



IMM Quarterly Report First Quarter 2011

Presented by:

Midwest ISO
Independent Market Monitor

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Potomac Economics

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Summary of Quarterly Results

- This presentation summarizes the outcomes of the Midwest ISO energy and ancillary services markets during the first quarter of 2011.
 - ✓ The markets continued to perform competitively in the first quarter.
- Energy prices averaged \$34 per MWh in both the real-time and day-ahead markets during the first quarter of 2011.
 - ✓ Real-time prices were approximately 14 percent higher than last quarter, but were 3 percent lower than in the same period in 2010.
 - ✓ The increase from last quarter is attributable to both higher fuel prices (gas prices are up 10 percent) and higher load (up 6.2 percent, adjusted for BREC).
- Ancillary service prices remained stable with infrequent periods of shortage or interzonal constraints.
- Real-time congestion in the first quarter was 35 percent higher in 2011 than in 2010 due to higher loads, fuel prices, and transmission and generator outages in the East.
 - ✓ However, Midwest ISO's "constraint relaxation" algorithm artificially reduced real-time congestion by almost 20 percent, which affects day-ahead congestion and FTR values.
- The Midwest ISO set a new wind generation peak (over 7 GW) and a new sixty-minute change peak (drop of over 2 GW) in the first quarter.
- The voluntary capacity auction continued to clear at a price close to zero, which is consistent with the prevailing high level of surplus capacity in the footprint.



Day-Ahead Average Monthly Hub Prices

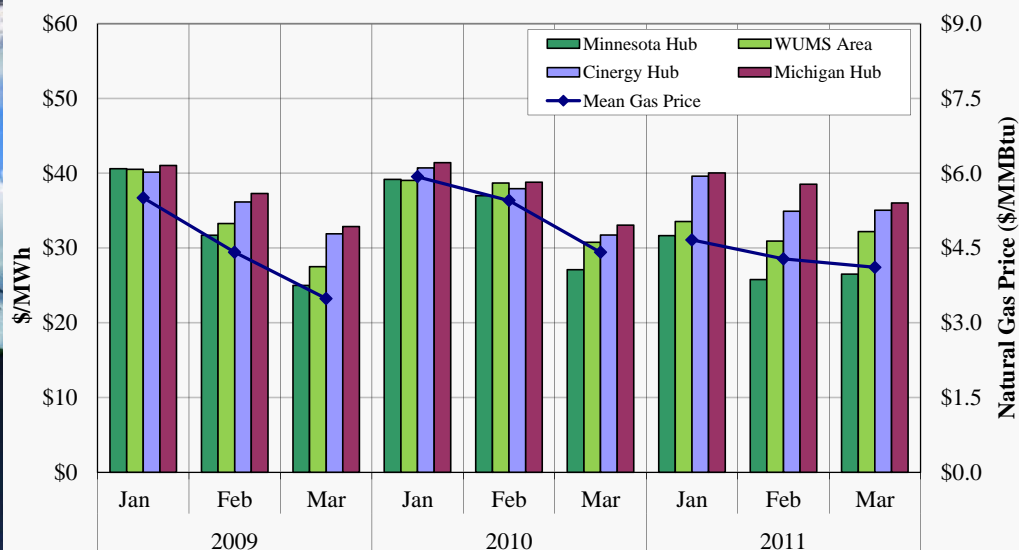
- The first figure in this section shows average day-ahead energy prices in the first quarter of 2009 through 2011 at four representative locations in the Midwest ISO.
 - ✓ The figure also shows natural gas prices because fuel costs are the majority of most suppliers' marginal costs and gas units are often on the margin in peak hours.
 - ✓ In a workably competitive market, energy and fuel prices should be correlated.
- Day-ahead prices in the first quarter of 2011 averaged \$34.17 per MWh, 7 and 3 percent lower than prices over the same period in 2010 and 2009, respectively.
- The primary driver of the year-over price decrease was a reduction in the price of natural gas, which fell 18 percent to \$4.35 per MMBtu. This was offset by:
 - ✓ An increase in average load of 1.5 percent from the first quarter of 2010 and 4 percent from the first quarter of 2009 (excluding membership additions).
 - ✓ Higher coal prices, which rose between 15 to 23 percent from one year ago.
 - ✓ A 35 percent increase in transmission congestion, notably in the East in February.
- Price differences in the Midwest ISO increased between locations in the east and west, in part reflecting increased west-to-east congestion relative to prior years.
 - ✓ Excess wind generation in the West region contributed to this – wind increased 14 percent to 3 GW, and peaked at over 7 GW on February 13 (a new record).
 - ✓ Prices in the East region were nearly \$10 per MWh greater than prices in the West.

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Day-Ahead Average Monthly Hub Prices First Quarter 2009 – 2011



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All-In Price

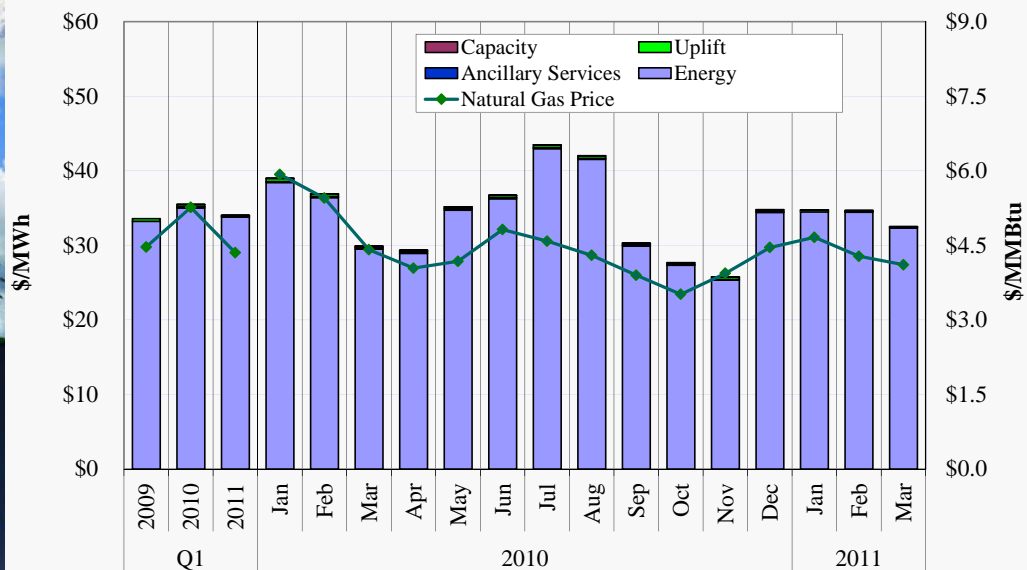
- The “all-in price” summarizes prices in the Midwest ISO and represents the total cost of serving load in the real-time market.
 - ✓ The all-in price is equal to the sum of the average real-time energy price, the average real-time uplift costs, and the costs of ancillary services and capacity.
 - ✓ Costs for capacity are not shown for the first quarter 2009 because the Midwest ISO began operating the market for capacity in June 2009.
- The all-in price for the first quarter of 2011 was \$34 per MWh, a 4 percent decrease from the first quarter of 2010 and in line with the first quarter of 2009.
 - ✓ However, the all-in price was 13 percent higher than in the fourth quarter of 2010 due primarily to higher fuel prices and load.
- Also shown on the figure is the price for natural gas, which decreased faster in the first quarter than did the energy price component of the all-in price.
 - ✓ Higher transmission congestion and demand increased the cost of serving load.
- As in prior quarters, energy costs continued to comprise nearly the entire all-in price (99.4 percent), with uplift, ancillary services and capacity accounting for the balance.
 - ✓ The voluntary capacity auction continues to clear at close to zero in each month, which is consistent with the high level of surplus capacity in the Midwest ISO.

