial customers to buy and sell electricity on the wholesale market. This practice was soon adopted throughout much of the West Coast, with the single exception of California.

Instead, California held a vast number of hearings for years to discuss the issue. Two points of view quickly emerged. The first, that California should adopt the successful model being pioneered in the rest of the West Coast, was recommended by a majority. The minority believed that markets required governmental administration as was the practice in the U.K.

When the enabling legislation finally passed in 1996, the die was cast. California rejected open markets in favor of a Rube Goldberg apparatus of markets, system operators, oversight agencies, and rules. No one has ever counted the pages of rules adopted in the course of establishing the California system, but estimates in the hundreds of thousands of pages are common.[3]

Enron's files, once we forced access to them three years ago, indicated that it saw how vulnerable California was to manipulation. By 1999, it had proficiency exams in market manipulation for new traders. A famous manipulation, "Silver Peak," used loopholes to increase wholesale prices by up to 48% on several occasions in 1999.[4] Towards the end of that year, Enron gambled the majority of its trading risk capital on buying forward contracts in California and the Pacific Northwest on the presumption of a market crisis[5] that its own forecasts indicated was not remotely possible.[6]

As we all are well aware today, the summer of 2000 saw the virtual collapse of the California administered markets, even though peak electric loads in California had fallen to their lowest level since 1998 and flows to the massive hydroelectric complexes along the Columbia River were close to normal.

After eight years of litigation, FERC, the courts, and other regulatory agencies determined that market manipulation was indeed a central cause of California's crisis. Criminal convictions of prominent Enron trading executives, massive fines and settlements, and refunds to victims establish the facts.

Unfortunately for New England and a number of other areas, the picture of a central agency setting prices, allocating transmission, and protecting the public from market manipulation proved too seductive for FERC to resist. Agencies modeled on California's were adopted without a careful understanding of the risks of administered markets.

[3] This is true for the similar system operators such as ERCOT (Texas), PJM (Pennsylvania-New Jersey- Maryland), MISO (the Midwest), and New England.

[4] Supplemental Testimony of Robert McCullough, EL03-180, January 27, 2005, p. 26.

[5] Regulation and Forward Markets: Lessons from Enron and the Western Market Crisis of 2000-2001, prepared by Robert McCullough for the Democratic Policy Committee on Regulation and Forward Markets, May 8, 2006, p. 14.

[6] Western Region Electricity Market Price Forecast 2000-2021, prepared by Henwood Energy Services for Enron North America, October 14, 1999.

But as prices have risen, large industrial customers, state attorneys general, environmentalists, and public power are seeking change. This is not a natural alliance. In truth, many of these parties are surprised to find themselves on the same side of any issue, let alone one with such strategic national importance as market reform.

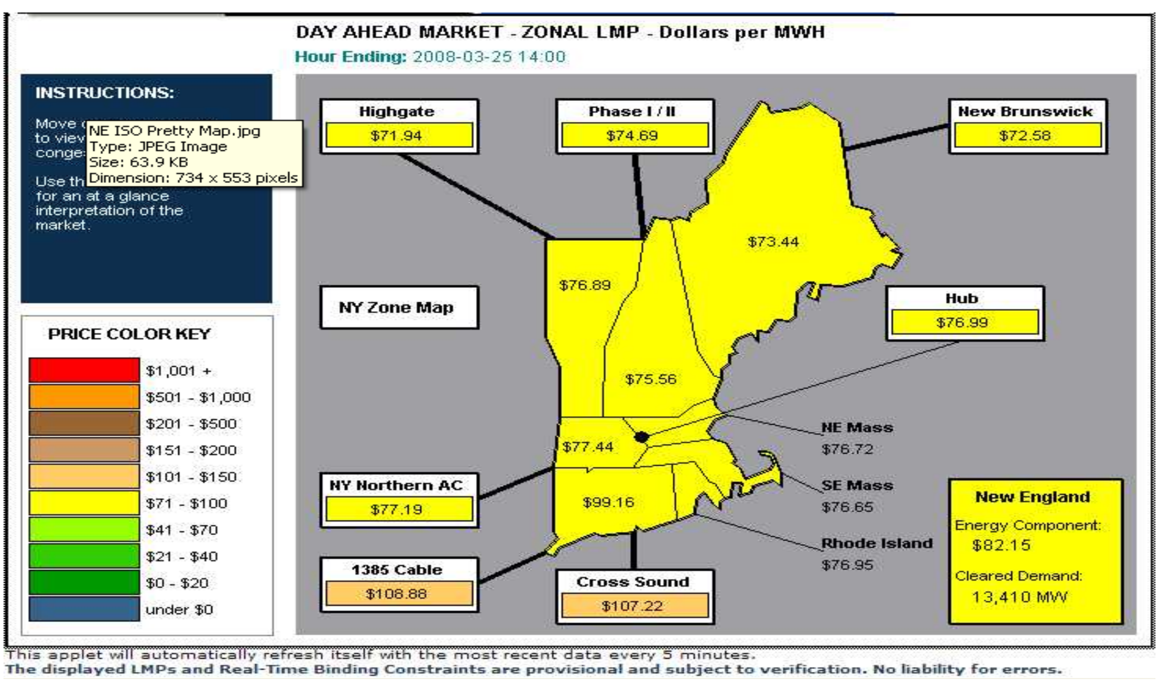
Reports from the front are mixed. After initial reluctance, FERC and the Commody Futures Trading Commission have taken a more activist role in market regulation. Few substantive reforms have made it through Congress. Transparency in energy markets is marginal at best, absent a federal mandate to fix the problem. Effective enforcement on the West Coast, Texas, and Illinois has been by outsiders, not by federal regulators or the generally passive RTO market surveillance groups.[7] A notable victory occurred during the Illinois Attorney General's battle in 2007 to overturn a disastrous electricity auction. Unfortunately, the parties settled so quickly that few of the underlying facts have ever been released.

[7] The single real exception has been the market surveillance activities in Texas under the leadership of Parviz Adib who is now retired. Joseph Bowring at PJM recently fought a controversial battle to retain independence from the PJM board, but the results are too early to detect.

Question 3: Where do administered electric prices come from?

In the course of an investigation in Texas several years ago we came across a taped conversation between two traders who, while manipulating supplies in the Texas ERCOT real-time market, idly discussed why the price was always set at $990.01/megawatt-hour. Whenever they created a condition of artificial scarcity in the ERCOT market, a single small bid was submitted in secrecy by a bidder who set the market at $990.01. This form of market manipulation is called signaling and it is designed to avoid market surveillance authorities (Enron pioneered this manipulation in Alberta, Canada, in 1999). The key is for the market manipulator to set the market shortage, but not to make the bid that sets the market price. In Texas, even the villains found the price calculations in an administered market mysterious.

It has become standard in RTOs to set prices by using a complex, secret computer algorithm to find the best prices given bids and system constraints. Since the algorithms frequently fail, additional rules come into play when the results are greater than price caps, errors have crept in, or there are policy initiatives imposed by ISO/RTO operators or management. The following chart shows the real time pricing map for New England on March 25, 2008 (this is publicly available). The cautions at the bottom warn the viewer that these prices may be adjusted later.



