APPENDIX R

2012 STATE OF THE MARKET REPORT FOR THE MISO ELECTRICITY MARKETS

Prepared by:

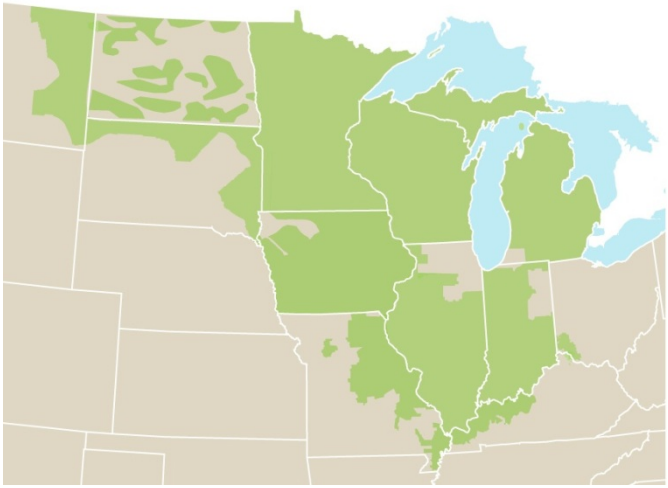
INDEPENDENT MARKET MONITOR FOR MISO

JUNE 2013

Executive Summary

As the Independent Market Monitor (IMM) for MISO, we evaluate the competitive performance and efficiency of MISO's wholesale electricity markets. This scope includes monitoring for attempts to exercise market power, identifying market design flaws or inefficiencies, and recommending improvements to the market design and operating procedures. This Executive Summary to the *2012 State of the Market Report* provides an overview of our assessment of the performance of the markets.

MISO operates competitive wholesale markets for energy, ancillary services, capacity, and financial transmission rights (FTRs) to satisfy the electricity needs of its market participants. These markets coordinate the commitment and dispatch of generation to ensure that resources are meeting the system's demands reliably and at the lowest cost.



The MISO markets also establish prices that reflect the marginal value of energy at each location on the network . These prices facilitate efficient actions by participants in the short term (e.g., resource dispatch and import/export scheduling) and efficient decisions in the long term (e.g., investment, retirement, and maintenance).

A. Competitive Performance of the Market

The MISO energy and ancillary service markets generally performed competitively in 2012. Conduct of suppliers was broadly consistent with expectations for a workably competitive market. Our analysis did not reveal substantial evidence of potential attempts to exercise market power or engage in market manipulation. The output gap, a measure of economic withholding, declined over the course of the year and averaged approximately 0.1 percent of actual load, which is extremely low. Consequently, market power mitigation measures were applied very infrequently.

B. Market Outcomes and Prices in 2012

Real-time energy prices in MISO averaged $28.56 per MWh, and ranged from $26 in the West region to $30 in the East. Prices were almost 14 percent lower than in 2011, which was due primarily to lower fuel prices. Western coal prices and natural gas prices both declined by more than 30 percent. The correlation between energy and natural gas prices is expected in a workably competitive market where natural gas-fired resources are often the marginal supply. In 2012, however, energy prices fell by substantially less than the decrease in fuel prices because the energy price reductions were offset by increases in the value of shortages during summer.

Although load declined slightly from 2011, unusually warm weather in July resulted in MISO setting successive all-time peaks, including 98.5 GW on July 23. MISO maintained reliability throughout this period, but experienced a number of operating reserve shortages that produced prices between $1,000 and $2,400 per MWh. Although high load and generator forced outages contributed to the shortages on many of these days, the report identifies the lack of coordinated interchange with PJM as the single most significant cause of the shortages in a number of cases.

Our net revenue analysis in this report shows that the MISO's economic signals would not support private investment in new resources, which is partly due to the modest capacity surplus that currently exists in MISO. However, we believe the economic signals would continue to be inadequate even under little or no surplus because of the shortcomings of MISO's current capacity market described in this report. This resource adequacy concern is likely to rise as environmental regulations, increasing wind output, and low natural gas prices accelerate the retirements of coal-fired resources in the medium term.