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All-In Price January 2010 – March 2011



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Monthly Real-Time Ancillary Service Prices

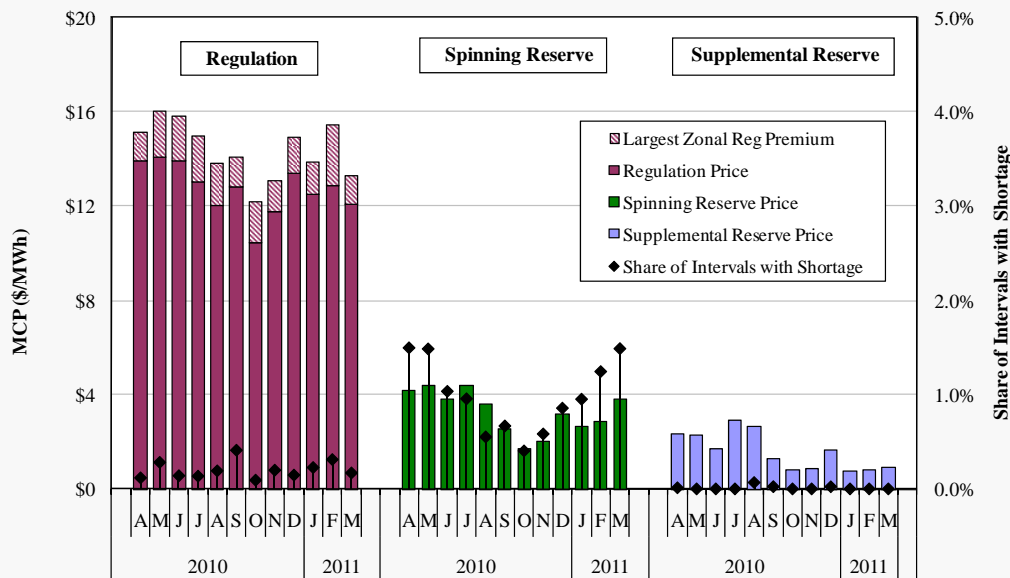
- The following chart shows monthly average real-time clearing prices for the Midwest ISO's ancillary service products for the preceding twelve months.
 - ✓ ASM markets continue to operate as expected with no significant issues.
- Regulation prices averaged \$12.47 per MWh in the first quarter, up 5 percent from the prior quarter but down 10 percent from the first quarter of 2010.
 - ✓ Regulating reserve demand curve prices averaged approximately \$167 per MWh in the quarter, down 42 percent from \$291 in the first quarter of 2010.
 - ✓ Although regulation shortages increased slightly to 60 intervals in the quarter, as a share of total intervals they remain extremely infrequent.
 - ✓ As a result shortage pricing did not impact marginal clearing prices very much.
- Locational differences in regulation prices continue to be relatively limited.
- Spinning reserve prices remain below \$4 per MWh, 21 percent lower than one year ago.
 - ✓ Shortages doubled from the fourth quarter of 2010, but remain nearly 30 percent less frequent than in the first quarter of 2010.
- Supplemental reserve prices averaged \$0.84 per MWh, down 40 percent from last year.
 - ✓ There were no operating reserve shortages in the quarter.
 - ✓ The Midwest ISO made a filing in February to implement new test procedures and is preparing new business procedures to reflect operating expectations that should decrease market uncertainty and improve offer response.

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Monthly Average Ancillary Service Prices Regulation and Spinning Reserves, 2010 – 2011



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Midwest ISO Fuel Prices

- The next figure shows daily average fuel prices from January 2009 through the first quarter of 2011.
- Economic recovery has contributed to increasing in fuel prices since the summer of 2009, although natural gas and western coal prices remain relatively low compared to the years before the recession.

Oil and Natural Gas Prices

- Natural gas prices averaged \$4.35 per MMBtu, up 10 percent from the prior quarter but down 18 percent from the first quarter of 2010, when they averaged \$5.28.
- Oil prices averaged over \$20 per MMBtu in the quarter and peaked near \$23.
 - ✓ Prices rose 18 percent from the prior quarter and are up nearly 40 percent from last year.
 - ✓ This rise has not significantly impacted the Midwest ISO because oil resources were rarely on the margin in winter months (see slide 14).

Coal Prices

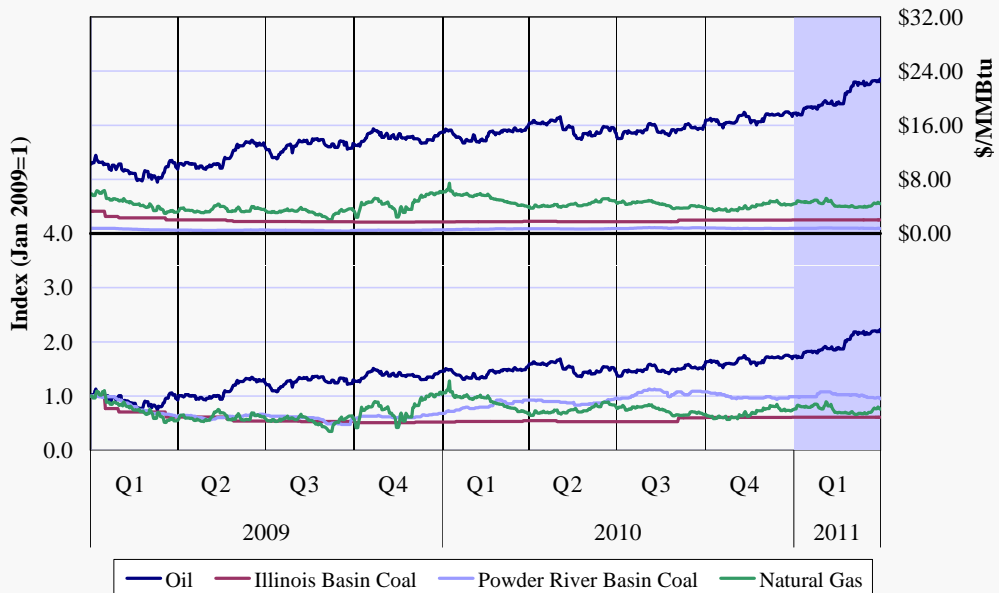
- Illinois Basin prices were flat at \$2 per MMBtu, although year-over prices have increased 15 percent.
- Similarly, Powder River Basin prices rose by only two cents in the first quarter to \$0.79 per MMBtu and are up 23 percent from the first quarter of 2010.

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Midwest ISO Fuel Prices 2009 – 2011



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Changes in Load and Weather Patterns

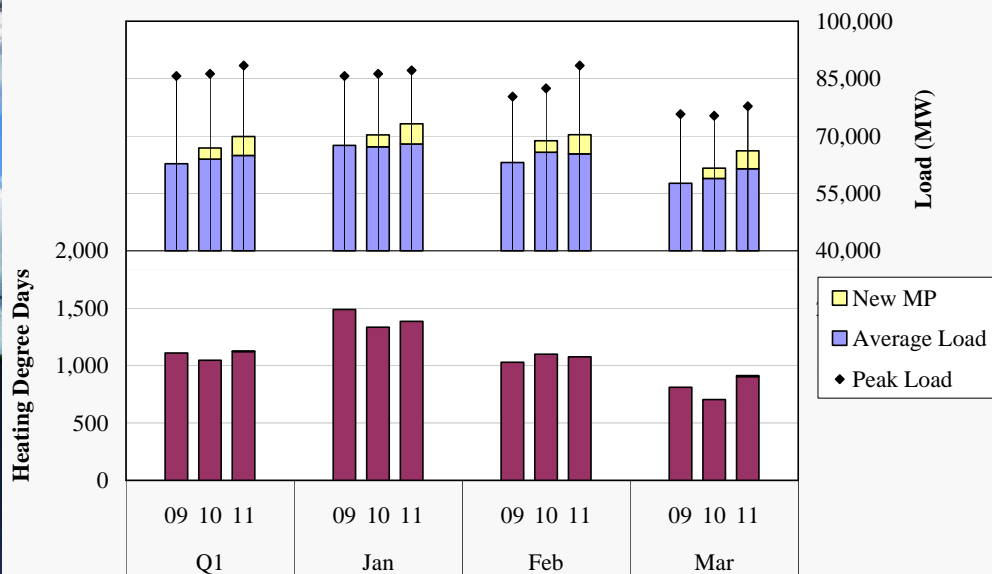
- The next figure shows changes in load in the first quarter of 2009-2011, as well as the changes in weather patterns that contributed to the load changes.
- The top panel shows the monthly average and peak loads in the first quarter of 2009 to 2011.
 - ✓ Load averaged 69.9 GW in the quarter and peaked at 88.4 GW on February 10.
 - ✓ Excluding membership changes, average load increased 1.5 percent from the first quarter of 2010 and 3.3 percent from the first quarter of 2009.
- Because a large share of the load is sensitive to weather, the figure shows how changes in weather patterns contributed to load changes.
 - ✓ The bottom panel in the figure shows the monthly heating degree days summed for the first quarters of 2009 to 2011 at four locations in the Midwest ISO.
 - ✓ The chart shows that the low load levels in 2009 were not due to weather.
 - ✓ Weather patterns and load were both up only slightly from the 1st quarter of 2010.
- Temperatures in January and March were slightly below normal, while February temperatures were normal.
 - ✓ As a result, the Midwest ISO did not approach winter peak load records during the first quarter of 2011.

