



## 2007 State of the Market Report Midwest ISO

Prepared by:

Midwest ISO  
Independent Market Monitor

David B. Patton, Ph.D.  
Potomac Economics

May 2008

POTOMAC  
ECONOMICS

## Executive Summary: Introduction

- As the Independent Market Monitor (“IMM”) for the Midwest ISO, one of our roles is to evaluate the competitive performance, design, and operation of the wholesale electricity markets operated by the Midwest ISO.
  - ✓ This State of the Market report provides our annual evaluation of the Midwest ISO’s markets and our recommendations for future improvements.
- The Midwest ISO introduced competitive wholesale electricity markets on April 1, 2005. These markets include:
  - ✓ Day-ahead and real-time energy markets that produce transparent prices that vary by location to reflect the value of transmission congestion and losses; and
  - ✓ Financial Transmission Rights (“FTRs”) that allow participants to hedge congestion between various locations.
- These markets will soon be augmented by:
  - ✓ Operating Reserves and Regulation markets (known as Ancillary Services Markets or “ASM”) will be implemented in Fall 2008 that will optimize the allocation of the Midwest ISO’s resources between the ASM and Energy markets.
  - ✓ Clarified capacity requirements and enforcement mechanisms that will ensure long-run economic signals support adequate supply and demand resources.



## Executive Summary: Benefits of the Midwest ISO Energy Markets

The Midwest ISO markets produce substantial savings in the following areas.

- **Daily commitment of generation:** Coordinated commitment of generation through the day-ahead market produces savings relative to the prior decentralized system by:
  - ✓ Reducing the quantity of generation that is committed; and
  - ✓ Ensuring that the most economic generation is committed.
- **Efficient dispatch and congestion management:** Total dispatch costs are reduced by:
  - ✓ Producing energy from the most economic supply and demand resources;
  - ✓ Employing the lowest cost redispatch options to manage congestion; and
  - ✓ Much fuller utilization of the transmission capability in the region.
- **Reliability:** Reliability is improved because the 5-minute dispatch provides much more responsive and accurate control of power flows on the transmission system versus Transmission Line Loading Relief procedures (“TLR”) relied on previously.
- **Price Signals:** The prices produced by the energy market provide a transparent economic signal to guide short and long-run decisions by participants and regulators.

- 3 -

POTOMAC  
ECONOMICS



## Executive Summary: Review of Results

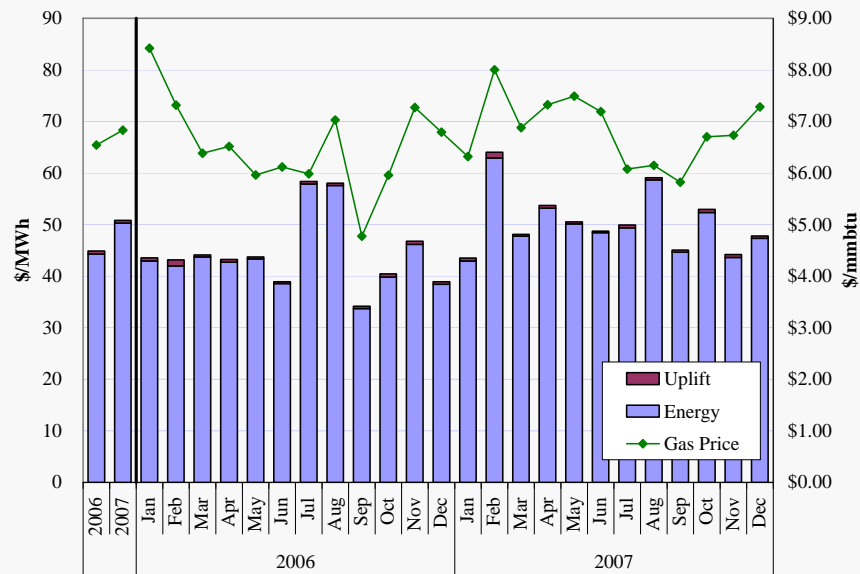
- The Midwest ISO energy markets performed competitively in 2007.
  - ✓ Although certain suppliers in the Midwest ISO have local market power, there was very little evidence of attempts to exercise market power in 2007.
  - ✓ Hence, mitigation measures were employed infrequently to address economic withholding that would have increased energy prices or uplift costs.
    - The most frequent mitigation occurred in Minnesota in a new Narrow Constrained Area (“NCA”) defined in January 2007.
- Higher fuel prices, played a primary role in the 13 percent increase in average energy prices in 2007 (see the following figure) and other rising costs, including:
  - ✓ A 26 percent increase in uplift costs associated with revenue sufficiency guarantee payments (“RSG”) that was due to higher fuel prices and increased commitment of peaking resources to manage congestion.
  - ✓ A 28 percent increase in congestion costs that was due to the increased redispatch costs caused by higher fuel prices and other factors discussed in the report.
- The remainder of this executive summary provides our assessment of the performance of the markets in 2007 and recommendations for improvements.

