POTOMAC ECONOMICS

2009 STATE OF THE MARKET REPORT FOR THE ERCOT WHOLESALE ELECTRICITY MARKETS

POTOMAC ECONOMICS, LTD.

Independent Market Monitor for the
ERCOT Wholesale Market

July 2010

EXECUTIVE SUMMARY

A. Introduction

This report reviews and evaluates the outcomes of the ERCOT wholesale electricity markets in 2009, and is submitted to the Public Utility Commission of Texas ("PUCT") and the Electric Reliability Council of Texas ("ERCOT") pursuant to the requirement in Section 39.1515(h) of the Public Utility Regulatory Act. It includes assessments of the incentives provided by the current market rules and procedures, and analyses of the conduct of market participants. This report also assesses the effectiveness of the scarcity pricing mechanism pursuant to the provisions of PUCT Substantive Rule 25.505(g). Key findings in the report include the following:

- The average wholesale electricity price was $34.03 per MWh in 2009, which is 56 percent lower than the 2008 average price of $77.19 per MWh. This is the lowest annual average price experienced in the ERCOT wholesale market since 2002.

- All-in wholesale electricity prices for the ERCOT market in 2009 were lower than in the organized wholesale electricity markets in California, New England, the New York ISO, and the PJM Interconnection.

- Lower wholesale electricity prices provide benefits to consumers in the short-term. However, pricing outcomes in 2009 continued to inadequately reflect market conditions during times of operating reserve scarcity. During such shortage conditions when demand for energy and operating reserves cannot be met with available resources, prices should rise sharply to reflect the value of diminished reliability as reserves are used to meet energy needs. Although these shortage conditions occur in only a handful of hours each year, efficient shortage pricing is critical to the long-term success of the ERCOT energy-only market.

- As a result of inadequate shortage pricing and the fact that the number of shortage intervals in 2009 were roughly one-half of that experienced in 2008, estimated net revenues in 2009 were substantially below the levels required to support market entry for natural gas combined-cycle and combustion turbine resources at all locations in the ERCOT region. Estimated net revenues for nuclear and coal resources were also insufficient to support new entry in 2009, although these results were more affected by the reduction in natural gas prices and associated reduction in wholesale energy prices than by pricing outcomes during shortage conditions.

★ Ancillary service costs generally track wholesale energy price movements, and therefore were significantly lower in 2009 than in recent years.

★ Load participation in the responsive reserve market declined in late 2008 and in 2009 relative to prior years, likely as a result of general economic conditions.

★ Interzonal price disparities were larger in 2008 and 2009 than in prior years, primarily as a result of increased wind capacity in the West Zone and inefficiencies that are inherent to the zonal market design.

★ The number of hours in which coal was the marginal (*i.e.*, price-setting) fuel in the ERCOT region was much higher in 2009 than in prior years. This increase can be attributed to (1) increased wind resource production; (2) a slight reduction in demand in 2009 due to the economic downturn; and (3) periods when natural gas prices were very low thereby making coal and natural gas combined-cycle resources competitive from an economic dispatch standpoint.

★ The ERCOT wholesale market performed competitively in 2009, with the competitive performance measures showing a trend of increasing competitiveness over the period 2005 through 2009.

In addition to these key findings, the report generally confirms prior findings that the current market rules and procedures are resulting in systemic inefficiencies. Our previous reports regarding ERCOT electricity markets have included a number of recommendations designed to improve the performance of the current ERCOT markets.[1] Some of these recommendations have

[1] "ERCOT State of the Market Report 2003", Potomac Economics, August 2004 ("2003 SOM Report"); "2004 Assessment of the Operation of the ERCOT Wholesale Electricity Markets", Potomac Economics, November 2004; "ERCOT State of the Market Report 2004", Potomac Economics, July 2005 ("2004 SOM Report"); "ERCOT

been implemented. Given the approaching implementation of the nodal market design in December 2010, no additional recommendations for the current market design are offered at this time. In particular, implementation of the nodal market will provide the following improvements:

- ★ The nodal market design will fundamentally improve ERCOT's ability to efficiently manage transmission congestion, which is one of the most important functions in electricity markets.
- ★ The wholesale market should function more efficiently under the nodal market design by providing better incentives to market participants, facilitating more efficient commitment and dispatch of generation, and improving ERCOT's operational control of the system. The congestion on all transmission paths and facilities will be managed through market-based mechanisms in the nodal market. In contrast, under the current zonal market design, transmission congestion is most frequently resolved through non-transparent, non-market-based procedures.
- ★ Under the nodal market, unit-specific dispatch will allow ERCOT to more fully utilize generating resources than the current market, which frequently exhibits price spikes even when generating capacity is not fully utilized.
- ★ The nodal market will allow ERCOT to increase the economic and reliable utilization of scarce transmission resources well beyond that attainable in the zonal market.
- ★ The nodal market will significantly improve the ability to efficiently and reliably integrate the ever-growing quantities of intermittent resources, such as wind and solar generating facilities.
- ★ The nodal market will produce price signals that better indicate where new generation is most needed (and where it is not) for managing congestion and maintaining reliability.

State of the Market Report 2005", Potomac Economics, July 2006 ("2005 SOM Report"); "ERCOT State of the Market Report 2006", Potomac Economics, August 2007 ("2006 SOM Report"), "ERCOT State of the Market Report 2007", Potomac Economics, August 2008 ("2007 SOM Report"); and "ERCOT State of the Market Report 2008", Potomac Economics, August 2009 ("2008 SOM Report").

In the long-term, these enhancements to overall market efficiency should translate into substantial savings for consumers.

B. Review of Market Outcomes

1. Balancing Energy Prices

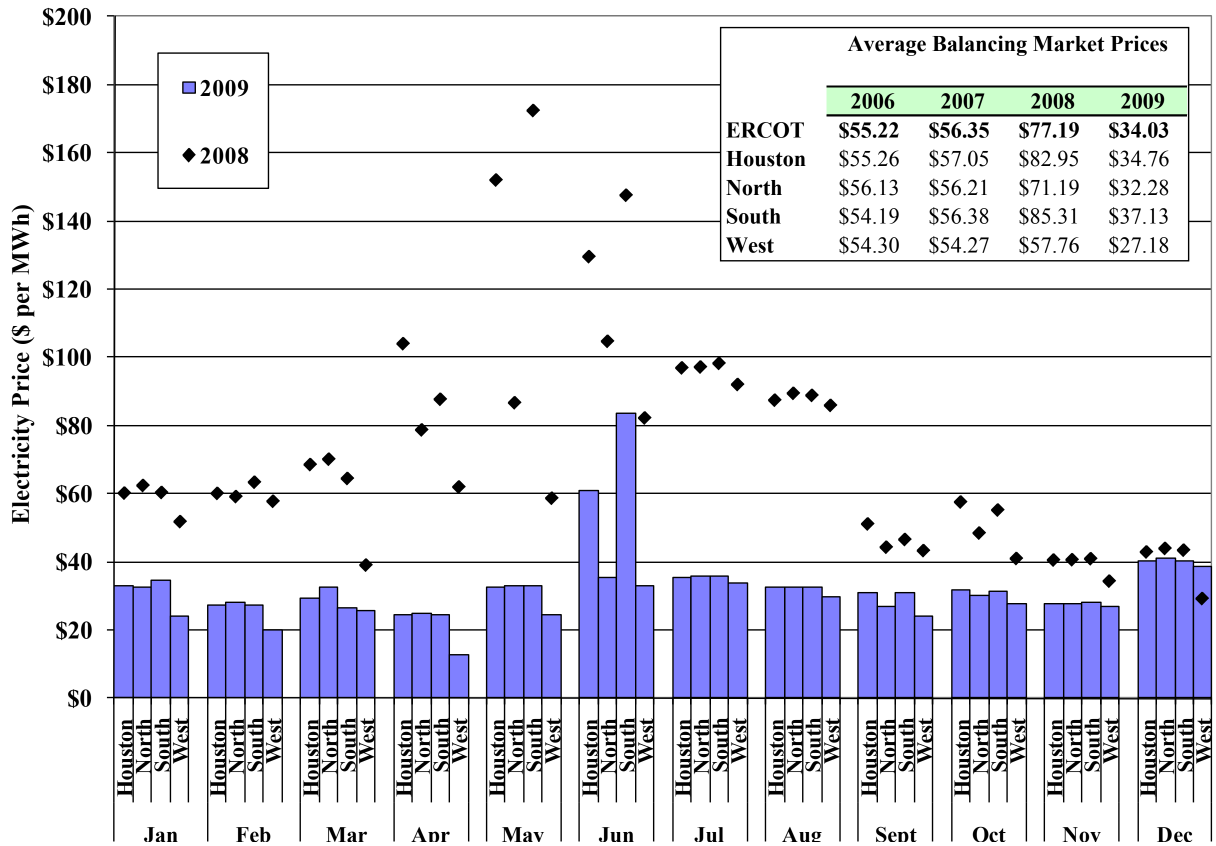
The balancing energy market allows participants to make real-time purchases and sales of energy to supplement their forward bilateral contracts. While on average only a relatively small portion of the electricity produced in ERCOT is cleared through the balancing energy market, its role is critical in the overall wholesale market. The balancing energy market governs real-time dispatch of generation by altering where energy is produced to: a) balance supply and demand; b) manage interzonal congestion, and c) displace higher-cost energy with lower-cost energy given the energy offers of the Qualify Scheduling Entities ("QSEs").