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Load and Weather Patterns First Quarter, 2009 – 2011



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Share of Interval Price Setting By Unit Fuel Type

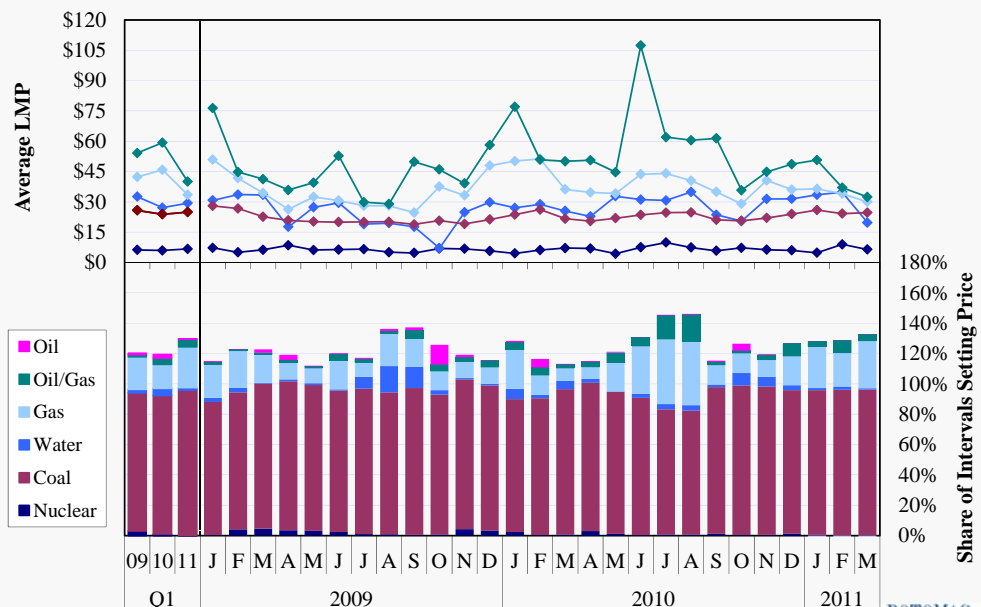
- The next figure shows the frequency with which different types of units set energy prices in the Midwest ISO.
 - ✓ When a constraint is binding, more than one type of unit may be setting prices (one in the constrained area and one in the unconstrained areas).
- Coal units set prices in approximately 96 percent of all hours in the first quarter of 2011 (including nearly all off-peak hours), up from 91 percent in the same period last year.
 - ✓ During high load periods, gas- and oil-fired resources typically set prices.
 - ✓ As a result, gas and oil-fired resources have a larger effect on load-weighted average prices than the percentages would indicate.
- Gas, oil-fired, and dual-fueled resources set energy prices in 28 percent of all intervals, up from less than 20 percent in 2010 and 2009.
 - ✓ This increase is partly due to the reliance on these higher-cost resources to satisfy the increased demand this quarter.
- The average LMP of gas- and dual-fueled resources decreased by roughly 30 percent in the first quarter of 2011 from 2010 due to:
 - ✓ An 18 percent reduction in gas prices; and
 - ✓ A higher share of intervals with efficient gas combined cycle units setting prices in 2011 (85 percent of the gas intervals versus 74 percent in 2010).

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Share of Interval Price Setting By Unit Fuel Type



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Day-Ahead and Real-Time Price Convergence

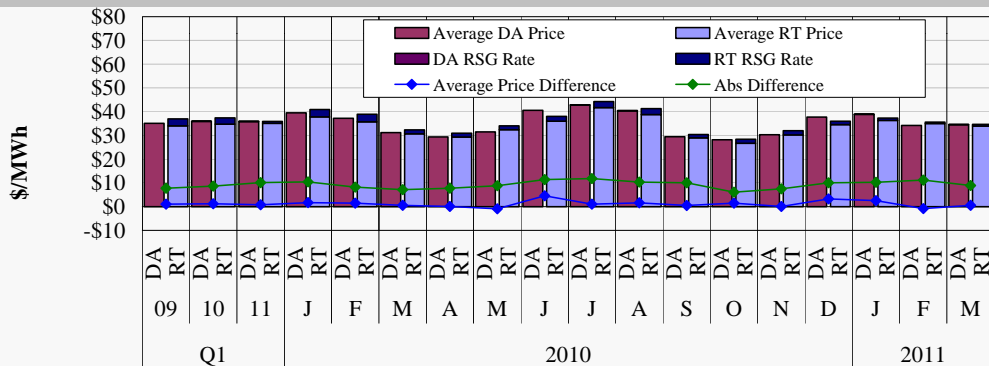
- A well-functioning and liquid day-ahead market should result in good convergence between the day-ahead and real-time prices.
 - ✓ Day-ahead premiums are generally expected due to the higher price volatility in the real-time market and larger RSG allocation to buyers in the real-time market.
- The next figure shows the day-ahead to real-time price convergence at the Cinergy Hub (the table shows other locations).
 - ✓ Overall, price convergence was good in the first quarter of 2011, although virtual transactions did not fully arbitrage price differences at some locations.
 - ✓ Slight day-ahead premiums prevailed at Cinergy and Michigan (1-3 percent), while Minnesota and WUMS exhibited modest real-time premiums.
 - ✓ Real-time price spikes occurred in February due to generator forced outages and storms that caused increased wind curtailments, which together led to real time premiums.
 - ✓ Convergence should improve beginning in April 2011 due to new RSG allocation procedures that reduce the costs allocated to virtual supply transactions.
- The absolute value of the hourly differences measures the typical magnitude of the differences, regardless of direction. This is highest in the congested areas due to:
 - ✓ Higher volatility and negative price spikes during off-peak hours (fluctuations in wind output in February led to a particularly large absolute average differences in February).

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Day-Ahead and Real-Time Price Convergence January 2010 – March 2011



Average DA-RT Price Difference (% of Real-Time Price)

| | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|---|---|----|----|----|----|----|----|----|----|----|---|----|-----|
| Cinergy Hub | 3 | 3 | 2 | 4 | 4 | 2 | 0 | -3 | 13 | 2 | 4 | 2 | 5 | 0 | 9 | 7 | -2 | 2 |
| Michigan Hub | 4 | 5 | 1 | 8 | 3 | 2 | 3 | 2 | 10 | 5 | 2 | 2 | -5 | 2 | 10 | 6 | -5 | 3 |
| Minnesota Hub | 9 | 7 | -5 | 13 | 4 | 4 | -2 | -3 | 0 | -5 | 3 | 5 | 7 | -1 | 4 | 1 | -6 | -10 |
| WUMS Area | 10 | 10 | -1 | 13 | 9 | 8 | 1 | -5 | 15 | -2 | 10 | 21 | 11 | 4 | 2 | 3 | -6 | 0 |

Average Absolute DA-RT Price Difference (% of Real-Time Price)

| | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Cinergy Hub | 23 | 25 | 29 | 28 | 23 | 23 | 26 | 27 | 32 | 28 | 27 | 35 | 23 | 25 | 29 | 28 | 32 | 26 |
| Michigan Hub | 24 | 26 | 32 | 30 | 24 | 24 | 32 | 39 | 33 | 31 | 27 | 40 | 37 | 29 | 31 | 31 | 36 | 28 |
| Minnesota Hub | 33 | 31 | 36 | 36 | 28 | 28 | 30 | 37 | 35 | 29 | 31 | 47 | 39 | 41 | 32 | 24 | 52 | 33 |
| WUMS Area | 31 | 30 | 28 | 35 | 26 | 28 | 28 | 35 | 41 | 30 | 33 | 50 | 31 | 31 | 31 | 24 | 34 | 25 |