While the map is impressive technically, the question of whether the prices are being set by competition or collusion is timely. Economists generally set five conditions for "perfect competition":

(1) There are large numbers of buyers and sellers.
(2) The quantity of the market's products bought by any buyer or sold by any seller is so small relative to the total quantity traded that changes in these quantities leave market price unaffected.
(3) The product is homogeneous; there is no reason for any buyer to prefer a particular seller and vice versa.
(4) All buyers and sellers have perfect information about the prices in the market and the nature of the goods sold.
(5) There is complete freedom of entry into the market.[8]

Paul Samuelson, the dean of American economists, adds a pithy remark in virtually each edition of his famous textbook that "the mere presence of a few rivals is not enough for perfect competition."[9]

First, there must be many buyers and many sellers. Almost every market in our economy has this feature: you can buy socks from a hundred sources, but this is not always true for electricity. Franklin Delano Roosevelt made possible competitive markets in electricity on the West Coast by building a freeway system of transmission lines open to any market participant. This generally is not the case on the East Coast. As you know, Connecticut has significant transmission constraints.

Second, there must be freedom of entry and exit. A central feature of the RTO system is that entry is often difficult. The skein of rules and the requirement for arcane computer technology tend to discourage smaller participants. Seattle City Light, a large public utility serving the Seattle area in Washington state, once calculated that bidding, scheduling, and billing overhead in CAISO added 10% to the cost of a transaction. Seattle City Light was too small to successfully enter California's administered markets. Most important is that competition has to occur in an open market where information concerning prices and quantities are freely available.

While RTOs, strangely enough, charge higher prices, they have had difficulties providing incentives for investment. This is terribly ironic when the old "cost plus" system of traditional regulation had lower prices and was generally accused of providing an incentive for utilities to over-invest in generation. A strident call has gone out to adjust the bids in administered markets above their current levels in order to provide such an incentive.

[8] Regulated Industries, Richard J. Pierce and Ernest Gellhorn, page 22.
[9] Economic: An Introductory Analysis, Paul A. Samuelson, 1958, page 42.

Unlike normal markets where price discovery is the rule rather than the exception, ISO New England's FERC Electric Tariff states that most market information is secret:

> In addition, the System Operator shall publish each month's bid and offer information for all markets on its website on the first day of the fourth calendar month following the month during which the applicable demand bids and supply offers were in effect (e.g., bid and offer data for January would be released on May 1), provided that the information is presented in a manner that does not reveal the specific load or supply asset, its owners, or the name of the entity making the bid or offer, but that allows the tracking of each individual entity's bids and offers over time.[10]

Like the blind wise men and the elephant, you do not get good answers in the dark. After a Boston price spike in 2006, traders could not guess the cause and admitted they might never know.[11]

I have proposed that FERC should desist from eliminating rules that required market participants to report their marginal costs.[12] Economic theory tells us that efficient prices should reflect marginal costs. In both New England and RTOs elsewhere we no longer know whether the prices are efficient since FERC keeps participants from reporting their marginal costs.

The most controversial prices set by the New England ISO are determined by arbitrary calculations. The U.S. Court of Appeals ruling of March 28, 2008 on challenges to the new capacity prices states:

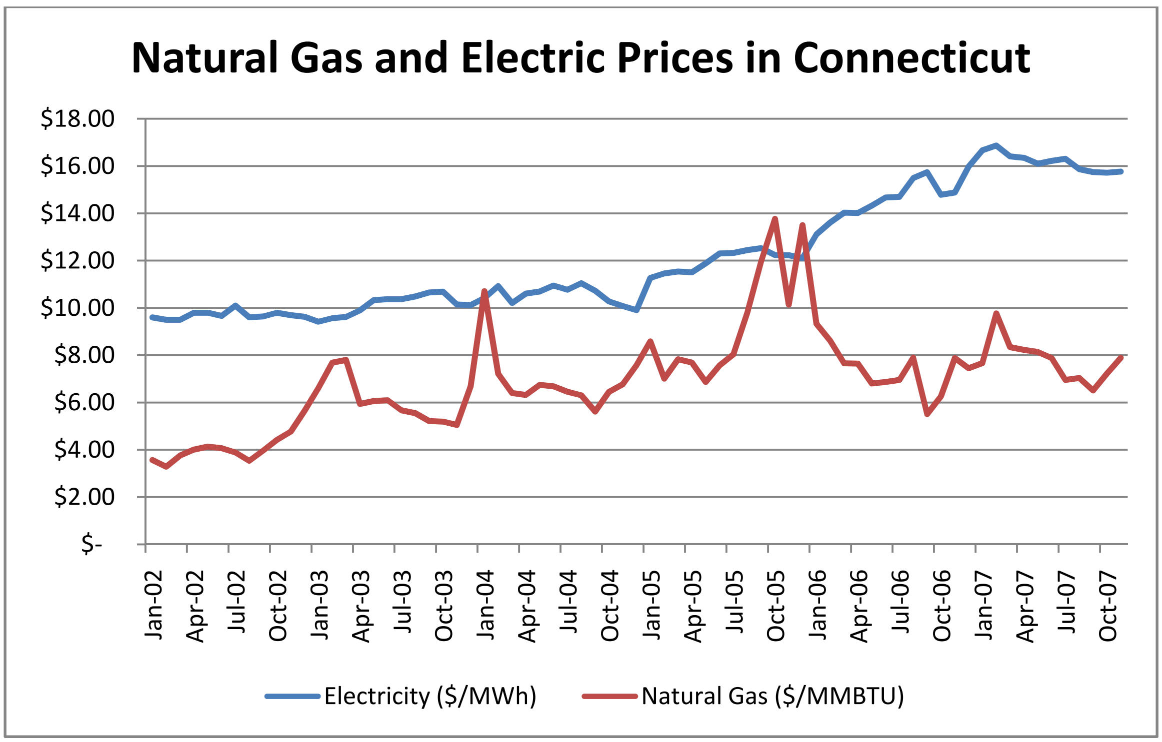
> 3 Although the parties refer to this as a "demand curve," that term is misleading. Normally, a "demand curve" is a model of the relationship between prices and consumer preferences in a free market. In contrast, the "demand curve" proposed by the ISO is an entirely artificial construct that specifies the prices that must be paid for various quantities of capacity. 107 FERC at 62,022; see also Elec. Consumers Res. Council v. FERC, 407 F.3d 1232, 1234-35 (D.C. Cir. 2005) (explaining the construction of a similar "demand curve" by the New York ISO). This proposal was intended to make revenues and price movements more stable and predictable. 107 FERC at 62,022. *That may or may not have been sound policy, but it more accurately should

[10] FERC Electric Tariff No. 3, Attachment D, page 9,410.
[11] Boston area power prices spike over $900, Reuters, May 9, 2006.
[12] "The Missing Benchmark in Electricity Deregulation," Robert McCullough and Ann Stewart, December 2007.

> be termed a "non-demand demand curve" reminiscent of the once regulatory invention, a "non-bank bank."*[13]

Following the Court's lead, I think we can state that prices are set in New England by a non-competitive competitive market.