In addition, the balancing energy prices also provide a vital signal of the value of power for market participants entering into forward contracts. Although most power is purchased through forward contracts of varying duration, the spot prices emerging from the balancing energy market should directly affect forward contract prices.

As shown in the following figure, ERCOT average balancing energy market prices were 56 percent lower in 2009 than in 2008, with an ERCOT-wide load weighted average price of $34.03 per MWh in 2009 compared to $77.19 per MWh in 2008. April through August experienced the highest balancing energy market price reductions in 2009, averaging 66 percent lower than the prices in the same months in 2008. With the exception of the West Zone in December, the balancing energy prices in 2009 were lower in every month in all zones than in 2008.

The average natural gas price fell 56 percent in 2009, averaging $3.74 per MMBtu in 2009 compared to $8.50 per MMBtu in 2008. Natural gas prices reached a maximum monthly average of $12.37 per MMBtu in July 2008, and reached a minimum monthly average of $2.93 per MMBtu in September 2009. Hence, the changes in energy prices from 2008 to 2009 were largely a result of natural gas price movements.

Average Balancing Energy Market Prices

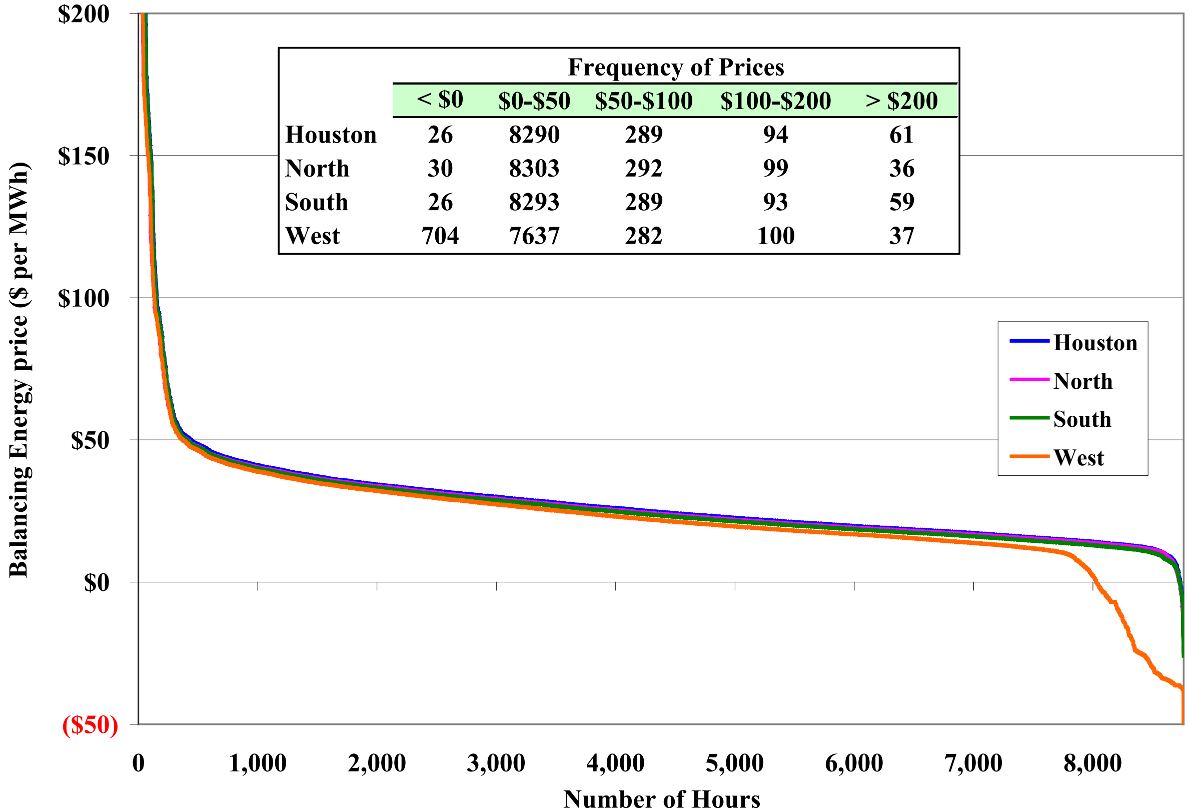