Virtual Load and Supply in the Day-Ahead Market

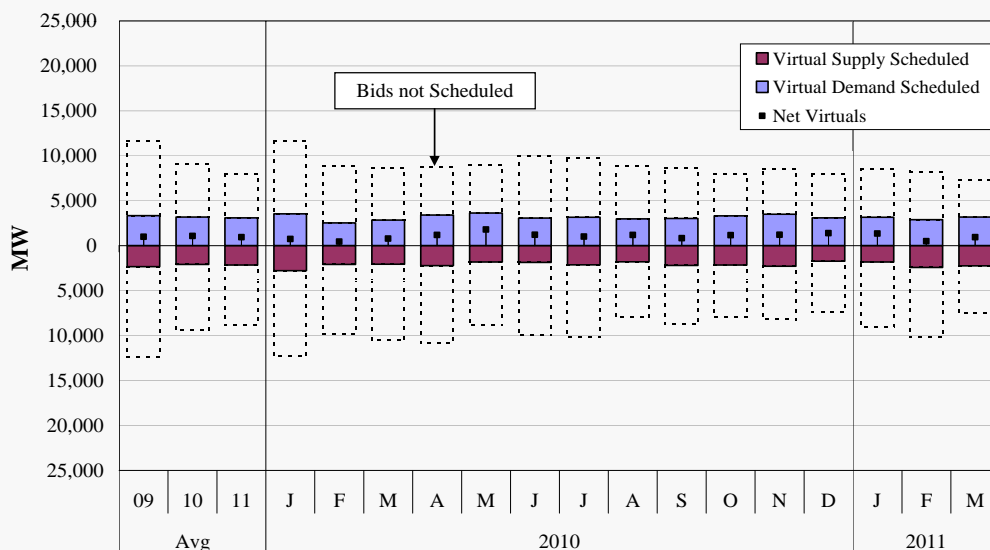
- Virtual trading in the day-ahead market facilitates convergence between the day-ahead and real-time prices. This serves to improve the efficiency of the day-ahead market results and mitigate market power in the day-ahead market.
- The next figure shows the average hourly virtual bids and offers, those that were scheduled, and the net virtual load scheduled (virtual load less virtual supply).
- Overall, first quarter offered volumes decreased slightly in 2011 from 2010, but these levels are 30 percent lower than in the first quarter of 2009.
 - ✓ However, scheduled volumes have decreased only 7 to 8 percent since 2009 to 2.1 GW.
 - ✓ Scheduled demand volumes are about 50 percent greater than scheduled supply volumes, averaging 3.1 GW in the first quarter of 2011.
- Hourly RSG costs allocated to virtual supply volumes averaged just \$0.86 per MWh (down from \$2.62 in the first quarter of 2010), but exceeded \$9 in some hours.
- Lower virtual trading volumes reduces overall liquidity in the day-ahead market and can impact convergence between day-ahead and real-time prices.
 - ✓ This has not been a problem yet in most areas, but we continue to monitor it closely.
 - ✓ We expect virtual trading activity to increase with the new RSG allocation rules implemented in April.

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Virtual Load and Supply in the Day-Ahead Market January 2010 – March 2011



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Virtual Profitability in the Day-Ahead Market

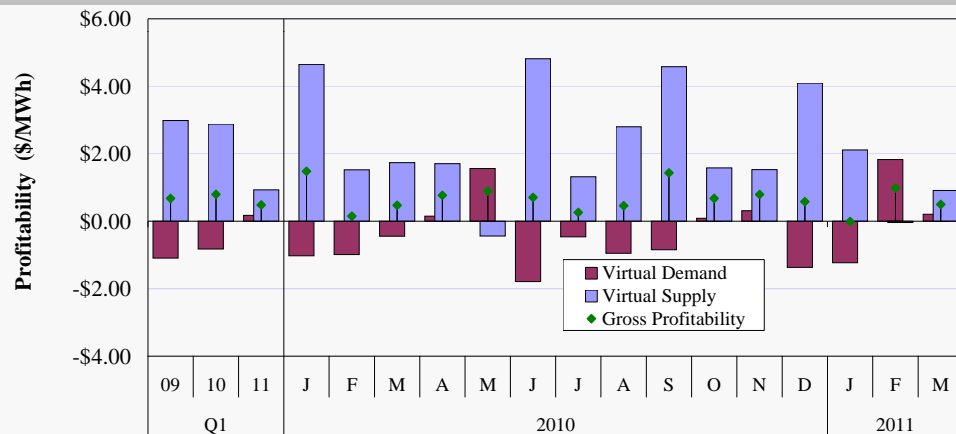
- The next figure shows monthly average profitability of virtual purchases and sales.
- Moderate gross profits of less than \$1 per MWh continued in the first quarter of 2011.
 - Real-time premiums in February made virtual demand more profitable than usual and virtual supply less profitable.
- Demand profits averaged \$0.27 per MWh in the first quarter, up from a \$0.82 loss in the first quarter of 2010.
 - Virtual demand is frequently unprofitable at hub locations where participants submit transactions to hedge against price spikes in the real-time market.
- Virtual supply transactions averaged \$0.89 per MWh in the first quarter, down from \$2.84 in the same period last year.
 - Virtual supply profit margins are reduced at times by considerable RSG cost allocations.
 - The weighted-average hourly RSG Distribution Rate assessed to virtual supply was just \$0.60 per MWh in the first quarter, which reduced net profitability to \$0.29.
- We continue to monitor for large losses on virtual transactions because they can indicate an attempt by a participant to manipulate the day-ahead market prices.
 - The table below the figure shows that the share of transactions incurring large losses remains low and did not raise significant competitive concerns.
 - The increase in February is attributable to increased price volatility at most locations, and does not raise concerns.

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Virtual Profitability in the Day-Ahead Market 2010 – 2011



Share of Cleared Virtuals with Extreme Profitability (%)

| | | | | | | | | | | | | | | | | | | |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Profit > \$50/MWh | 1.2 | 1.7 | 2.6 | 2.4 | 1.0 | 1.3 | 2.1 | 3.6 | 2.4 | 2.3 | 1.7 | 2.7 | 2.7 | 2.5 | 2.5 | 2.3 | 3.6 | 1.9 |
| Profit < -\$50/MWh | 1.2 | 0.9 | 1.2 | 1.2 | 0.8 | 0.6 | 1.0 | 1.5 | 0.9 | 1.3 | 1.0 | 1.4 | 1.0 | 1.3 | 1.1 | 0.7 | 2.0 | 0.9 |

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Peaking Resource Real-Time Dispatch

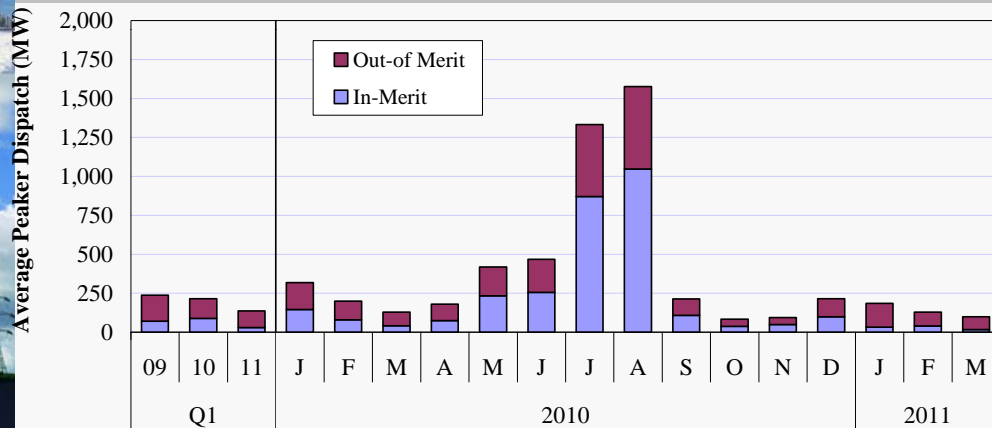
- The following figure shows the dispatch of peaking resources, indicating the share of the peaking resources that were out-of-merit (offer price higher than the LMP).
- Peaking resource dispatch quantities decreased to 138 MW per hour in the first quarter of 2011.
 - ✓ This is down 31 and 42 percent from first quarter of 2010 and 2009, respectively.
 - ✓ Quantities in March (98 MW) were at their lowest since April 2009.
- This decrease is primarily due to full day-ahead load scheduling, which reduces the quantity of resources the Midwest ISO commits in real time to meet load and ancillary services requirements.
 - ✓ The share of peaking resources run out-of-merit increased to 78 percent, which is not unusual in periods when very few peaking resources are being dispatched.
- If peaking resources do not set the energy price, a large share of the relatively high-cost resources to manage congestion or to meet capacity will be out-of-merit.
 - ✓ The Midwest ISO continues to develop pricing improvements that will allow peaking resources to set energy prices when appropriate.