- 4 -

POTOMAC  
ECONOMICS



## All-In Price 2006 & 2007



Note: The All-In Price is computed by calculating a load-weighted average real-time energy price, plus a load-weighted real-time RSG allocation rate.

- 5 -



## Executive Summary: Long-Term Economic Signals

- In long-run equilibrium, the market should provide net revenues (revenue in excess of production costs) that create efficient incentives for investment and retirement.
- Based on our estimates of the annualized costs of new investment, the Midwest ISO markets would not support investment in gas turbines, but may support investment in combined cycle generation in the congested areas.
- These results are consistent with expectations because:
  - ✓ The Midwest ISO footprint has a small capacity surplus that contributed to no significant periods of shortage occurring in 2007.
  - ✓ The current markets do not fully price shortages when they occur because operating reserve shortages and interrupted load do not contribute to setting prices.
  - ✓ The ASM markets will improve shortage pricing and the Midwest ISO is working on other pricing changes to allow interruptible load to set prices.
- Changes being introduced to Module E of the Tariff should also improve the long-term market signals needed to maintain adequate resources by allowing a decentralized market to develop to meet the Midwest ISO's capacity requirements.

- 6 -



## Executive Summary: Generating Capacity and Reserve Margins

- Generating resources in the Midwest ISO market totaled almost 126 GW in 2007.
- The maximum capacity levels planners assume can be optimistic if all deratings are not fully reflected, particularly those that tend to occur under hot conditions.
- Reserve margins in 2008 are highly sensitive to the assumed maximum capacity levels and whether interruptible demand is included.
  - ✓ Reserve margins based on nameplate capacity levels indicates a substantial surplus.
  - ✓ When one removes the deratings and temperature sensitive capacity that may not be available at peak, the reserve margin for MISO ranges from 10 to 19 percent (the higher margin includes interruptible load). Margins are much tighter in the East and Central.
  - ✓ This indicates that real-time conditions may be relatively tight -- forced outages (avg. 5 percent) and operating reserves (3 percent) will utilize most of the remaining capacity surplus on generating units so that calling on interruptible load is likely.
- Although the system's resources are adequate for this summer, new resources will likely be needed soon. Hence, it is important for the market's economic signals that govern new investment and retirement decisions to be efficient.

- 7 -

POTOMAC  
ECONOMICS



## Development of Demand Response Resources

- Demand participation in the market is beneficial in many ways.
  - ✓ It contributes to reliability in the short-term, resource adequacy in the long-term, reduces price volatility and other market costs, and mitigates supplier market power.
  - ✓ Hence, the development of demand response in Midwest ISO should be a high priority.
- Demand can participate in the Midwest ISO markets currently in one of two ways:
  - ✓ Price responsive demand – reducing consumption as prices rise, but not dispatchable.
  - ✓ Demand response resources (“DRRs”) – dispatched like supply resources (must be dispatchable on a 5-minute basis).
- When all forms of demand response is included, the Midwest ISO has more than 8600 MW, or roughly 45 percent of the total demand response capability in all of the RTOs.
  - ✓ Most of this interruptible load was developed by utilities under regulated retail initiatives. In general, this load is curtailed for reliability and is not price-responsive.
- Midwest ISO has been working to facilitate the development of demand response by:
  - ✓ Allowing DR resources to sell ancillary services or energy, and satisfy the resource adequacy requirements.
  - ✓ Removing disincentives to the development of DRRs. (e.g., waiving the RSG costs to entities that stray from their economic dispatch level, setting efficient shortage prices).
  - ✓ Removing any technical barriers to the expansion of DRRs in the market.