The value of real-time congestion in 2012 rose 5 percent to $1.30 billion. Normally, sharp declines in fuel prices as occurred in 2012 would lead to significant reductions in congestion. However, the fuel price changes were more than offset by the following two factors:

- MISO began more fully pricing its constraints when it disabled constraint relaxation on internal constraints in February. This was an essential change because it allowed these constraints to be priced at their full reliability value when they are violated.
- Congestion values increased in the West region where transmission derates and upgrades were most significant. Congestion on constraints from the West also persisted partly because of growing wind output in the West, which increased 30 percent to over 3.6 GW

per hour. Expansion of the DIR capability has greatly improved MISO's ability to manage this congestion and delivered substantial production cost savings.

Finally, ancillary services prices declined by 2 to 26 percent. The impact of lower fuel prices was greatest for regulating reserves. The effects of lower fuel prices on spinning and supplemental reserve prices were mostly offset by a substantial increase in operating reserve shortages. MISO's ancillary services markets continued to operate with no significant issues, and in 2012 and early 2013 successfully integrated several important market improvements. However, this report identifies a flaw in MISO's accounting of reserves that fails to recognize the reserves being provided during the period when a quick-start unit is starting.

C. Day-Ahead Market Performance

Convergence of energy prices between the day-ahead and real-time markets is important because day-ahead outcomes determine most resource commitments and are the basis for the payments to FTRs. Energy prices converged well in most months, exhibiting a day-ahead premium of less than two percent at the Indiana Hub after accounting for the real-time Revenue Sufficiency Guarantee (RSG) cost allocation (averaging $0.57 per MWh in 2012).

The market was less effective in arbitraging locational differences in some of MISO's more congested areas. This was most notable in the West region in spring, where several real-time events were unforeseen day-ahead. MISO has corrected an error in the allocation of congestion-related RSG to virtual transactions (which existed because of a previous FERC order) that should improve convergence in these areas. This report includes additional recommendations that should improve liquidity of the day-ahead market in these areas.

Scheduled virtual transactions rose 3 percent to 7.2 GW per hour. Approximately 40 percent of these transactions were price-insensitive (bid or offered to clear at any reasonable price), which are less valuable in providing liquidity in the day-ahead market. Two-thirds of these transactions are placed to establish an energy-neutral position (offsetting virtual supply and demand) between locations to arbitrage congestion-related price differences between the day-ahead and real-time markets. Incentives to engage in these transactions have increased since April 2011 when the RSG allocation methodology was modified to net participants' helping and harming deviations to determine who receives an allocation of the RSG costs. Harming deviations (e.g., virtual supply)

can cause MISO to commit additional resources in real time to satisfy the system demands. Hence, by clearing offsetting virtual supply and demand transactions, a participant will reduce its exposure to RSG charges. While we believe these balanced positions are valuable in improving the convergence of congestion patterns between the day-ahead and real-time market, we recommend MISO develop a virtual spread product that would allow participants to engage in this activity more efficiently.

D. Real-Time Market Performance and Uplift

Substantial volatility in real-time energy markets occurs because the demands of the system can change rapidly and because supply flexibility is restricted by the resources' physical limitations of the resources and the transmission network. In contrast, the day-ahead market is less volatile because it operates over a longer time horizon with more commitment options and liquidity provided by virtual transactions.

MISO operates a true five-minute real-time market, sending out new dispatch instructions and price signals every five minutes. As currently designed, the real-time market software is limited in its ability to "look ahead" and anticipate near-term needs.[1] As a result, the system is frequently "ramp-constrained" (i.e., generators are moving as quickly as they can up or down), which produces transitory price spikes.

Because settlements are based on hourly average prices, the MISO market includes price-volatility make-whole payments (PVMWP) to ensure that suppliers have the incentive to be flexible and are not harmed when they respond to MISO's dispatch instructions. PVMWP declined 25 percent from 2011 to $63.2 million, consistent with a comparable decline in price volatility. However, the report recommends that MISO make limited changes to the eligibility rules for PVMWPs to eliminate the ability for participants to receive unjustified payments. Ultimately, we find that suppliers' incentives would be substantially improved by moving to a five-minute settlement for generators and imports/exports from the current hourly real-time settlement.

1 However,. a Look-Ahead Commitment (LAC) was implemented in the second quarter of 2012 that improves the system's ability to commit and decommit fast-starting resources economically.