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Peaking Resource Dispatch and In-Merit Status 2010 – 2011



Out-of-Merit Quantity and Share

| | | | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| MW | 167 | 127 | 107 | 173 | 120 | 88 | 106 | 185 | 212 | 461 | 530 | 106 | 46 | 44 | 116 | 152 | 88 | 82 |
| % | 70% | 59% | 78% | 54% | 60% | 68% | 59% | 44% | 45% | 35% | 34% | 49% | 54% | 47% | 54% | 82% | 68% | 82% |

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Real-Time and Day-Ahead RSG Payments

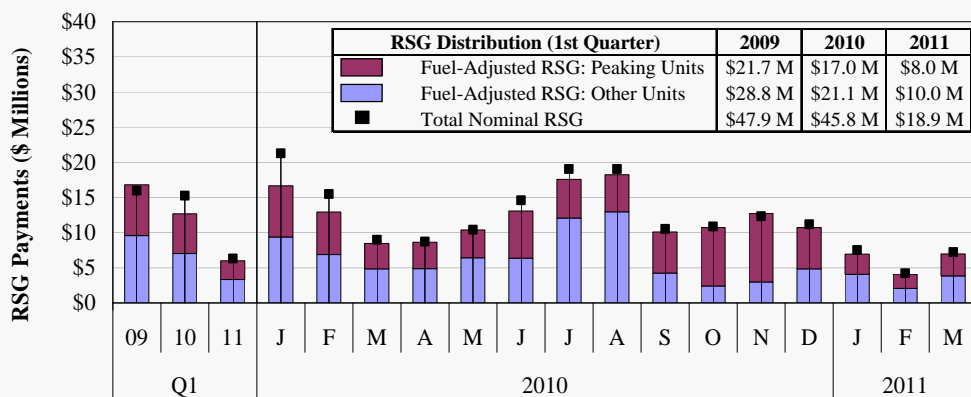
- The next two figures show RSG payments made to peaking units and other units in the real-time and day-ahead markets. To account for fuel prices, RSG costs are shown on a nominal basis and adjusted for changes in fuel prices.
- RSG costs in the real-time market in the first quarter of 2011 decreased 59 percent from the same period in 2010 on a nominal basis and 53 percent on a fuel-adjusted basis.
 - ✓ This decrease is primarily attributable to full load scheduling, which reduces the number commitments the Midwest ISO must make in real-time.
 - ✓ The change in the day-ahead commitment discussed below has reduced real-time RSG.
- As in prior quarters, more than half of the real-time RSG payments were paid to peaking units, which is expected because they are the highest-cost units and often do not set real-time energy prices so their costs must be recovered through RSG.
- The second figure shows day-ahead RSG levels, which continued to be lower than real-time RSG because reliability requirements are not modeled in the day-ahead market.
 - ✓ The Midwest ISO changed in the commitment requirement in the day-ahead market in June 2010 to include a headroom target that reflects the real-time headroom needed to meet the ramp needs of the system.
 - ✓ This change has resulted in higher day-ahead commitments and day-ahead RSG costs.
 - ✓ It contributed to the \$2.5 million increase in day-ahead RSG costs compared to the first quarter of 2010, but was offset by a larger reduction in real-time RSG costs.

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Real-Time RSG Payments 2010 – 2011



Share of Real-Time RSG Costs by Unit Type (%)

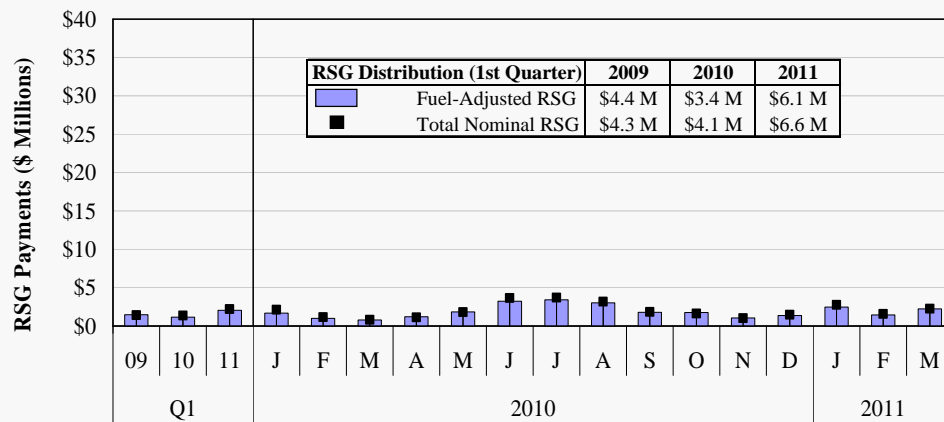
| | | | | | | | | | | | | | | | | | | |
|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Peaker | 57.5 | 56.6 | 56.0 | 58.1 | 53.4 | 58.9 | 58.4 | 63.6 | 49.7 | 69.2 | 70.8 | 39.4 | 20.2 | 23.2 | 46.8 | 60.6 | 51.0 | 54.1 |
| Congestion | 10.2 | 8.4 | 7.9 | 9.8 | 9.0 | 4.3 | 15.8 | 27.0 | 4.5 | 6.1 | 10.4 | 11.7 | 12.7 | 15.9 | 13.1 | 7.3 | 12.9 | 5.5 |
| Capacity | 47.3 | 48.2 | 48.1 | 48.3 | 44.3 | 54.6 | 42.5 | 36.6 | 45.2 | 63.1 | 60.4 | 27.7 | 7.5 | 7.2 | 33.7 | 53.3 | 38.1 | 48.5 |
| Non-Peaker | 42.5 | 43.4 | 44.0 | 41.9 | 46.6 | 41.1 | 41.6 | 36.4 | 50.3 | 30.8 | 29.2 | 60.6 | 79.8 | 76.8 | 53.2 | 39.4 | 49.0 | 45.9 |
| Congestion | 11.1 | 7.3 | 22.7 | 5.7 | 6.3 | 12.8 | 19.3 | 15.8 | 20.3 | 6.5 | 3.4 | 51.7 | 72.2 | 67.4 | 31.1 | 15.4 | 21.3 | 31.0 |
| Capacity | 31.5 | 36.0 | 21.3 | 36.2 | 40.3 | 28.3 | 22.3 | 20.6 | 30.0 | 24.3 | 25.8 | 8.9 | 7.6 | 9.4 | 22.1 | 23.9 | 27.6 | 14.9 |

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Day-Ahead RSG Payments 2010 – 2011



Share of Day-Ahead RSG Costs by Unit Type (%)

| | | | | | | | | | | | | | | | | | | |
|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Peaker | 2.4 | 2.4 | 1.4 | 3.6 | 0.2 | 2.3 | 3.2 | 14.3 | 10.9 | 25.9 | 34.7 | 9.7 | 2.6 | 3.2 | 9.0 | 1.4 | 0.4 | 2.2 |
| Non-Peaker | 97.6 | 97.6 | 98.6 | 96.4 | 99.8 | 97.7 | 96.8 | 85.7 | 89.1 | 74.1 | 65.3 | 90.3 | 97.4 | 96.8 | 91.0 | 98.6 | 99.6 | 97.8 |

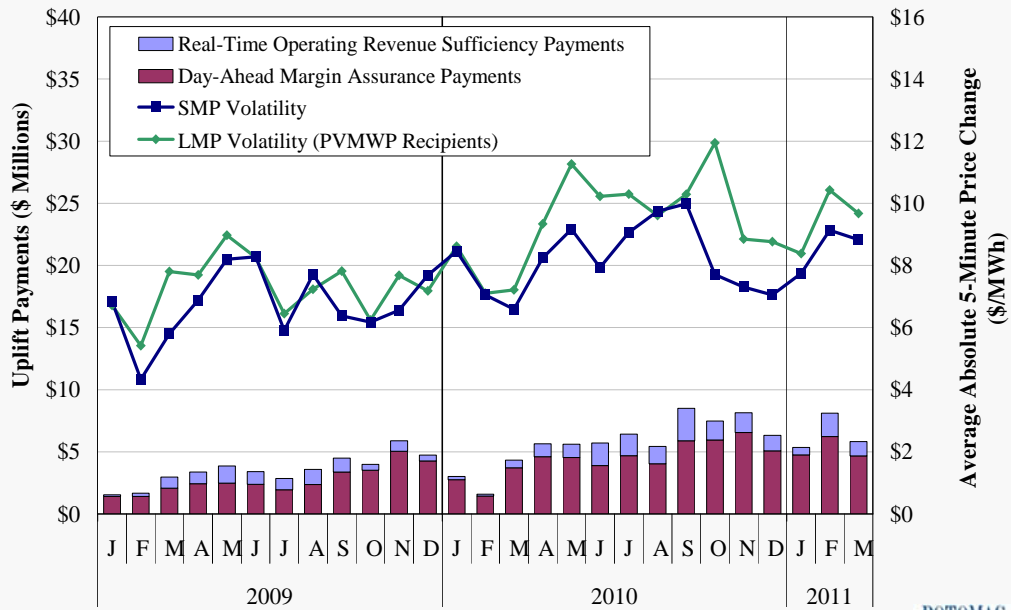


Price Volatility Make Whole Payments

- The next chart shows Price Volatility Make Whole Payments (“PVMWP”) that improve incentives for participants to follow dispatch instructions during periods of price volatility.
 - ✓ These payments come in two forms: Day-Ahead Margin Assurance (“DAMAP”) and Real-Time Offer Revenue Sufficiency Guarantee Payments (“RTORS GP”).
- The magnitude of these payments has increased from an average of \$3.5 million in 2009 and \$5.7 million in 2010 to \$6.4 million per month in 2011 to date:
 - ✓ In the first quarter of 2011, total PVMWP equaled \$19.3 million, approaching the total RSG costs for the quarter (\$25.5 million).
- The lines on the chart show two measures of price volatility: one based on the system marginal price and the other on LMPs at generator locations.
 - ✓ The figure shows that the payments have been correlated with price volatility as expected – increased volatility leads to higher obligations to flexible suppliers.
 - ✓ It also shows that volatility is higher at recipients’ locations because they are generally redispatched more than other suppliers due to the larger price changes.
 - ✓ We have reviewed the formulas for these payments and identified some issues that should be addressed that will be the basis for one of the recommendations in the 2010 State of the Market Report.



