

October 12, 2005

Staff Report



**GULF COAST STORMS EXACERBATE
TIGHT NATURAL GAS SUPPLIES;
ALREADY HIGH PRICES DRIVEN HIGHER**



FEDERAL ENERGY REGULATORY COMMISSION

Summary

The pump was primed for significant energy price effects well before Hurricanes Katrina and Rita hit the Gulf Coast production areas in September. The Gulf storms exacerbated already tight supply and demand conditions, increasing prices for fuels in the United States further after steady upward pressure on prices throughout the summer of 2005. Most of this was due to increased electric generation demand for natural gas caused by years of investment in gas-fired generation and a significantly warmer-than-average summer. Supply showed some weakness despite increasing numbers of active drilling rigs. The result was broadly higher energy prices (see Table 1).

Natural gas prices rose most significantly, but continued to reflect normal historical patterns of moving between the prices for residual and distillate fuel oil based on apparent scarcity. Prices for electricity also increased due to rising fuel costs and the hot summer. Measured in national average cooling degree days (CDDs), the three core summer months (June, July, August and September) were 26 percent hotter than in 2004, which was closer to average. The higher prices were consistent with the potential for summer price increases noted last spring in staff's *2005 Summer Energy Market Assessment* (presented May 4, 2005).

Then Hurricanes Katrina and Rita shut down many offshore gas platforms, onshore refineries and gas processing plants, albeit with different patterns of disruption. Hurricane Katrina led to an immediate rise in natural gas prices to as high as \$12.69/MMBtu at Henry Hub, followed by a decline to \$11.03/MMBtu by September 11 as it became clear that damage was less severe than initially feared. Hurricane Rita has led to continuing upward price pressures as the full extent of damage becomes clear. After prices reached \$15.22/MMBtu immediately after Rita, Henry Hub was out-of-service until October 4, 2005, removing a key national benchmark for natural gas prices during an important period.

Forward prices for natural gas and electric power have reached record-high levels. New York Mercantile Exchange (NYMEX) natural gas futures for January 2006 delivery ended September at \$13.90/MMBtu at Henry Hub. Further, the NYMEX ClearPort basis swaps for New York City delivery reached \$8.27/MMBtu on October 3, 2005. Traded forward electric price swaps reached over \$190/MWh for on-peak January deliveries in New York City and New England.

Table 1
Summer 2005 Prices of Energy Products

	Spring 2005 <i>(4/5 - 4/9)</i>	Summer before Hurricanes <i>(8/22-8/27)</i>		Summer after Hurricanes <i>(9/26-9/30)</i>	
	<u>Average Price</u>	<u>Average Price</u>	% Change to <u>Prior Price</u>	<u>Average Price</u>	% Change to <u>Prior Price</u>
Natural Gas (Henry Hub*)	\$7.39 /MMBtu	\$9.81 /MMBtu	33%	\$14.10 /MMBtu	44%
Natural Gas (Transco Zone 6 NY)	\$7.96 /MMBtu	\$10.39 /MMBtu	31%	\$14.90 /MMBtu	43%
Crude Oil (West Texas)	\$9.40 /MMBtu	\$11.42 /MMBtu	21%	\$11.39 /MMBtu	0%
Heating Oil (New York)	\$11.97 /MMBtu	\$13.33 /MMBtu	11%	\$15.15 /MMBtu	14%
Residual Oil (NY .3% Sulfur)	\$7.47 /MMBtu	\$9.58 /MMBtu	28%	\$12.71 /MMBtu	33%
Coal (Powder River Basin)	\$26.50 /Ton	\$30.70 /Ton	16%	\$33.10 /Ton	8%
Coal (Central Appalachian)	\$60.60 /Ton	\$58.30 /Ton	-4%	\$59.10 /Ton	1%

* Texas Eastern East Louisiana point substituted for Henry Hub when it was out of service due to flooding.
Source: Platts *Gas Daily* and Bloomberg

Summer 2005 Energy Price Review: Gulf Storms Exacerbate Tight Natural Gas Supplies; Already High Prices Driven Higher