A standard explanation frequently offered is that we make electricity with oil and natural gas, so the prices are increasing in response to international oil prices. What is the truth? The following chart shows the most recent natural gas and electric prices provided by the U.S. Department of Energy's Electric Power Monthly:



The data, both in Connecticut, and elsewhere in RTOs, do not explain why the decline in natural gas prices from winter 2005 through winter 2007 have not been matched by a comparable fall in electric prices.[14]

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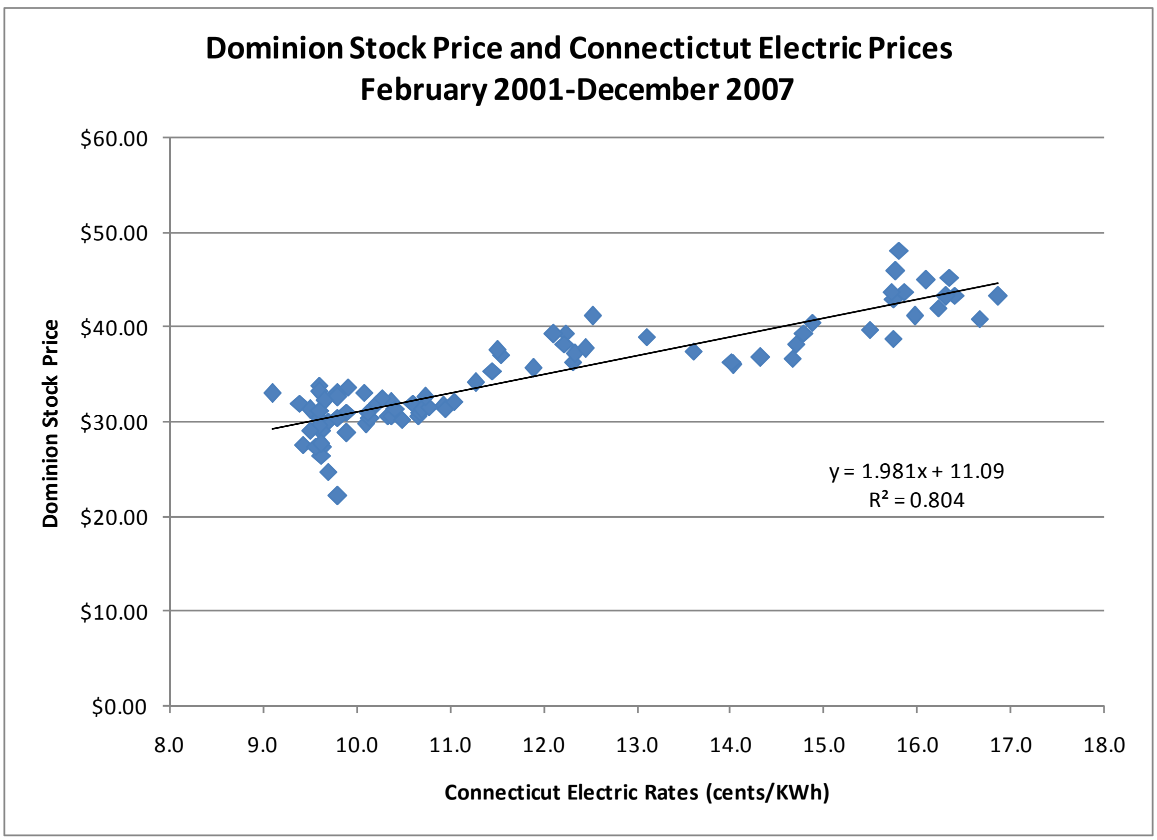
[13] On Petitions for Review of Orders of the Federal Energy Regulatory Commission, March 28, 2008, page 3.
[14] This is a question best addressed by statistics. Formally stated, can we reject the hypothesis that there is no relationship between Connecticut's electricity and natural gas prices over the past five years? A Generalized Least Squares regression – correcting for the autocorrelation in error terms – indicates that we cannot reject this hypothesis.

If, as we have seen above, prices are increasing and we are uncertain how to protect consumers, there are a number of alternatives. In Illinois, an interim approach was to directly hedge spot prices on the open market. Until a solution is enacted that allows the state to procure cost-effective supplies, such as a proposed state energy authority, a logical alternative is to find solutions that are within the reach of energy consumers.

In a perfect world consumers would hedge their electric prices directly on the NYMEX trading exchange. Obviously, this is difficult. NYMEX contracts are large and require a substantial investment. While reviewing the surging profits of a number of the participants in the Connecticut market, we remembered a maxim from introductory finance that the optimum hedge is given by the correlation of two financial instruments. One alternative hedge to NYMEX contracts is the common stock of Dominion. The following chart shows the relationship between Dominion stock and average retail prices in Connecticut:



Financial theory measures the efficiency of the hedge (its ability to protect the consumer) by the R^2.[15]

In this case, purchasing Dominion stock is a very efficient hedge against further increases in electric prices in Connecticut. While this idea may appear radical, it simply reflects the market realities that market participants will reap large profits from future electric price increases and these profits will be reflected in their stock price.

Question 4: Does retail choice in electricity require an ISO/RTO?

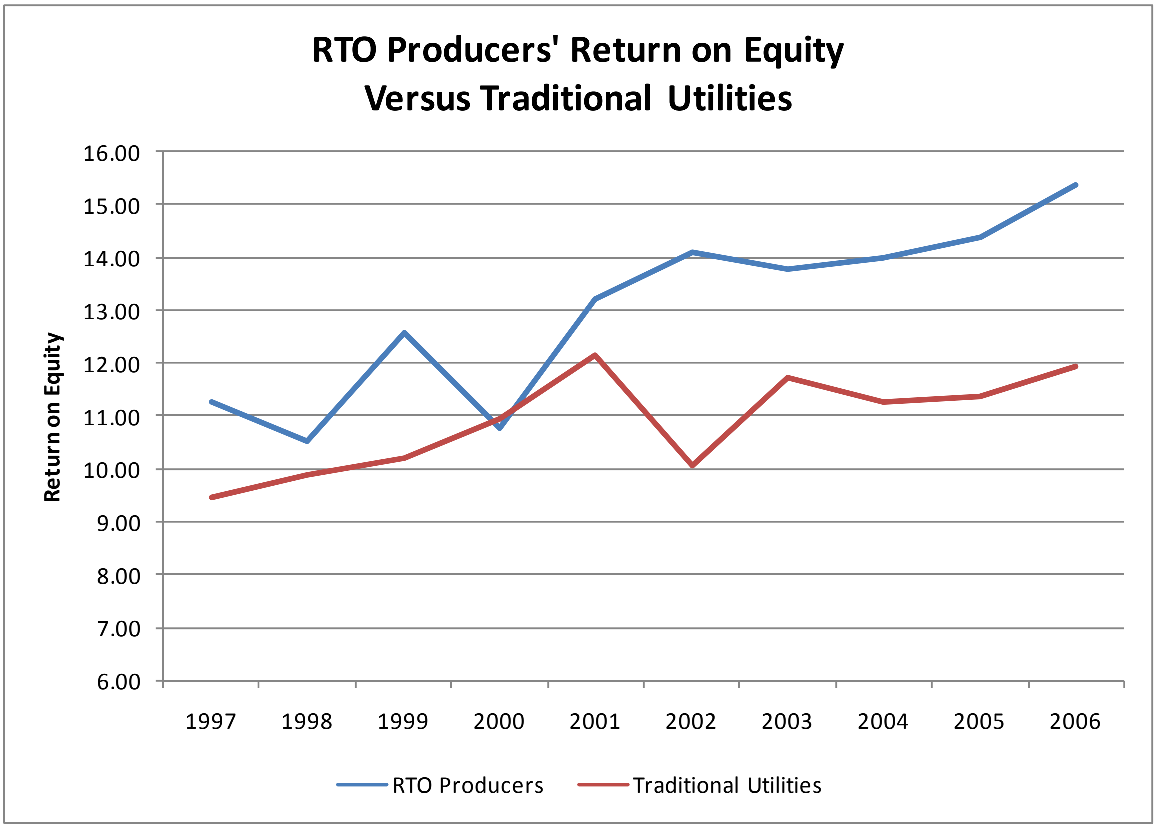
The answer to this question is no. The successful deregulation of natural gas in the 1980s took place without a central administrative agency to apportion transportation and set prices. Large natural gas customers today have a wide choice of suppliers. The market does not require a big brother setting prices and allocating transmission.