Price Volatility Make Whole Payments 2009 - 2011

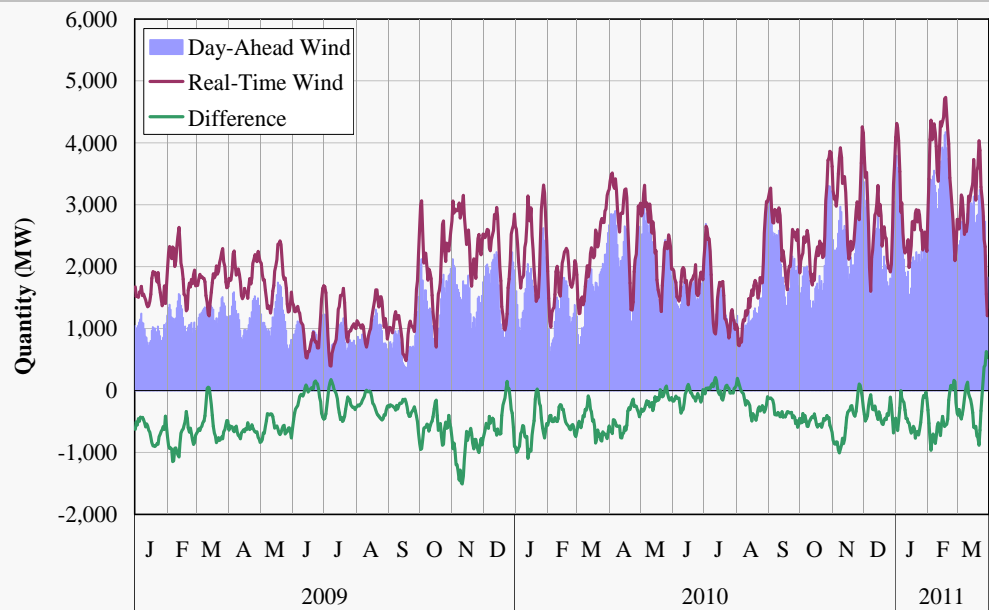


Scheduling of Wind Generation in Real-Time and Day-Ahead Markets

- Wind generation and capacity have grown rapidly in the Midwest ISO market.
 - ✓ This trend is expected to continue due to attractive wind profiles in the West region, state renewable portfolio standards, and federal mandates and subsidies.
- The following figure shows wind output scheduled in the day-ahead and real-time markets – differences must be managed by the Midwest ISO.
- Wind output continues to grow in the Midwest ISO and averaged 3 GW in the first quarter, a 41 percent increase over the first quarter of 2010.
 - ✓ Day-ahead wind scheduling has improved over the past two years.
 - ✓ The average difference as a share of real-time wind output was 10 percent in the first quarter of 2011, down from 25 and 36 percent in the first quarters of 2010 and 2009, respectively.
- Wind output remains volatile, underscoring the forecasting, scheduling, and reliability challenges that must be addressed by the Midwest ISO.
 - ✓ Sixty-minute wind volatility increased 55 percent year-over-year. This has been due in part to suppliers self-curtailling in response to low energy prices.
 - ✓ The introduction of the Dispatchable Intermittent Resource type in June 2011 should alleviate many of these concerns.



Scheduling of Wind Generation in Real-Time and Day-Ahead Markets



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Manual Wind Curtailments

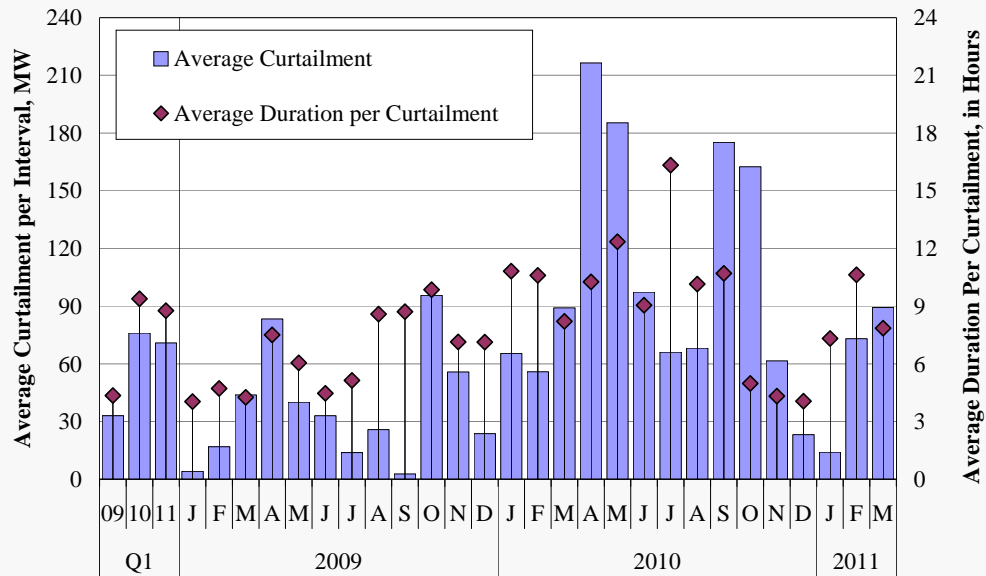
- As wind output has increased, manual curtailments by the Midwest ISO of wind output in order to prevent transmission overloads have also increased. This has been necessary because wind resources are not currently dispatchable.
- Curtailments averaged 71 MW per interval in the first quarter of 2011, down from 76 MW per interval in the first quarter of 2010 and 102 MW last quarter.
 - ✓ On average 2.3 percent of wind generation was curtailed in the first quarter of 2011, less than the 3.45 percent that was curtailed in the first quarter of last year.
 - ✓ The average curtailment lasted nearly nine hours, slightly less than in the first quarter of 2010, but nearly double the duration from last quarter.
- Record wind output in February (peaking at over 7 GW) resulted in participants periodically self-curtailing their output in response to sustained low prices.
 - ✓ At times over 700 MW was self-curtailed, which presents additional challenges to the Midwest ISO (these quantities are not reflected in the figure).
 - ✓ Changes to allow wind units to be dispatchable will go into effect in June.
 - ✓ Initial DIR participation of approximately 1,200 MW should provide the Midwest ISO with enough additional flexibility to manage congestion primarily through the market dispatch.

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Manual Wind Curtailments 2009 – 2011



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Day-Ahead Congestion and Obligations to FTR Holders