Natural Gas Markets

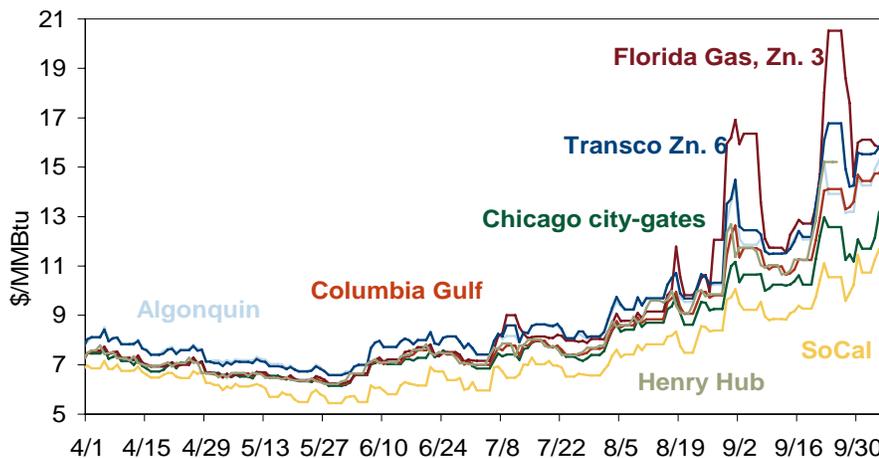
Natural gas prices rose throughout the summer, reflecting rising oil prices, unusually high demand for gas-fired electric power and lagging gas supply additions. Price increases were not uniform across the country (see Figure 1):

- Natural gas prices rose in the West less than in the East due to relatively cooler weather and improved access to newer Wyoming gas supplies through recently expanded pipeline systems.
- Immediately in the wake of the hurricanes, Florida prices rose to the highest levels in the nation, reflecting delivery infrastructure disruptions due to the hurricanes themselves.
- Forward markets implied the likelihood of increasing price differences between producing regions and the Northeast, suggesting that market participants are concerned about the adequacy of transportation infrastructure to that region for the winter.

Natural Gas Supply Forces

Much of the increase in natural gas prices came from tight supplies. Even before the hurricanes, the market was responding to declines in domestic production and reduced imports of liquefied natural gas (LNG).

Figure 1
Price Responses to Gulf Hurricanes Differed by Region
(August 1 through October 7, 2005)



Note: Due to a *force majeure* declaration by Sabine Pipeline, operator of the Henry Hub, index publishers have not reported after Sept. 25, 2005.

Source: Staff analysis of *Gas Daily* data as of Oct. 3, 2005.

Declining Gas Production

According to Lippman Consulting, domestic production of natural gas has fallen by about one percent (389 MMcfd) between the summer of 2003 and the summer of 2005.¹ Production has declined despite increases in natural gas exploration and development. The rotary rig count rose 30 percent during the same period.² Cambridge Energy Research Associates (CERA) projects that increases in LNG receipts and net pipeline imports will not offset domestic gas production declines and natural gas storage withdrawals. CERA forecasts that overall gas supply for the United States will fall 0.2 percent for 2005 from 59.62 Bcfd in 2004.³

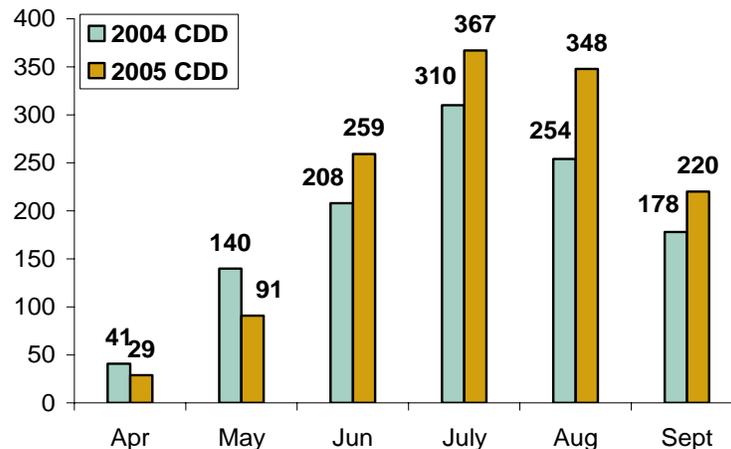
Summer LNG Imports Declined Despite Higher North American Gas Prices