The American Public Power Association recently tabled a "Day 1" proposal designed to reduce the scope of the nation's RTOs to critical reliability assignments. This would have the impact of returning RTO-administered markets to the open marketplace. Streamlining the role of RTOs would have no impact on retail choice.

Question 5: Who is profiting from the replacement of open markets by administered markets?

A relatively small set of firms have profited from the change to administered markets. These include Exelon in Illinois, Public Service Electric and Gas, the former TXU, and Constellation. Although the situation is different company by company and state by state, a clear picture has emerged over the past five years:

[15] Leland Johnson, "The Theory of Hedging and Speculation in Commodity Futures," *Review of Economic Studies* (27), 1960, pp. 139-151.



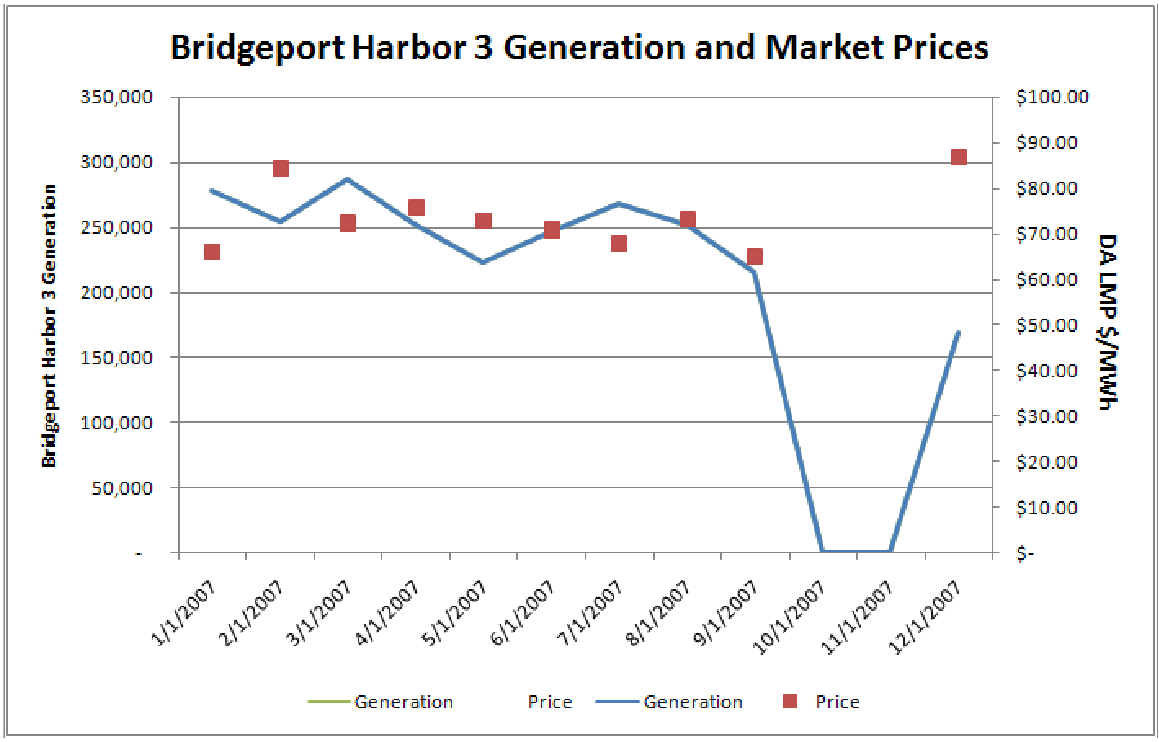
One important reason for their enhanced profitability has been the transfer of existing plants from regulated pricing to market pricing. In Connecticut, for example, two large baseload plants, Bridgeport Harbor and Millstone, have been able to command very high rates of profit. We note that financial reporting rules do not require depreciation, interest, and sales to be broken out by generating unit. The calculations below use standard sources such as SEC 10-K filings, data provided to FERC, the Environmental Protection Agency, and the Energy Information Administration, to build a picture of revenues and costs by generating unit.

Bridgeport Harbor 3

Bridgeport Harbor was sold in 1999 by United Illuminating as part of a package with New Haven for $272 million. Soon afterwards, its new owner Wisconsin Energy sold the units to NRG for $325 million. In the course of the NRG bankruptcy, the plants were then resold to PSEG Power for $220 million.

PSEG identified operating costs for the Bridgeport Harbor unit as $59,801,178 in its 2005 FERC Form 1. PSEG's 2007 10-K indicates that the coal for Bridgeport Harbor has been purchased under a fixed price contract, so it is logical that these costs, adjusted for generation and inflation, are relevant today.[16] As a cross check, the dispatch curve used by PSEG in its financial presentation closely matches the operating costs from PSEG's FERC Form 1.

Actual hourly operations at Bridgeport Harbor 3 are filed with the U.S. EPA. Day-ahead LMP values for Connecticut are available from the New England ISO. This is sufficient to give a good picture of Bridgeport Harbor 3's energy revenues:



We do not have information on the division of the purchase price of $220 million paid for Bridgeport Harbor and New Haven, so we conservatively assumed that the purchase price could be apportioned between New Haven and Bridgeport Harbor 3. With these assumptions, the 2007 profit before taxes for Bridgeport Harbor 3 was 256.37%.[17]

[16] 2007 PSEG 10-K, page 4.
[17] Profit calculations involve quantities that are not available on a per unit basis. In this case, the benchmark average interest rate and average depreciation rate for 2007 were taken from PSEG's 10-K. An assumed 50% debt equity ratio was also used.

Millstone 3

Millstone 3 revenues are estimated from generation data provided by the Energy Information Administration and prices from the New England ISO. Dominion owns 93.5% of Millstone 3. Since ownership of the unit is split between more than one owner, specific capital values are available from Dominion Resources' 10-K.[18]

	Bath County Pumped Storage Station	North Anna Power Station	Clover Power Station	Millstone Power Station(1)
(millions, except percentages)				
Ownership interest	60.0%	88.4%	50.0%	93.5%
Plant in service	$1,013	$2,053	$ 557	$ 791
Accumulated depreciation	(415)	(998)	(141)	(141)
Nuclear fuel	—	457	—	253
Accumulated amortization of nuclear fuel	—	(356)	—	(162)
Plant under construction	10	110	1	55

Assuming the entire unit was financed at Dominion's average interest rate, the interest cost would be 5.3%.[19] Depreciation was assumed to be equal to Dominion's average rate from its 10-K. With these assumptions, the profit before tax in 2007 for Millstone 3 was 110.05%.