RSG payments are are made in both the day-ahead and real-time markets to ensure suppliers' offer costs are covered when a unit is dispatched. These costs tend to be much larger in real-time because most resource commitments for reliability occur in real time. Nominal real-time RSG payments declined 41 percent from 2011 because: (a) fuel prices were much lower; (b) load was more fully scheduled day ahead during most months (reducing MISO's need to commit peaking resources after the day-ahead market to satisfy incremental load); and (c) commitments for voltage support where shifted to the day-ahead market. FERC also approved Tariff revisions in September that included tighter mitigation measures for units committed for voltage support and more direct allocation of these costs.

Despite several improvements made over the past two years, the allocation of RSG costs remains substantially inconsistent with the causes of real-time RSG costs. For example, roughly 90 percent of real-time RSG costs are allocated to market-wide deviations, even though they cause only about half of these costs. This report includes recommendations to address these issues.

E. Resource Adequacy and Demand Response

Overall, our assessment indicates that the system's resources should be adequate for summer 2013 if the peak conditions are not substantially hotter than normal. Although MISO reports a planning reserve margin of 28.1 percent for the summer 2013, this margin falls to 16.9 percent if it includes only firm imports and more realistic assumptions regarding wind and demand response. This exceeds the minimum required planning margin of 14.2 percent and should be sufficient to cover MISO expected forced outages (which generally averages six to eight percent in the summer) and its operating reserve requirements of approximately 2.5 percent.

However, we also show that under "90/10" weather conditions in the summer (i.e., conditions that should occur only once every ten years), this margin will fall to less than 6 percent as load rises and temperature-related generator derates occur. At this level, MISO will have to rely relatively heavily on imports that are not contracted on a firm basis.

While the supply is likely adequate for the upcoming summer, the increased penetration of wind resources and new EPA regulations will put substantial economic pressure on baseload coal resources that should accelerate retirements and reduce planning reserve margins. MISO's analysis suggests that up to 12 GW of coal-fired capacity in MISO would be at risk of retirement

due to the compliance costs of these regulations, which could be even higher if low natural gas prices continue over the long term. This underscores the importance of MISO Resource Adequacy Construct (RAC).

MISO made several improvements to its RAC in 2012 that should improve the price signals for capacity. This includes the replacement of the Voluntary Capacity Auction (VCA) with an annual Planning Resource Auction (PRA) that features a zonal requirements for capacity. However, two significant shortcomings continue to undermine the efficiency of the RAC: (a) the representation of the demand for capacity in MISO's PRA and (b) the prevailing barriers to capacity trading between PJM and MISO. These issues contributed to MISO's VCA clearing at close to zero in every month of 2012, as well as in the first annual PRA conducted in April 2013.

The minimum capacity requirements and deficiency price in Module E establish a "vertical demand curve", which implicitly values incremental capacity above the minimum requirement at zero. This is inconsistent with its true reliability value to the system and results in inefficient capacity market outcomes. Hence, we continue to recommend MISO work with its stakeholders to develop a sloped demand curve that would recognize that incremental capacity above the minimum requirement has value (i.e., improves reliability). This change would allow prices to rise efficiently as capacity margins fall to accurately signal the value of capacity, which will be important for both new investors and for suppliers considering environmental retrofits.

Finally, we find that the capacity credit for wind resources and a large share of the demand response resources are likely overstated under MISO's current rules in Module E, which can contribute to understated capacity prices. The current capacity credit for wind is likely more than three times higher than a reasonably conservative capacity credit. Such a credit should be based on the minimum output level one could expect under peak summer conditions.

Finally, demand response is an important contributor to MISO's resource adequacy and provides a number of other benefits to the market. However, the amount of demand response participating in MISO demand response programs, including Emergency Demand Response (EDR) increased from 400 MW in 2010 to 1,500 MW. This is a significant change because it increases MISO's ability to utilize it when needed and to set prices efficiently when these resources are deployed. MISO continues to seek to expand its DR capability, including efforts to

allow for Batch Load DR and Price Responsive Demand. However, the RAC provides a key economic signal for the development of new demand response capability, so the improvements recommended for the RAC will facilitate efficient development of new DR resources.

F. Recommendations

Although the markets performed competitively in 2012, we recommend a number of improvements. Some of these recommendations were made in prior reports, which is not unexpected as many of them require both Tariff and software changes that can require years to implement.