The United States imported 45 Bcf (or 13 percent) less LNG during the period from April through September in 2005 than in 2004.⁴ During August prior to Hurricane Katrina, U.S. imports were almost 600 MMcfd lower than for the comparable period in 2004. The United States competes with other nations for spot LNG shipments, and often higher LNG prices in other countries drew away spot supplies.

Demand Forces

The summer of 2005 was abnormally hot. The National Climatic Data Center (NCDC) reports that during the critical period between June and August, cooling degree days (CDDs) increased 26 percent compared to 2004 (see Figure 2).⁵

Figure 2
June through August 2005 Was Significantly Hotter than 2004



Source: Staff analysis of National Weather Service, Climate Prediction Center, as of Sept. 30, 2005.

¹ Lippman Consulting, Inc., "U.S. Wellhead Production Report," October 2005.

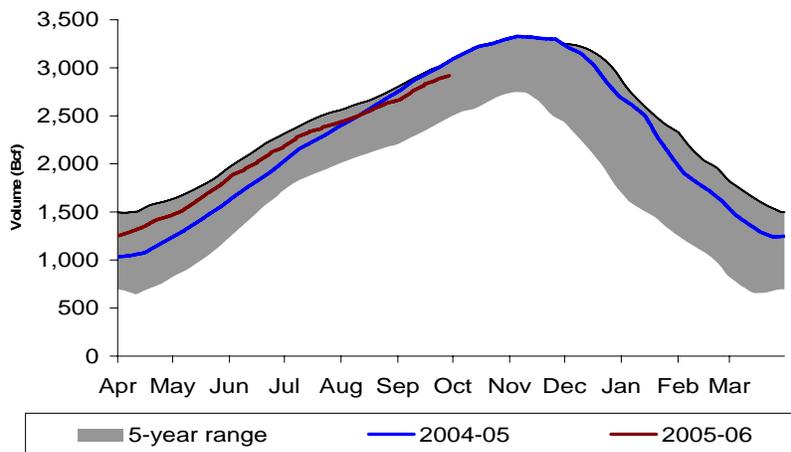
² Baker Hughes, Inc.

³ CERA, Monthly Gas Briefing, "A Band of Uncertainty," Table 9. Lower-48 Gas Supply/Demand Summary, September 20, 2005. Staff analysis of Table 9.

⁴ U.S. Waterborne LNG Report, Sept. 29, 2005.

⁵ National Weather Service, Climatic Prediction Center, on-line degree day statistics.

Figure 3
Surplus Natural Gas Storage Inventories
Fell Through Summer 2005



Source: Staff analysis; derived from EIA *Historical Weekly Storage Estimates Database*, *Weekly Natural Gas Storage Report* data through the week ending Sept. 30, 2005.

Starting in June, increased air conditioning demand increased the use of gas-fired electric generation. At the end of May, year-to-date net generation by gas-fired generators was 0.4 percent below the 2004 level; by the end of July, it was 7.1 percent higher. In July, natural gas consumption by gas-fired generators was 25 percent higher than in July 2004.⁶

Natural Gas Supply/Demand Balance

The closest-to-real-time measure of the active balance of supply and demand is natural gas inventories in storage. At the beginning of summer 2005, natural gas storage inventories were high compared with earlier years. That initial storage surplus dropped throughout the summer (see Figure 3). As reported by the Energy Information Administration, effective May 27, working gas inventories were 1,778 Bcf, or 20.6 percent (304 Bcf) above the five-year average.⁷ For the week ending September 30, national storage inventories exceeded the five-year average by 40 Bcf, or 151 Bcf lower than the comparable week in 2004. Storage inventories differ by region, with relatively high inventories in the West and low in the eastern consuming areas. Hurricanes Katrina and Rita have reduced (sometimes eliminated) injections into production area storage, but the full effects are not yet clear.