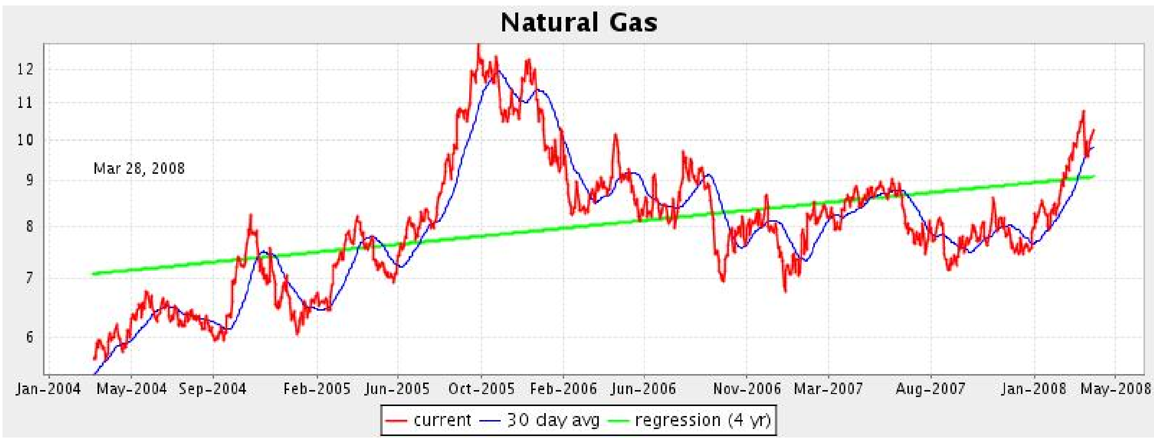
While these before-tax profits may appear high, they are a logical outcome of the low divestiture costs and current high market prices. Nothing in these high prices reflects negatively on the current owners who have operated efficiently in the open market – buying low and selling high. Economists have studied this particular problem for many years. The formal name for the surplus that accrues to inexpensive units is "producers' surplus". Traditional regulation retained the producers' surplus for ratepayers by restricting profits to an allowed return.

Question 6: Where is the next generation of electric capacity going to come from?

While many market participants continue to announce that the use of natural gas for the generation of electricity is likely to increase, the reality is that natural gas prices have followed oil prices. Over the past decade natural gas prices have increased by 500%. The eco-

[18] Dominion Resources 10-K, February 28, 2008, page 67.
[19] Dominion – 2008 Earnings Guidance Kit, January 30, 2008, page 23.

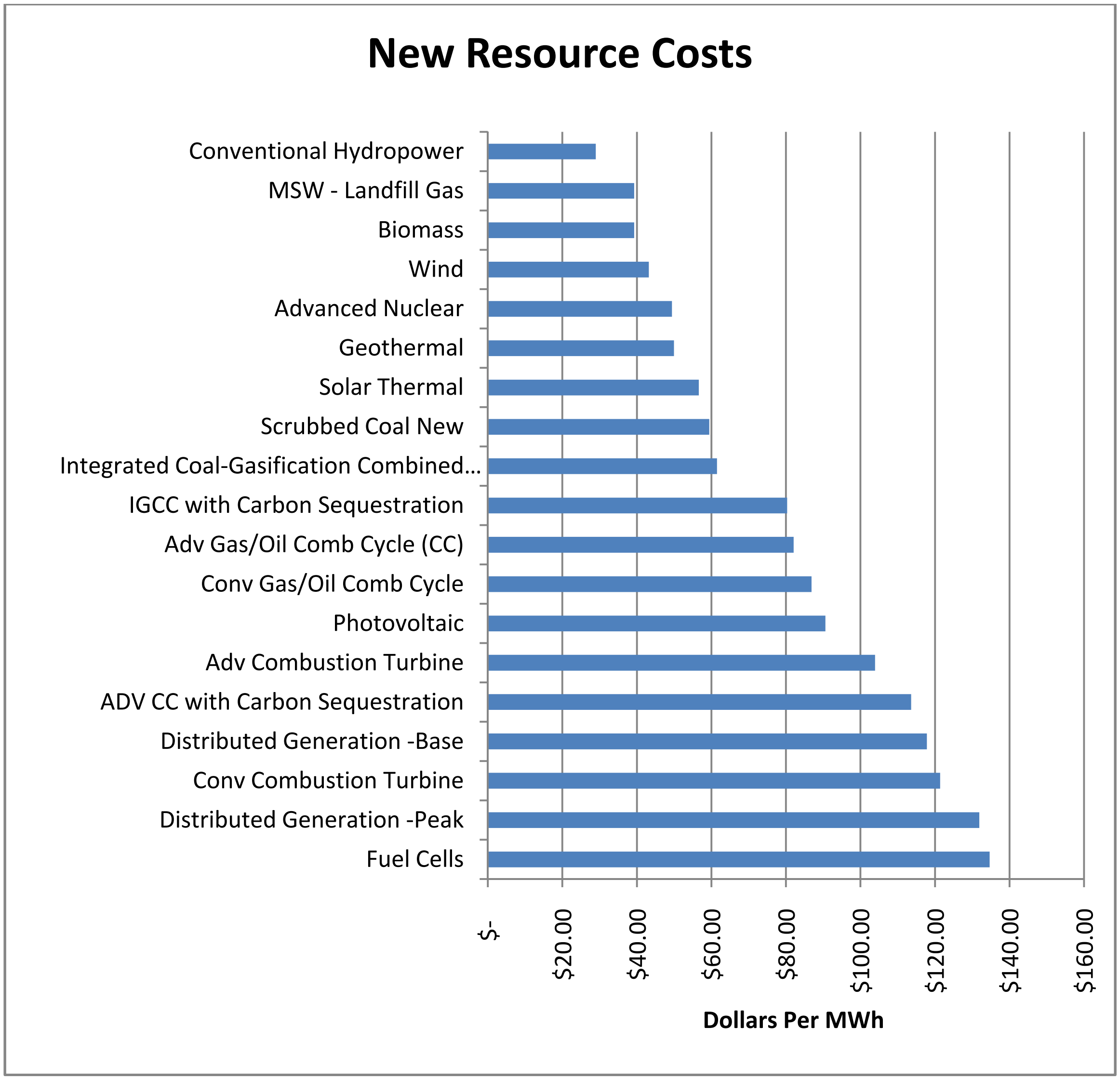
nomics of alternative generation options, coal, nuclear, and renewables, are now considerably more attractive.



An authoritative source for new generation costs are the most recent estimates from the U.S. Department of Energy's Energy Information Administration.