Average Balancing Market Prices

	2006	2007	2008	2009
ERCOT	**$55.22**	**$56.35**	**$77.19**	**$34.03**
Houston	$55.26	$57.05	$82.95	$34.76
North	$56.13	$56.21	$71.19	$32.28
South	$54.19	$56.38	$85.31	$37.13
West	$54.30	$54.27	$57.76	$27.18

The following figure shows the price duration curves for the ERCOT balancing energy market each year from 2006 to 2009. A price duration curve indicates the number of hours (shown on the horizontal axis) that the price is at or above a certain level (shown on the vertical axis). The prices in this figure are hourly load-weighted average prices for the ERCOT balancing energy market.

Figure 5: Zonal Price Duration Curves

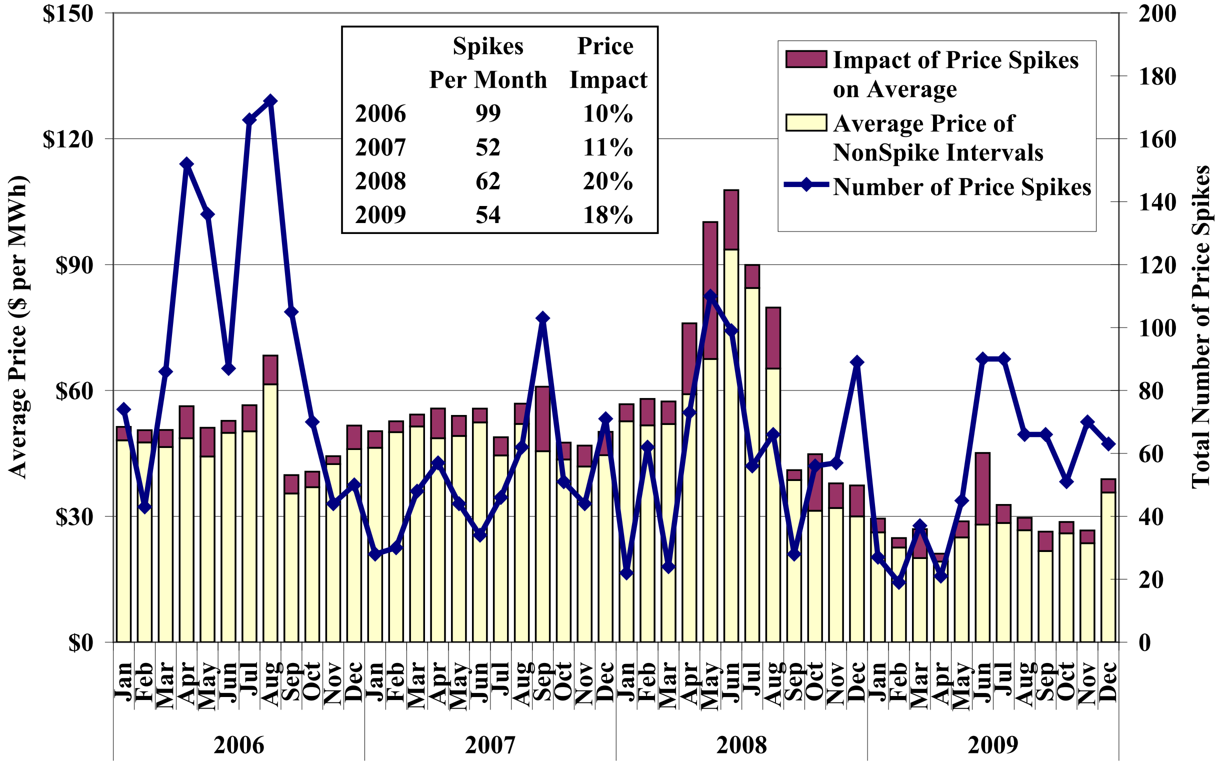


	< $0	$0-$50	$50-$100	$100-$200	> $200
Houston	26	8290	289	94	61
North	30	8303	292	99	36
South	26	8293	289	93	59
West	704	7637	282	100	37

Figure 5 shows the hourly average price duration curve for each of the four ERCOT zones in 2009 and that the Houston, North and South Zones had similar prices over the majority of hours in 2009. The price duration curve for the West Zone is generally lower than all other zones, with over 700 hours when the average hourly price was less than zero. These zonal price differences are caused by zonal transmission congestion, as discussed in more detail in Section III.