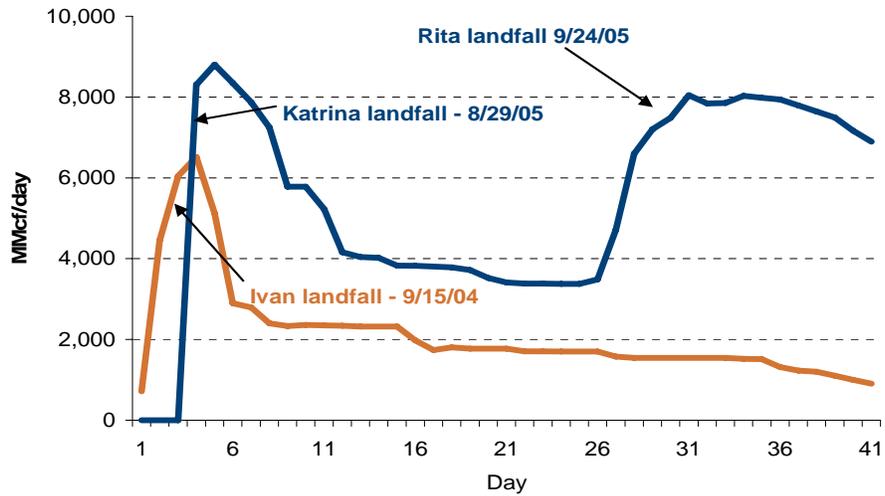
Effects of Hurricanes Katrina and Rita

Hurricane Katrina resulted in the immediate loss of 8.3 Bcfd of gas production, significantly more than Hurricane Ivan in 2004 (see Figure 4 on the next page). About 66 percent of Gulf production was back on line before Hurricane Rita struck. Hurricane Rita increased outages greatly, and recovery has been slower. The hurricanes not only reduced

⁶ EIA, *Monthly Flash Estimates of Electric Power Data*, tables 3.1 and 3.2, September 2005 edition.

⁷ EIA, *Weekly Natural Gas Storage Reports* and staff analysis.

Figure 4
Hurricanes Katrina and Rita Cut Gulf Production
More than 2004's Hurricane Ivan



Source: Staff analysis of MMS data.

natural gas production but also damaged pipeline and gas processing infrastructure and electric power supply along with oil production and refineries. The effects on natural gas markets were both to increase prices (and price volatility) and to reduce market activity.

Price Effects

Hurricane Katrina produced a sharp increase in prices followed by a moderate decline as the industry found that damage was less severe than initially feared. Overall, Henry Hub spot prices increased to \$12.69/MMBtu.⁸ The futures contract for September delivery reached a final expiration price of \$10.85/MMBtu.⁹ Hurricane Rita again raised daily prices later in September as high as \$15.22/MMBtu at the Henry Hub before it was closed due to flooding and prices no longer published.¹⁰ Forward prices have reached very high levels, as we will discuss in a later section.

Trading Operations and Liquidity

After Katrina hit the Gulf Coast on Monday, August 29, the last trading day for the September natural gas futures contract, Henry Hub deliveries were not possible due to physical outages. Price volatility increased in the futures markets as traders scrambled to reduce their exposures. Physical deliveries under the September contract were the lowest since 1992.¹¹ Again after Hurricane Rita, Henry Hub was physically unavailable due to flooding. NYMEX adjusted delivery of the September and October natural gas contracts to make up for the Henry Hub

⁸ *Gas Daily*, Sept. 1, 2005

⁹ *Gas Daily*, Aug. 30, 2005.

¹⁰ *Gas Daily*, Sept. 23, 2005

¹¹ Physical deliveries are contemplated under NYMEX's natural gas futures contract, but are not the norm. Source is a staff conversation with CFTC staff.

interruption. Uncertainty engendered by physical outages at Henry Hub appeared to contribute to unusually volatile trading on September 28, the last trading day for the October contract.