Technology	Online Year[1]	Size (mW)	Leadtimes (Years)	Base Overnight Costs in 2006 ($2005/kW)	Contingency Factors: Project Contingency Factor	Contingency Factors: Technological Optimism Factor[2]	Total Overnight Cost in 2006[3] (2005 $/kW)	Variable O&M[5] ($2005 mills/kWh)	Fixed O&M[5] ($2005/kW)	Heatrate in 2006 (Btu/kWhr)	Heatrate nth-of-a-kind (Btu/kWr)
Scrubbed Coal New[7]	2010	600	4	1,206	1.07	1.00	1,290	4.32	25.91	8,844	8,600
Integrated Coal-Gasification Combined Cycle (IGCC)[7]	2010	550	4	1,394	1.07	1.00	1,491	2.75	36.38	8,309	7,200
IGCC with Carbon Sequestration	2010	380	4	1,936	1.07	1.03	2,134	4.18	42.82	9,713	7,920
Conv Gas/Oil Comb Cycle	2009	250	3	574	1.05	1.00	603	1.94	11.75	7,163	6,800
Adv Gas/Oil Comb Cycle (CC)	2009	400	3	550	1.08	1.00	594	1.88	11.01	6,717	6,333
ADV CC with Carbon Sequestration	2010	400	3	1,055	1.08	1.04	1,185	2.77	18.72	8,547	7,493
Conv Combustion Turbine[5]	2008	160	2	400	1.05	1.00	420	3.36	11.40	10,807	10,450
Adv Combustion Turbine	2008	230	2	379	1.05	1.00	398	2.98	9.91	9,166	8,550
Fuel Cells	2009	10	3	3,913	1.05	1.10	4,520	45.09	5.32	7,873	6,960
Advanced Nuclear	2014	1350	6	1,802	1.10	1.05	2,081	0.47	63.88	10,400	10,400
Distributed Generation -Base	2009	2	3	818	1.05	1.00	859	6.70	15.08	9,500	8,900
Distributed Generation -Peak	2008	1	2	983	1.05	1.00	1,032	6.70	15.08	10,634	9,880
Biomass	2010	80	4	1,714	1.07	1.02	1,869	2.96	50.18	8,911	8,911
MSW - Landfill Gas	2009	30	3	1,491	1.07	1.00	1,595	0.01	107.50	13,648	13,648
Geothermal[6,7]	2010	50	4	1,790	1.05	1.00	1,880	0.00	154.92	36,025	30,641
Conventional Hydropower[6]	2010	500	4	1,364	1.10	1.00	1,500	3.30	13.14	10,107	10,107
Wind	2009	50	3	1,127	1.07	1.00	1,206	0.00	28.51	10,280	10,280
Solar Thermal[7]	2009	100	3	2,675	1.07	1.10	3,149	0.00	53.43	10,280	10,280
Photovoltaic[7]	2008	5	2	4,114	1.05	1.10	4,751	0.00	10.99	10,280	10,280

Capital costs vary dramatically between options. An environmentally friendly option, Integrated Gasification Combined Cycle (IGCC) with carbon sequestration, has capital costs twice as high than a comparable unit fueled by natural gas or oil. A key factor will be fuel costs. Natural gas now costs three times as much per mmbtu than coal. When fuel costs are factored in, coal units actually become less expensive than natural gas by a considerable margin. Using these prices and including today's cost for fuels gives the following:



While the news is generally good – renewables and U.S. coal are considerably less expensive than imported fossil fuels – it is also bad, since the least cost alternatives are all capital intensive. This poses a significant policy issue: how will these expensive units be financed? Clearly a nuclear unit whose life is measured in decades will not be built in response to a one-, two-, or three-year auction.

Question 7: Why should Connecticut know about what happened in Illinois?

Recent proposals in Connecticut would institute a similar approach to that which has recently failed in Illinois.

Illinois held a reverse price auction on August 6, 2006. The auction was controversial since similar auctions in New Jersey and Maryland had proved disappointing and the auction design was flawed. The basic approach was to auction the right to serve the vast majority of customers in Illinois in the course of a single combined session.

Illinois has two different market areas in two different RTOs. In both areas, FERC's market screening process had indicated the existence of market power. Market transactions between the Chicago area and central Illinois seldom occur. NERA Economic Consulting (NERA) and the Illinois Commerce Commission combined the two market areas, but restricted any one participant to 35% of the customers in each market area. Exelon, for example, held most of the generation in the Chicago area, but was restricted from winning more than 35% of the load in the Chicago area.

The auction was conducted under conditions of extreme secrecy. The Assistant Attorney General following the auction noted that auction participants were instructed to not identify their affiliation. While this might well have forestalled cooperative arrangements in a perfect world, the identities of the representatives were known even to the Assistant Attorney General.

The reverse auction took place over three days. The highest value product was dominated by Exelon. On the third day, several bidders abruptly left the auction, apparently in response to an infinitesimal change in prices.

The auction results were high. Even NERA estimated that the prices arrived at in the auction were 40% greater than contemporaneous forward prices on the NYMEX Northern Illinois market.

By any standard, the Herfindahl-Hirschman Index (HHI) for market concentration was very high in the auction. This, combined with the unusually high prices and the anomalies that occurred during the bidding, led the Illinois Attorney General to file for review at the Federal Energy Regulatory Commission.

Although a number of parties filed interesting claims attempting to explain the large differential between the auction results and market prices, the market participants quickly agreed to a $1 billion dollar refund from the auction prices. Unfortunately, for those of us who were active in the FERC complaint, the winning bidders settled before we could conduct discovery at FERC. By the conditions of the settlement most of the interesting facts are still not public.

As part of the negotiations, the auction process was abandoned and is being replaced by the creation of a state power authority that will pursue energy supplies in the future by negotiations. An intermediate solution until the authority is in operation took place last month where Ameren and Exelon purchased hedges against spot purchases. Interestingly, although the price of electricity has increased markedly over the past two years, the hedges came in at prices relatively close to the NYMEX Northern Illinois market prices.

Question 8: Where do complex "NERA" style auctions fit into the future supply picture?

In general, the results of these auctions have been disappointing. As noted above, the 2006 Illinois received supplies at approximately 40% more than contemporaneous bilateral prices. Similar auctions elsewhere have been 20% above comparable markets. While an extensive debate can take place (and has) concerning whether the high differential is defensible, the reality is that dispatch of bulk purchases for retail customers has traditionally been an inexpensive product and should not be significantly more expensive for procurement auctions than bilateral purchases.

There are nine primary reasons why such auctions have proved disappointing:

1. Lack of Transparency: Bidders argue for secrecy on a variety of grounds ranging from national security to protection against antitrust. Ironically, the possible victims of collusion are not among those calling for secrecy.
2. Scale: Auctions on a statewide basis place customers at a disadvantage since the huge block of demand faces a relatively small market.
3. Market Power: Lack of transmission and high levels of concentration often leave very few suppliers in an enviable position.
4. Unduly Short-Term Purchases: Most customers, both residential and commercial, make relatively long-term decisions which are poorly served by short-term supplies. Short-term auctions also pose a barrier to entry to new suppliers that cannot hope to recoup capital investments over relatively short periods.
5. Poor Product Design: Products defined poorly find few counterparties – a result that raises prices.
6. Poor Market Definition: When the geographic area served by the auction is arbitrary, possible bidders will find entry difficult or impossible.
7. Collusion: While the lack of transparency is often designed to discourage collusion, the simple reality is that colluding bidders can simply exchange information

outside the auction mechanisms. As the auction mechanics became more opaque and complex, opportunities for collusion increase significantly.

8. Signaling: "Ascending" and "Descending" auctions offer multiple steps which provide ample opportunities for bidders to allocate markets even without explicit collusion.
9. Type of Auction: While "ascending" and "descending" auctions normally have similar characteristics, the exception occurs when information is asymmetric: the dominant bidders have vastly more information than other bidders.