MISO addressed a number of prior recommendations in 2012 and early 2013, which are discussed in the final section of this report. The following table shows our current recommendations, organized by the area of the market they address.

RECOMMENDATIONS 2012
Energy Pricing and Transmission Congestion
1. Develop provisions that allow non-dispatchable DR (including interruptible load and BTMG) to set energy prices in the real-time market.
2. Implement a five-minute real-time settlement for generation and external schedules.
3. Eliminate excess payments and excess charges to physical transactions that affect external constraints.
4. Improve external congestion processes by modifying how relief obligations are calculated and how the constraints are modeled in the real-time market. a. Base relief obligations on n*et* Market Flows, not gross forward flows. b. Cap MVL on external (non-M2M) flowgates.
5. Introduce a virtual spread product.
Guarantee Payment Eligibility Rules and Cost Allocation
6. Improve the allocation of real-time RSG costs to make it more closely aligned with causes of the costs by making the following changes: a. Net market-wide deviations to determine the share of the real-time RSG costs that should be allocated via the DDC rate. b. Allocate real-time RSG only to harming deviations (pre- and post-NDL). c. Eliminate the use of GSFs in determining costs that should be allocated via the CMC rate.

7. Implement improved eligibility requirements for PVMWPs a. Modify eligibility requirements to address gaming issues. b. Correct the mitigation rule governing authority over PVMWP and RSG eligibility.
8. Improve the efficiency of reserve scheduling by eliminating guarantee payments to deployed spinning reserves.
9. Modify the mitigation measures to allow the definition of a "dynamic NCA" that is utilized only when network conditions exist that create substantial market power.
Improve Dispatch Efficiency and Real-Time Market Operations
10. Develop a look-ahead real-time dispatch capability to efficiently satisfy the system's anticipated ramp demands.
11. Implement a ramp capability product to address unanticipated ramp demands.
12. Implement changes to more effectively identify and remedy units not following dispatch. a. Develop enhanced tools to identify units that are effectively derated or not following dispatch so that they may be placed off-control. b. Tighten thresholds for uninstructed deviations.
13. Expand the JOA to optimize the interchange with PJM to improve price convergence with PJM.
14. Implement procedures to utilize provisions of the JOA that would improve day-ahead M2M coordination with PJM.
15. Eliminate the transmission constraint deadband.
16. Re-order MISO's emergency procedures to utilize demand response efficiently.
17. Modify the market systems to recognize supplemental reserves being provided from quick-start units when they are in the process of starting.
Resource Adequacy
18. Remove inefficient barriers to capacity trading with adjacent areas.
19. Introduce a sloped demand curve in the RAC to replace the current vertical demand curve.
20. Evaluate capacity credits provided to wind resources and LMR to increase their accuracy.