The IntercontinentalExchange (ICE) reported that trading volumes at key points such as Henry Hub and Transco Station 65 declined markedly with the onset of Hurricane Katrina, but then resumed more normal levels. However, trading volumes reported at other Gulf points – such as Sonat and Florida Gas Transmission Zone 3 – remain depressed. These points took some time to fully recover due to upstream gas processing outages and flow disruptions on interconnecting pipelines. Henry Hub resumed trading on ICE on October 7, 2005.

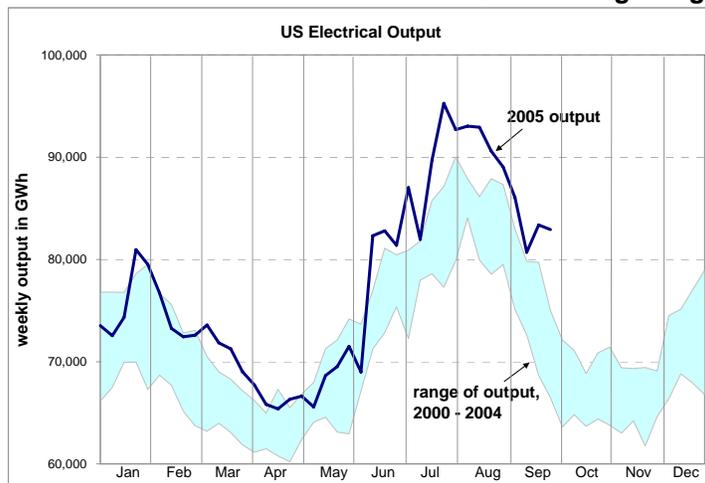
Electricity Markets

Overall, electricity prices have been significantly higher in 2005 than in 2004. Through early September, year-to-date prices in NYISO averaged \$79/MWh versus \$59 at the same time last year; in PJM, \$64 versus \$50; at Cinergy, \$57 versus \$39; and at Palo Verde, \$58 versus \$44.¹²

Electricity prices rose through the summer in response to higher demand and higher fuel costs. Hot weather prevailed in many regions, especially in the East. From April 1 through mid-September, CDDs were 39 percent above average in the Mid-Atlantic and 42 percent above average in the Northeast. As a result, generation in June, July and August far outpaced recent history (see Figure 5) and peak demand set many new records (see Table 2 on the next page).

Rising levels of peak demand highlight a continuing need for upgrades to the electric infrastructure in some regions, most prominently the Northeast and California.

Figure 5
Electric Generation Increased with Heat from June through August, 2005



Source: Staff analysis of data from Edison Electric Institute, *Weekly Electrical Output*. Excludes data from Alaska and Hawaii.

¹² Prices given are for peak hours (typically Monday through Friday, 7 a.m. through 11 p.m.) Off-peak prices rose roughly 50 to 100 percent in the East and Midwest and 10 to 25 percent in the West.

Table 2
Electric Systems Reached New Demand Peaks in 2005

Region	New Peak MW (date)	Previous Peak MW (date)
New England (ISO-NE)	26,921 (7/27/05), 26,760 (7/19/05)	25,348 (8/02)
New York (NYISO)	32,075 (7/26/05), 31,741 (7/19/05)	30,982 (8/01)
Mid Atlantic/Central (PJM)	135,000 (7/26/05), 130,574 (7/18/05)	[n/a]
Midwest (MISO)	131,434 (8/3/05), 131,188 (8/2/05)	[n/a]
South Central (SPP)	38,852 (7/22/05), 38,612 (7/21/05)	38,321 (8/03)
Texas (ERCOT)	60,279 (8/23/05)	60,095 (8/03)
Southern California (SCE)	21,110 (7/20/05)	20,762 (9/04)

Source: ISO-NE, NYISO, PJM, MISO, SPP, ERCOT, press reports.