Dr. LaCasse, the administrator of the reverse auctions in Pennsylvania, Illinois, and New Jersey has said:

> In this article, I develop a simple bidding model in which collusion is endogenous. Buyers at a first-price sealed-bid auction decide whether to rig their bids given that they face the threat of government prosecution. A legal authority chooses whether to investigate the buyers on the basis of the bids tendered. In the unique sequential equilibrium of the game, buyers rig their bids with positive probability, but the legal authority can never ascertain, on the basis of the bids alone, that a conspiracy has formed.[20]

Her dissertation and other articles have addressed the economics of collusion in the context of auctions.[21] Her studies have indicated that collusion is a reasonable strategy in many cases:

> These results imply that, if a cartel forms, it will have no difficulty maintaining its collusive agreement. The first part of the thesis investigates when agents choose to collude given the benefits of collusion (cooperative payoffs dominate non-cooperative payoffs) and its cost (agents risk government prosecution). We choose the context of a simple bidding model. Buyers at a first price sealed-bid auction decide whether to collude and decide on a bidding strategy. The government can decide to investigate the bidders based on the price fetched by the object. The sequential equilibrium of this one-shot game is semi-separating. Bidders choose to collude with some positive probability. A high winning bid implies that the bidders were acting non-cooperatively; a low winning bid could have been submitted by a cartel or by non-cooperative buyers. The probability of collusion is monotonically decreasing in the number of players.[22]

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[20] "Bid Rigging and the Threat of Government Prosecution," Chantale LaCasse, *RAND Journal of Economics,* Autumn 1995, page 398.

[21] "Collusive Pricing With Incomplete Information," dissertation, Chantale LaCasse, 1991.

[22] Ibid. pages iii-iv.

In general, collusion is a common problem often addressed in the study of auctions. It is also generally understood that "ascending" auctions, a term of art that includes auctions where intermediate results are announced by the auctioneer as opposed to sealed-bid auctions, are more susceptible to collusion. The textbook on auction theory by Paul Klemperer notes:

> The general conclusion is that ascending auctions are more susceptible to collusion, and this is particularly the case when, as in our example, many auctions of different car models and different consumers are taking place simultaneously.[23]

He continues:

> So collusion in an ascending auction seems much easier to sustain than in an "ordinary" industrial market, and it should therefore be no surprise that ascending auctions provide some particularly clear examples of collusion, as we illustrate below.
>
> By contrast, a first-price sealed-bid auction is usually much more robust to collusion: bidders cannot "exchange views" through their bids, or observe opponents' bids until after the auction is over, or punish defection from any agreement during the course of the auction, or easily deter entry. But, perhaps because auction theorists have little that is new or exciting to say about collusion, too little attention has been given to this elementary issue in practical applications.[24]

As a general rule, the worst possible auction is one where signaling and punishment can occur outside of the public view. This was the unfortunate case in the notably unsuccessful Illinois reverse auction in 2006. One auction theorist once remarked, that "Multi-unit ascending auctions may be viewed as a negotiation between bidders on how to divide the available quantity."[25]

The auction was a reverse ascending auction where "reverse" meant that prices were lowered at each stage until the quantities bid were comparable to those available, and "ascending" meant that bidding took place in succeeding rounds. At the end of the auction, prices were approximately 40% higher than those in contemporaneous forward markets, and the dominant bidder, Exelon, procured 95% of the most valuable rights to serve customers. Since the auction was selling the rights to serve customers, high prices favored bidders.

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[23] *Auctions: Theory and Practice,* Paul Kemperer, Princeton University Press, 2004, page 86.
[24] Ibid. page 136.
[25] "The Ascending Auction Paradox," Lawrence M. Ausubel and Jesse A. Schwartz, July 5, 1999, page 15.

Each of the nine factors cited above contributed to the disappointing results.

Transparency
The most important issue must be transparency. Real-world markets are characterized by high degrees of transparency. Your decision to purchase a house takes place in a market where the prices are subject to open outcry. You can discover the price of houses by asking. Transactions are public and prices are freely posted. Imagine a process for buying a house where the vendors are secret, the prices are secret, and the outcome (and your house) is known to you only at the end of the auction. Even if you were assured that the sellers were highly ethical, if you ended up paying 40% more than the market prices quoted elsewhere, you might fear that some degree of collusion had occurred.

In Illinois, every step was made to avoid bidders communicating within the auction itself. The two parties conducting the auction, state regulators and NERA, agreed to these stringent conditions. Their own review of the results was largely limited by lack of transparency.

Scale
The scale of a statewide auction poses a second problem. At 25,000 megawatts, the Illinois auction was limited by overall capacity and transmission limitations to a select set of bidders. The adoption of an arbitrary limit on successful bids by a single bidder (approximately one third) neglected to recognize the fact that since the dominant bidders controlled much of the generation required to meet the needs in Illinois, other bidders would need to purchase the rights to the generation from the dominant bidders in order to compete with them. This led to a form of "musical chairs" where transactions were simply allocated among the players.

Scale also causes an extreme asymmetry in information among bidders. In Illinois, Exelon owned a large block of generation that would not have been bidden because of the auction's restrictions *unless* a side transaction took place with another bidder. In practice this meant that Exelon had information about the costs of a significant block of competing bids. The choice of a reverse auction exacerbates the scale problem by informing the dominant bidder of the size of the bidding pool at the outset of the auction.

Market Power
The electricity business was founded originally in urban areas and in a time when the U.S. did not have strong regional interconnections. As larger utilities formed over the last century, it was common for them to exercise market power over their service territories. FERC created RTOs to address this situation by making transmission open to all market participants. While the success of this experiment is still open to debate, the RTO mechanisms to address market power are ultimately limited by physical constraints. When one party controls a predominance of the generation in an area and few alternatives are available through transmission of power from other areas, open access transmission policies will not offset market power.

Short-Term Auctions
Given the scale of the recent auctions and the absence of transmission to bring in currently existing alternatives, the only real competition would have come from new generation. The length of the auctions is usually three years or less. Thus any new generation would be forced to finance a project based on a contract for only the first three years of its life. Given the high capital cost of new generation, competition will increase only if an auction allows bidders to make bids with longer terms, allowing them to finance their projects in the normal capital markets.

Poor Product Design
The Illinois auction sold products that comprised the right to serve an approximate 50-megawatt block of Illinois customer load if the load had not chosen another supplier. For large, sophisticated bidders, risk management devices exist to offset some of the problems with the purchase of a right to serve an uncertain load.

Matias Negrete-Pincetic and George Gross offer an interesting perspective on why more mobile loads received higher prices in the Illinois auction.[26] They argue that the ability of industrial loads to find alternative suppliers made purchase of a right to serve their remaining load less attractive. Since it was less attractive, there was less competition to meet it and the prices were higher.

Poor Market Definition
In Illinois, the auction simply combined two different markets with very different characteristics. This is similar to the inclusion of Maine in the transition capacity charge in the New England ISO even though its characteristics differ from the other states.

Collusion
As several of Dr. LaCasse's papers show, collusion is a reasonable solution in many auctions. In Illinois there was a reasonable body of evidence that collusion had occurred. As with the Enron, El Paso, Reliant, and Sempra investigations of previous years, the initial evidence would have been followed up by reviewing trading records, bilateral contracts, and trader tape recordings. Instead, the parties that were implicated quickly settled for a massive refund to Illinois ratepayers.