Queue Update
Resource Adequacy Preview

Board of Directors

System Planning Committee

August 21, 2013

Future Capacity Additions by Summer 2016

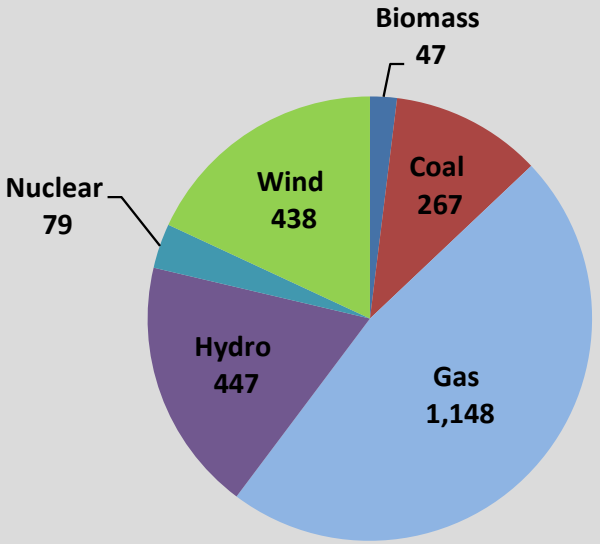
As of July 2013

100% Confidence
Signed IA / Under Construction
1,620 MW

50% Confidence
Providing Post Queue Updates / Seeking Regulatory Approval
560 MW

10% Confidence
All Other Active Queue Units
247 MW

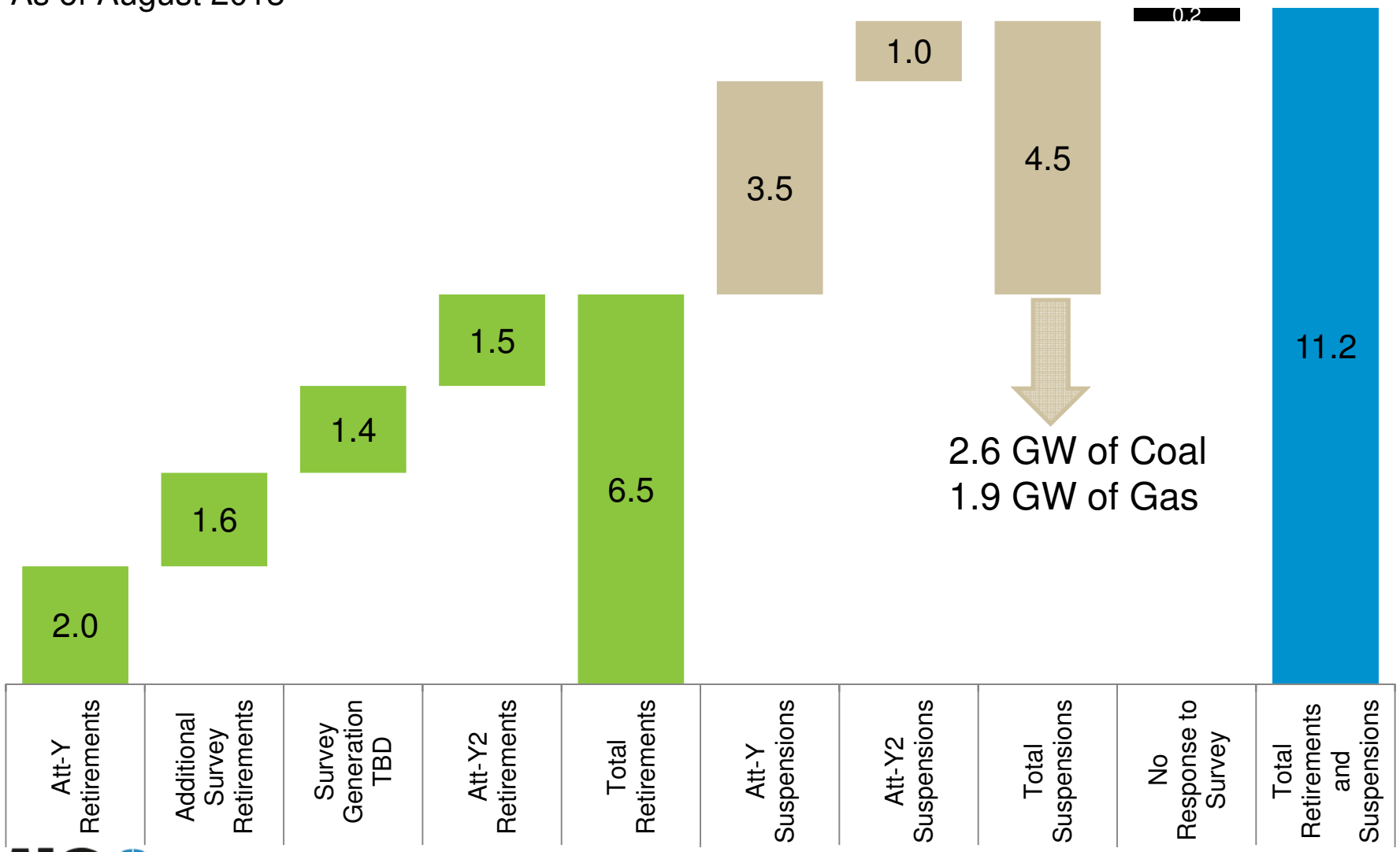
Under this methodology, MISO anticipates 2,427 MW of on peak capacity additions by the 2016 summer



- Wind units given a 13.3% peak capacity credit
- Non-wind units capacity credit based on historical thermal de-ratings

2016 Registered Retirements and Suspensions

As of August 2013



Caveats:

1. 11.2 GW Registered Capacity is equivalent to 8 GW Summer Rated Deliverable Capacity