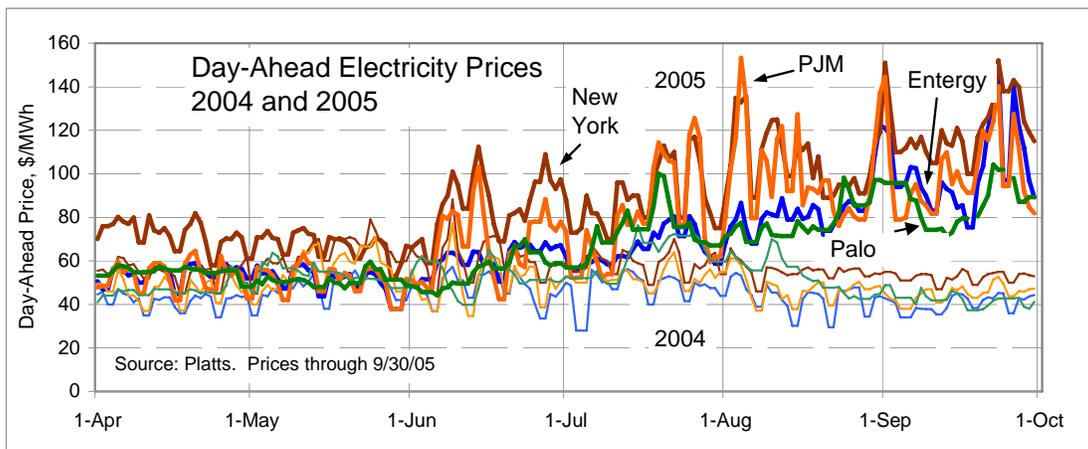
Rising fuel prices, especially for natural gas, contributed to higher electricity prices. Fuel costs affected prices most strongly in eastern regions because they have substantial gas- and oil-fired generation and higher locational fuel premiums, but electricity prices in all regions ended the summer well above year-ago levels (see Figure 6).

Effects of Hurricanes Katrina and Rita on Electricity

Hurricane Katrina caused significant electric system damage in Florida and unprecedented destruction in Mississippi and Louisiana. Just after landfall on the Gulf Coast, 2.7 million customers were without power. Hurricane Rita struck Louisiana and Texas and left 1.5 million customers without power, including about 200,000 not yet restored from Katrina.¹³

The hurricanes' effects on natural gas prices flowed through to electric markets, especially in the East. For example, in the two weeks after Katrina struck, New England bilateral power prices averaged 21 percent higher than the prior two weeks. Western prices also rose, but less steeply, reflecting the lower price of gas in the West.

Figure 6
Electric Generation Increased with Heat from June through August 2005



Source: Staff analysis of Platts *Megawatt Daily*, PJM, NYISO data. Prices are for peak hours.

¹³ DOE, Office of Electricity Delivery and Energy Reliability, *Gulf Coast Hurricanes Situation Reports*, Sept. 22 – 25, 2005.

Implications for Winter Energy Prices

Conditions that affected energy markets this summer are likely to continue to affect winter markets. Forward prices for key fuels have risen, partly because of concern about storage inventories, especially for natural gas. In turn, forward power prices increased to over \$200/MWh in the Northeast and well over \$100/MWh elsewhere before falling slightly in October.

Natural Gas Supply and Futures Prices

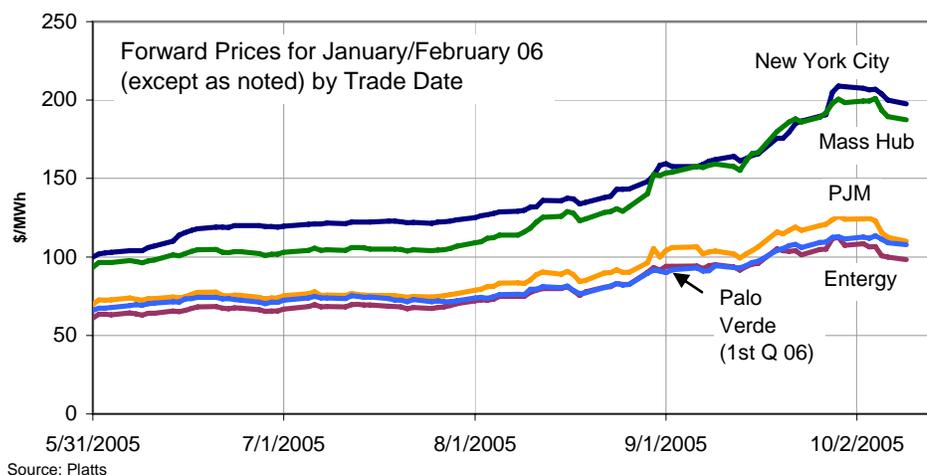
Hurricanes Katrina and Rita will have a lasting effect on natural gas prices. As of October 6, more than 6.4 Bcfd of Federal offshore natural gas remained shut-in due to damage to wells, platforms, pipelines and gas processing facilities.¹⁴ Re-opening processing plants is particularly important; 15 facilities constituting 10.1 Bcfd of capacity remain closed as a result of the hurricanes.¹⁵