Kemperer's textbook makes the point that collusion is a central issue in auction design regardless of the form used.[27] His review of a large number of auctions, however, tends to

[26] "Lessons from the 2006 Illinois Electricity Auction," Matias Negrete-Pincetic and George Gross, 2007 iREP Symposium - Bulk Power System Dynamics and Control - VII, Revitalizing Operational Reliability, August 19-24, 2007, Charleston, South Carolina.
[27] *Auctions: Theory and Practice,* page 153. The term "ascending" is meant to mean auctions with sequential bids – including both Dutch and English auctions.

highlight ascending auctions (meaning sequential bid auctions) as particularly susceptible to collusion:

> An important consequence is that choosing an ascending auction is often a mistake for an auctioneer. Ascending auctions allow bidders to use the early rounds to signal to each other how they might "collusively" divide the spoils and, if necessary, use later rounds to punish any rivals who fail to cooperate. Ascending auctions can also deter entry into the bidding since a weaker potential bidder knows that a stronger bidder can always rebid to top any bid he makes.[28]

Enforcement against collusion has been particularly weak in electricity markets. Current legal debate concerns whether these markets are even subject to antitrust review. Several important cases have found that the filed rate doctrine has shifted antitrust enforcement from state authorities to FERC. To add to the problem, while several individuals involved in market manipulation have been prosecuted by the U.S. Department of Justice, the penalties have tended to continue the bias against severe punishment for white-collar criminals.

Signaling

The close of the Illinois auction was marked by the sudden withdrawal of several bidders in response to trivial changes in price. While the identity of the departing bidder was not made public, the sudden drop in the number of bids made verification of any collusive arrangements much easier. Signaling in electricity auctions was a problem long before Illinois. Enron, for example, used $990/MWh as a price signal in its market manipulations, a practice in use today. The ease with which auction data can be used for signaling is one of the reasons why some theorists prefer sealed price bids.

Type of Auction

In electricity auctions the choice of a reverse auction has one clear drawback. Given the issues with scale, market definition, and market power described above, the real question faced by colluding bidders is the number of competitors and their appetite for competition.

The first bid in a reverse auction defines the universe of potential competitors. If the number is large – as it is for seniors in high school applying to Yale University – collusion is unlikely. If it is small – as it is for electricity auctions – the value of collusion may be very large. Imagine if seniors seeking admittance to Yale knew in advance how many students were seeking admittance. If the number was low compared to the number of students to be admitted, a thriving market would soon surface where lower-ranking students would purchase their seats from higher-ranking students. This would be viewed as an unethical outcome.

[28] Ibid. page 152.

In Illinois, Exelon received a very important piece of information from the first round of the reverse auction which was that its market dominance would not be challenged by any of the other bidders. If the number of bids had vastly exceeded its expectations, Exelon could have reverted to a competitive strategy. Since the number of bids was not large, the utility knew that it could follow its strategy of dominating the high values components of the auction.

Conclusion

The Illinois auction is a case where poor design accentuated the non-competitive underlying conditions. Concentration was high, prices were high, and few new competitors emerged. A popular saying is that the devil is in the details and another says that the road to hell is paved with good intentions. In Illinois, the road was paved by many well-intentioned and poorly understood details. When market power is present, and especially when exacerbated by limited transmission access from other regions, a reverse or Dutch auction has a serious disadvantage. The dominant bidder(s) receive a significant advantage on the first round of the auction by learning whether their dominance is likely to be challenged. This is exactly the wrong answer for the highly concentrated and poorly regulated bulk power electric market. If a sequential auction is preferred, ratepayers will be far better served by keeping the dominant bidders in doubt whether their dominance will be challenged and forcing them to bid competitively as long as possible.

Question 9: Is a state power authority a good alternative?

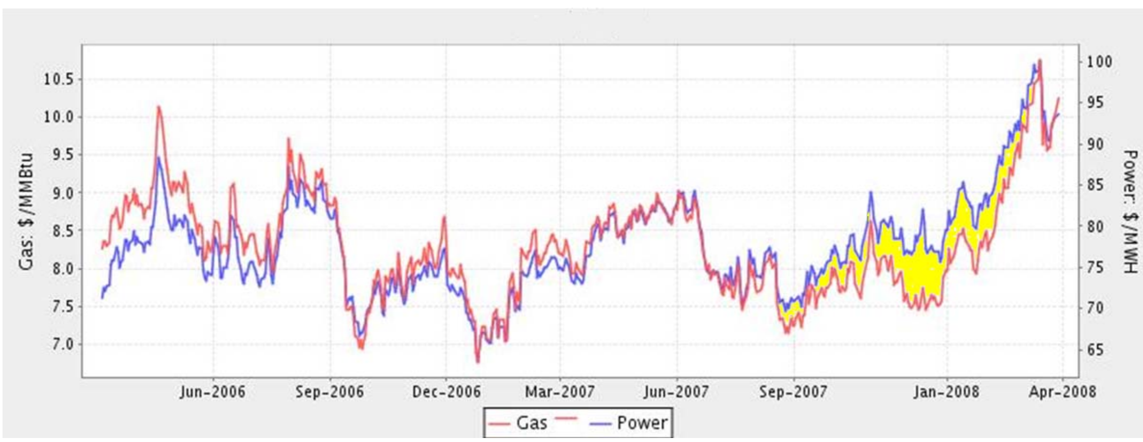
The electric industry moved to the "cost plus" regulatory scheme in the early days of the last century in order to finance the enormous costs of new generation. This regulatory model dominated the industry until the 1980s. The problem that "cost plus" regulation was designed to solve is the same problem that we face today: high fuel costs have shifted our choice in electric generating stations from those with low capital costs to those with high capital costs. The traditional regulatory model used the broad base of ratepayer credit to allow cost effective funding of high capital projects. Under restructuring legislation currently in place, this is not a viable option since ratepayers may change suppliers at choice. The state power authority has the ability to finance new plants either by outright ownership or by long-term contracts. Since renewable resources are likely to be high capital cost options, this may be the only short term solution to adding these options to the resource mix in Connecticut.

Question 10: What is going to happen next?

We can look towards the coming presidential election as a window to enact federal legislation that will repair some of the worst abuses – lack of transparency, lack of effective enforcement, and effective anti-trust measures – but it is unlikely that Congress will have either the will or the authority to simply make the problems go away.

In the short run we can expect that continuing market problems will lead to higher prices compared to fuel costs. For example, this winter we saw a very effective "corner" of the PJM electric markets – unnoticed by either FERC or the PJM market monitors.

The following chart shows the relationship between a one year electric strip in PJM and a comparable one year strip for natural gas. The shaded area is an unexplained increase in PJM forward prices that began in September and ended in March. Electric consumers who purchased a one year strip over that period paid considerably more for electricity than can be explained by natural gas prices.



This is the same pattern we saw in the Amaranth natural gas hedge fund's market manipulations eighteen months ago: logical market relationships diverge for periods due to large positions in the largely unregulated forward markets. While the shaded area looks small on the chart, it reflects billions of dollars in transactions.

New England also faces exposure to the new capacity markets. The indications from PJM are that these prices will be very, very high and that there will be little competition between suppliers. Since these capacity charges are largely a transfer between electric consumers and the owners of existing generation, the 2010 capacity auction is likely to be a considerable shock for Connecticut.

Generation alternatives will make Connecticut markets more competitive, but the financing of these alternatives is currently very challenging. If Connecticut is going to see lower cost alternatives, it will have to put the alternatives in place today.