- 8 -

POTOMAC  
ECONOMICS



## Executive Summary: Planned Market Improvements

The Midwest ISO is implementing a number of changes that will substantially improve the performance of the energy markets and the economic signals the markets provide.

- Midwest ISO is planning to introduce ancillary services markets in September 2008.
  - ✓ ASM will also set efficient prices in both markets to reflect the economic trade-offs between reserves and energy, particularly during shortage conditions.
  - ✓ ASM will also set efficient prices in both markets to reflect the economic trade-offs between reserves and energy, particularly during shortage conditions.
- Midwest ISO is completing its work to clarify the capacity requirements in Module E of the Tariff and take appropriate steps to enforce the requirements.
  - ✓ This will allow a decentralized contract market to develop for satisfying these capacity requirements.
  - ✓ These development of this market will improve the market signals that govern investment and retirement decisions.

- 9 -

POTOMAC  
ECONOMICS



## Summary of Recommendations

Although the markets have performed relatively well and will perform better with the implementation of ASM, we recommend the Midwest ISO consider the following changes.

*1. Continue its work to improve the management and pricing for demand response programs, including:*

- Developing centrally-coordinated demand response programs that allow DR resources to participate more fully in the energy and ancillary services markets; and
- Allowing the interruptible load and demand response resources to set energy prices in the real-time market when they are called on under shortage conditions.
- This will improve the incentive and opportunity for the development of new demand response, and allow the Midwest ISO to send more efficient long-term economic signals.

*2. Develop real-time software and market provisions that allow gas turbines running at their EcoMin or EcoMax to set the energy prices.*

- This change would improve the efficiency of the real-time prices, improve incentives to schedule load fully in the day-ahead market, and reduce RSG costs.
- To set prices correctly, the market must distinguish between GTs that are needed versus those that would be shut-down if they were flexible and dispatched optimally.
- The Midwest ISO has developed promising research in this area and should be in a position to test the practical feasibility of its approach later in 2008.

- 10 -

POTOMAC  
ECONOMICS



## Summary of Recommendations

3. *Develop a “look-ahead” capability in the real-time that would commit quick-starting gas turbines and better manage ramp capability on slow-ramping units.*
  - The MISO has made operational improvements in its commitment of peaking resources, but the commit of these units can be further improved by reliance on an economic model to commit the units.
  - Allowing the market to commit and de-commit the turbines would reduce the out-of-merit quantities, reduce RSG payments, and improve the ability of peaking resources to set the energy price.
4. *Replace the current ex-post pricing methodology with an approach that would simply utilize ex-ante prices corrected for metering or other errors.*
  - Ex-post pricing has never been shown either theoretically or empirically to improve the efficiency of real-time prices or the incentives of suppliers.
5. *Discontinue its constraint relaxation procedure and use the constraint penalty factor to set the LMPs when a transmission constraint is unmanageable.*
  - This will allow the prices to more efficiently reflect the overloaded constraint, particularly in cases when the relaxation procedure has caused the congestion to apparently disappear.
  - This is particularly important for low voltage and market-to-market constraints.



## Summary of Recommendations

6. *Allow generating resources with lower effects on a constraint to be redispatched (i.e., GSFs less than the current 2 percent cutoff).*
  - In addition to increasing the manageability of transmission constraints, this will tend to reduce price volatility by providing the market more redispatch options.
7. *Regarding the market-to-market process, we recommend the Midwest ISO consider:*
  - Adjusting the amount of relief each RTO requests from the other;
  - Instituting a process to more closely monitor the information being exchanged with PJM to quickly identify cases where the process is not operating correctly;
  - Optimizing the real-time net interchange between the two RTO areas; and
  - Developing a process to coordinate external transactions with non-MISO/PJM areas within the JOA.
8. *Regarding intra-hour imports and exports, we recommend the Midwest ISO consider:*
  - The feasibility of settling intra-hour transactions on at 15-minute basis; and
  - Limiting acceptance of such transactions based on its available capability to ramp internal generation up or down in support of the transaction.