Currently, spot prices in the United States are significantly higher than in Europe (although winter forward prices are similar), leading some analysts to believe that the United States may be able to attract additional LNG imports away from Europe this fall.¹⁶ The Lake Charles terminal in Louisiana has the capacity to accommodate additional LNG cargoes. While the ship-turning basin at Lake Charles was initially littered with hurricane detritus, clean-up was quick and the first post-hurricane shipments began to arrive in early October

Price Implications for Electricity

Winter power prices may be much higher than last year. Forward power prices for winter have risen all summer and are now at historic highs (see Figure 7).

Figure 7
January/February 2006 Forward Electricity Prices
Reflect Fuel Price Expectations for the Winter



¹⁴ *Dow Jones News Wire*, MMS: Further Improvement in Reported Oil, Gas Output, October 6, 2005

¹⁵ *Gas Daily*, Oct. 3, 2005

¹⁶ *Natural Gas Intelligence*, Sept. 12, 2005, 7-8.

Price increases are likely to be greater in the Northeast. A January/February forward contract for New England was about \$75 higher than one for PJM on September 30; on June 1 the difference was about \$24. This increased differential may reflect regional concerns about deliverability of natural gas through the winter. Scarcity premiums for natural gas also may cause winter price spikes in the Northeast, as they have for the last three years. Such spikes will be more likely (and perhaps higher) if gas supply interruptions remain severe or if winter weather is colder than normal.

Electric power prices in the Northeast will be driven more by natural gas prices than by availability of electric generation. Lower winter loads reduce system demands, lower congestion costs and make the use of scarcity pricing unlikely. Still, electric price spikes resulting from gas price spikes are possible and could be aggravated by strains that extremely cold weather can put on the electric systems. The Northeast also faces a continuing need for infrastructure upgrades (for example, into southwest Connecticut), without which the transmission system is more vulnerable to strain.

FERC will soon release its *Winter Energy Market Assessment, 2005-06*, which will review prospects for winter prices in more detail.

Appendix:

Summer 2005 Northeastern Electricity Price Issues

Electric markets in New York and New England have faced unusual challenges during 2005 because of both hot weather and particular features of their markets.