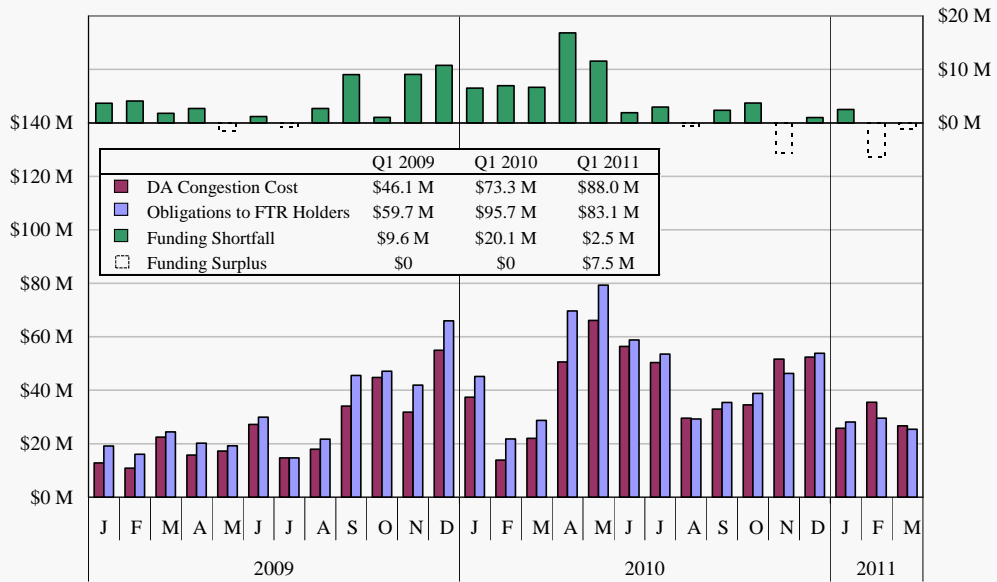
- The next figure shows the Midwest ISO's obligation to FTR holders, which entitle them to congestion costs that arise between particular locations on the network.
 - ✓ Day-ahead congestion totaled \$88 million in the first quarter of 2011, an increase of 20 percent compared to the same quarter in 2010.
 - ✓ This increase was due partly to the increase in real-time congestion and partly to the fact that congestion was under-priced day ahead in the first quarter of 2010 and over-priced in the first quarter of 2011.
- The figure also shows the actual FTR payments and the shortfall between the obligation and the payment.
 - ✓ Shortfalls and surpluses occur when the portfolio of FTRs represent more or less transmission capacity than the capability of the network in the day-ahead market.
- The \$2.5 million shortfall in January was offset by the surplus of \$7.5 million in February and March, causing overall revenues to be sufficient to cover all FTRs.
- The reduction in FTR underfunding is primarily due to the Midwest ISO's continued work on the ARR allocation process and modeling improvements in the FTR and day-ahead markets.
 - ✓ The day-ahead funding shortfall declined from 21 percent in the first quarter of 2010 to effectively zero this quarter.

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Day-Ahead Congestion and Obligations to FTR Holders

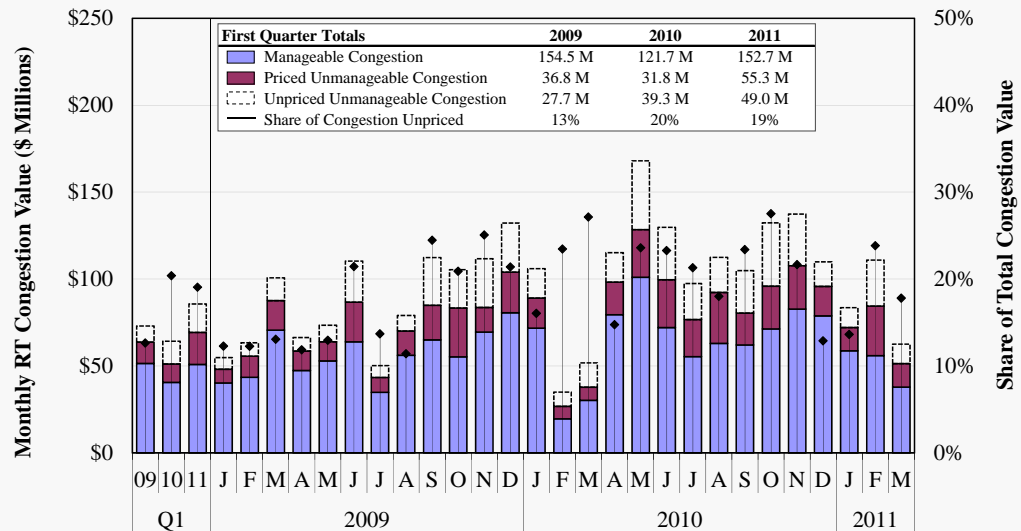


Value of Real-time Congestion

- The next figure shows the value of real-time congestion.
 - ✓ The value of real-time congestion equals the marginal cost of a constraint (i.e., the shadow price) times the flow over the constraint.
 - ✓ The total value shown is higher than the congestion costs collected by the Midwest ISO because loop flows do not settle with the Midwest ISO and PJM has entitlements to transmission capability on the Midwest ISO system.
- The value of real-time congestion declined 30 percent from the last quarter of 2010 to \$208 million, but increased by 35 percent compared to the first quarter of 2010.
 - ✓ West-to-east congestion has continued to increase as wind output has increased.
 - ✓ The reduction in congestion versus the prior quarter is primarily due to less congestion into and within Michigan that had been associated with outages there.
- The figure also shows congestion associated with constraints that are temporarily violated (i.e., unmanageable congestion).
 - ✓ When this occurs, the Midwest ISO employs a “constraint relaxation” algorithm that artificially reduces the value of the congestion, often to zero.
 - ✓ The figure shows that this algorithm eliminated nearly 20 percent of the real-time congestion that should have occurred in the first quarter, which affects day-ahead congestion values and the revenues from the FTR market.
 - ✓ We continue to recommend the Midwest ISO suspend use of this algorithm.



Value of Real-time Congestion



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Value of Real-Time Congestion by Type of Constraint

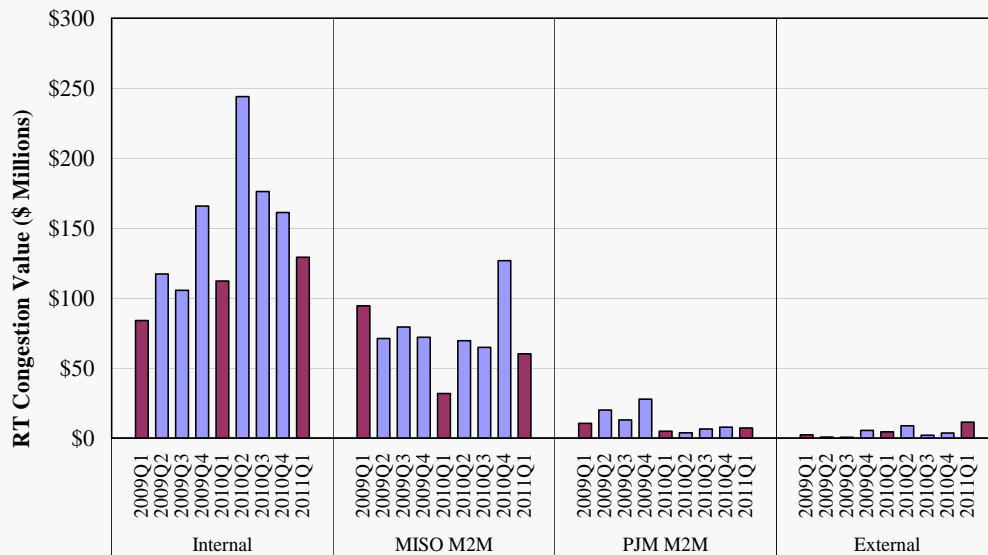
- The next figure shows the value of real-time congestion by the type of constraint from 2009 through the first quarter of 2011.
 - ✓ It includes congestion on external constraints, which occurs when a neighboring system calls a TLR that causes Midwest ISO to re-dispatch its generation.
- As in prior quarters, most of the congestion during the quarter occurred on Midwest ISO internal constraints (including Midwest ISO market-to-market constraints).
 - ✓ In total, the Midwest ISO constraints (internal and market-to-market) account for 91 percent of all the congestion value, down from 96 percent last quarter.
 - ✓ Congestion on market-to-market constraints totaled over \$60 million, less than half of the amount in the fourth quarter of 2010.
 - Nearly all of this congestion occurred in the East in January and February.
- Congestion on external flowgates increased modestly in the first quarter.
 - ✓ The majority of this was on select SPP flowgates and was not unmanageable (Midwest ISO lacked the redispatch capability to provide the requested relief).
 - ✓ A large share of this congestion value is the result of inefficient redispatch.
 - ✓ We are investigating whether changes could be made to the TLR process to address these inefficiencies.