Other market factors that affect balancing energy prices occur in a subset of intervals, such as the extreme demand conditions that occur during the summer or when there is significant transmission congestion. Figure 4 shows that there were differences in balancing energy market prices between 2006 and 2009 at the highest price levels. For example, 2008 experienced considerably more occasions when prices spiked to greater than $300 per MWh than previous years. To better observe the effect of the highest-priced hours, the following analysis focuses on the frequency of price spikes in the balancing energy market from 2006 to 2009. Figure 6 shows average prices and the number of price spikes in each month of 2006 to 2009. In this case, price spikes are defined as intervals where the load-weighted average Market Clearing Price of Energy ("MCPE") in ERCOT is greater than 18 MMbtu per MWh times the prevailing natural gas price (a level that should exceed the marginal costs of virtually all of the on-line generators in ERCOT).

Figure 6: Average Balancing Energy Prices and Number of Price Spikes



	Spikes Per Month	Price Impact
2006	99	10%
2007	52	11%
2008	62	20%
2009	54	18%

The number of price spike intervals was 62 per month during 2008. The number decreased in 2009 to 54 per month. The highest frequency of price spikes occurred in June and July during 2008, caused by significant transmission congestion that ERCOT was inefficiently attempting to resolve by using zonal congestion management techniques.[11] The high number of price spikes during June 2009 was also the result of zonal congestion management actions, although for reasons different than in 2008, as discussed in Section III. Other months with a higher frequency of price spikes in 2009 – particularly in the months after May 2009 – can be attributed to the more frequent deployment of off-line, quick start gas turbines in the balancing energy market as a result of the implementation of PRR 776 in May 2009, as discussed in Section II. Off-line, quick start gas turbines typically have a marginal cost that is greater than the 18 MMBtu per MWh threshold used in Figure 6.

11 *See* 2008 ERCOT SOM Report, at 81-87.

To measure the impact of these price spikes on average price levels, the figure also shows the average prices with and without the price spike intervals. The top portions of the stacked bars show the impact of price spikes on monthly average price levels. The impact grows with the frequency of the price spikes, averaging $4.68, $5.30, $10.71 and $4.67 per MWh during 2006, 2007, 2008 and 2009, respectively. Even though price spikes account for a small portion of the total intervals, they have a significant impact on overall price levels.

Although fuel price fluctuations are the dominant factor driving electricity prices in the ERCOT wholesale market, fuel prices alone do not explain all of the price outcomes. Several other factors provided a meaningful contribution to price outcomes in 2009. These factors include (1) changes in peak demand and average energy consumption levels, as discussed in Section II; (2) changes in the frequency and magnitude of transmission congestion, as discussed in Section III; (3) the increased penetration of wind resources, as discussed in Sections II and III; (4) the effectiveness of the scarcity pricing mechanism, as discussed in Section II; and (5) the competitive performance of the wholesale market, as discussed in Section IV. Analyses in the next subsection adjust for natural gas price fluctuations to better highlight variations in electricity prices not related to fuel costs.

2. Balancing Energy Prices Adjusted for Fuel Price Changes

The pricing patterns shown in the prior subsection are driven to a large extent by changes in fuel prices, natural gas prices in particular. However, prices are influenced by a number of other factors as well. To clearly identify changes in electricity prices that are not driven by changes in natural gas prices, Figure 7 and Figure 8 show balancing energy prices adjusted to remove the effect of natural gas price fluctuations. The first chart shows a duration curve where the balancing energy price is replaced by the marginal heat rate that would be implied if natural gas were always on the margin. The *Implied Marginal Heat Rate* equals the *Balancing Energy Price* divided by the *Natural Gas Price*.[12] The second chart shows the same duration curves for the five percent of hours in each year with the highest implied heat rate. Both figures show duration curves for the implied marginal heat rate for 2006 to 2009.

12 This methodology implicitly assumes that electricity prices move in direct proportion to changes in natural gas prices.