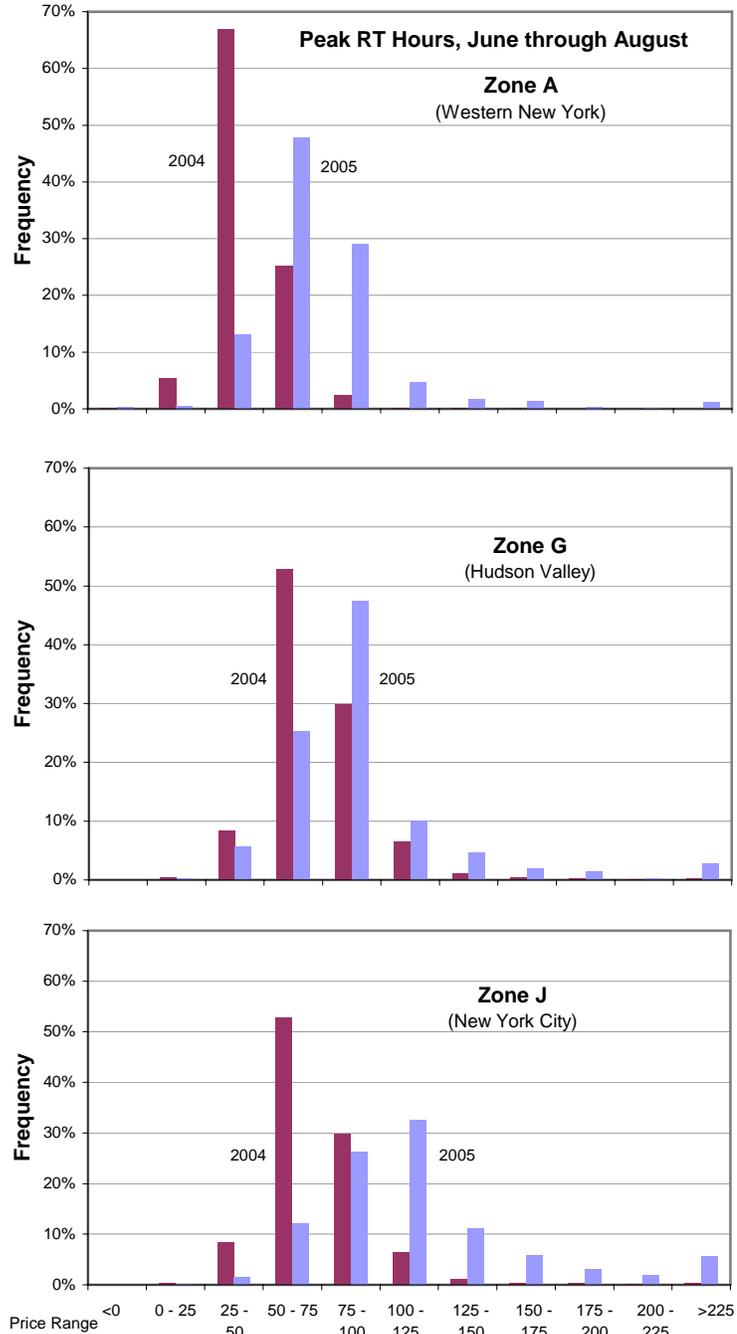
New York

The New York Independent System Operator (NYISO) used its demand curve for reserves for about 12 percent of the hours in its real time market during the summer of 2005. It had never been used before. These administrative price premiums apply when operating reserves are close to or below required levels. The price premiums ranged from negligible to about \$250/MWh.¹⁷

Very high real-time market prices were more common in 2005 than in 2004 (see Figure 8). The reserve demand curve, higher loads and higher overall price levels were likely causes.

¹⁷ Reserve demand premiums vary by product and location and often affect prices for less than one hour, so it's difficult to accurately measure their total price effect.

Figure 8
Peak Electricity Prices in the New York ISO



Source: Staff analysis of NY-ISO data.

New York also saw a few very high or very low real-time prices that resulted from software errors. NYISO subsequently corrected these prices. Finally, load forecasting errors caused a few high negative prices before the forecast software was adjusted to take into account earlier system performance.¹⁸

New England

Real-time prices were high during times of high loads and constrained resources. The NEMA/Boston (Northeast Massachusetts plus Boston) zone price reached \$1,467/MWh for one hour on August 8 when a large generator in the zone went out of service. The NEMA/Boston price reached \$857/MWh during another hour two days later, in similar circumstances.

During 2005, congestion and uplift have increased substantially. Connecticut zone congestion averaged \$7.39/MWh this summer, compared to \$1.76 last summer. Congestion in the NEMA/Boston zone increased to \$4.43 from negative 17 cents.

Uplift costs for dispatching out-of-merit units totaled \$200 million through August, surpassing the 2004 total of \$169 million. Most of the uplift (71 percent) came from the real time market.

¹⁸ Source: NYISO discussions with staff. The real-time market handles about 3 percent of energy market volumes in New York. The day-ahead market handles about 50 percent of energy market volumes.