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Value of Real-Time Congestion by Type of Constraint 2009 – 2011



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Average Hourly Real-Time Imports

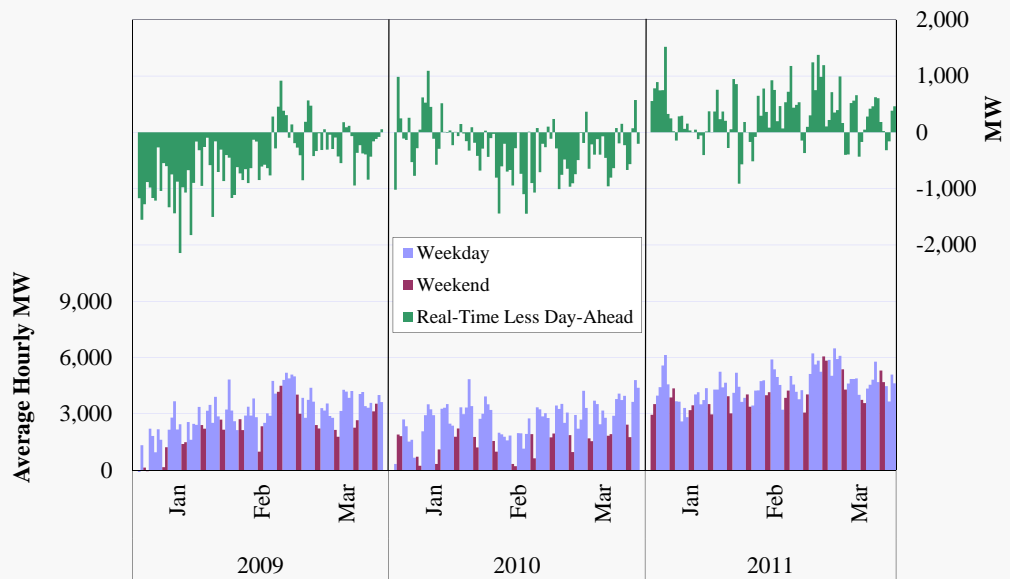
- The next figure shows net imports in the real-time market and the change in net imports from the day-ahead market during the first quarter from 2009 to 2011.
- The Midwest ISO imported nearly 4,400 MW on average in the first quarter.
 - ✓ The largest share of this was across the PJM interface: PJM net imports averaged 1,160 MW, up nearly 1,000 MW from the first quarter of 2010.
 - ✓ Imports rose much faster during off-peak hours (up nearly 200 percent to 3,900 MW).
- Unlike in prior quarters, real-time net imports in the first quarter were greater than those scheduled in the day-ahead market.
 - ✓ Net imports increased on 70 days in the quarter (on average by 311 MW).
 - ✓ This is in contrast to the first quarter of both 2010 and 2009, when net imports decreased by 281 MW and 494 MW, respectively.
 - ✓ This change may be partly because the Midwest ISO has been committing less after the day-ahead market recently and wind has been more fully scheduled day ahead.
- Although scheduling consistency has improved since 2009, changes from day-ahead to real-time continue to be substantial at times.
 - ✓ Imports changed by more than 1,000 MW on five days in the quarter.
 - ✓ Absolute average differences – the average difference between day-ahead and real-time imports regardless of direction – was unchanged from the first quarter of 2010.

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Average Hourly Real-Time Imports First Quarter, 2009 – 2011

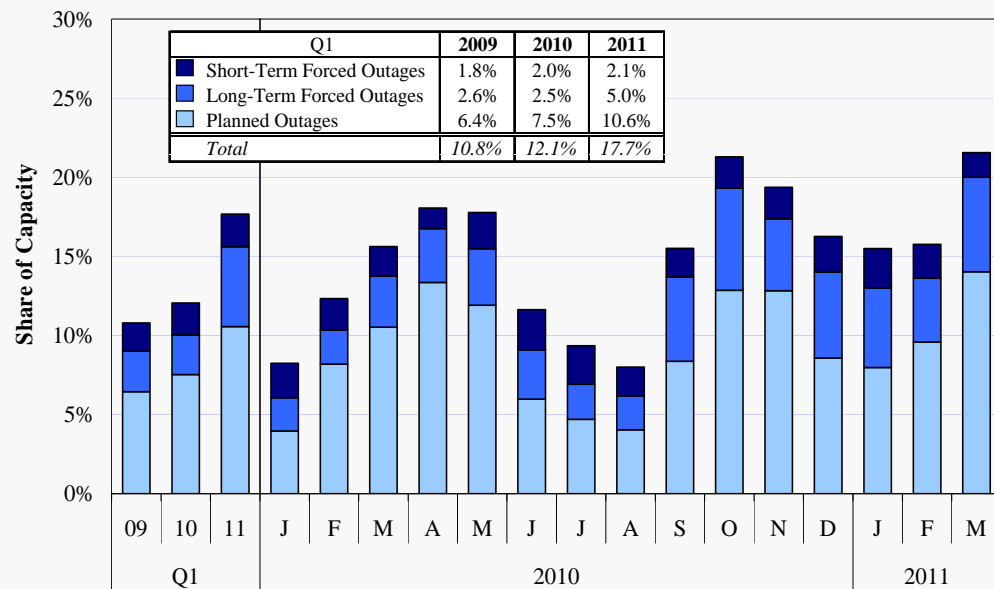


Generation Outage Rates

- The following figure shows the generator outages that occurred in each month since January 2010 as a percentage of total generation capacity.
 - ✓ These values include only full outages, not partial outages or deratings.
 - ✓ The figure divides the forced outages between short-term (less than 7 days) and long-term (longer than 7 days).
- The total outage rate for the three classes of outages was 17.7 percent in the third quarter of 2011, up from 12.1 percent in 2010 and 10.8 percent in 2009.
 - ✓ Long-term forced and planned outages in particular both increased by nearly 3 percentage points.
 - ✓ Short-term outages were largely unchanged, which is consistent with load patterns.
 - Higher loads tend to result in additional unit commitments and provide more opportunities for unit failure.
 - We continue to monitor short-term outages closely because they can indicate potential physical withholding.
- In addition, Module E must-offer compliance requirements that were revised in late 2009 increased the incentive for participants to accurately report outages.



Generation Outage Rates 2010 – 2011

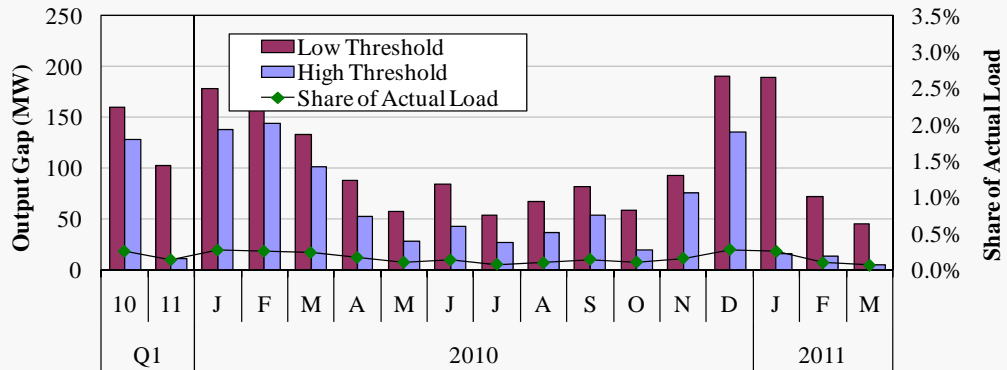


Monthly Output Gap

- The output gap measure is used to screen for economic withholding by participants.
 - ✓ It measures the difference between actual output and the output level that would be expected based on competitive offers.
- The next figure shows the output gap since January 2010 under two thresholds: a “high” threshold (equal to the mitigation threshold) and a “low” threshold (equal to one-half of mitigation threshold).
- In the first quarter of 2011, output gap levels under the high and low thresholds were 71 and 95 percent lower, respectively, than in the first quarter of 2010.
 - ✓ In particular, offline output gap – quantities by offline units that would have been economic to commit – was near zero after January.
- As a share of overall load, the low-threshold output gap averaged less than 0.15 percent in the quarter, and was low as 0.06 percent in March.
 - ✓ The mitigation thresholds for Narrow Constrained Areas (i.e. WUMS, NWUMS and Minnesota) were updated per Module D in January and the WUMS and Minnesota thresholds were increased significantly.
- These results show that there were few competitive concerns in the first quarter.
 - ✓ We continue to routinely investigate hourly increases in the output gap.



Monthly Output Gap 2010 – 2011



Low Threshold Results by Unit Status (MW)

| | | | | | | | | | | | | | | | | | |
|----------|----|----|-----|-----|----|----|----|----|----|----|----|----|----|----|-----|----|----|
| Off-Line | 86 | 63 | 74 | 110 | 75 | 28 | 12 | 31 | 16 | 19 | 18 | 5 | 33 | 95 | 142 | 30 | 17 |
| On-Line | 74 | 40 | 105 | 57 | 59 | 60 | 46 | 54 | 38 | 49 | 64 | 54 | 61 | 96 | 48 | 43 | 29 |

High Threshold Results by Unit Status (MW)

| | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|----|----|----|---|
| Off-Line | 83 | 0 | 67 | 110 | 73 | 27 | 12 | 31 | 16 | 19 | 18 | 5 | 33 | 89 | 0 | 0 | 0 |
| On-Line | 45 | 12 | 71 | 35 | 29 | 26 | 17 | 12 | 12 | 19 | 36 | 15 | 43 | 46 | 17 | 14 | 5 |

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Mitigation in the Real-Time Energy Market

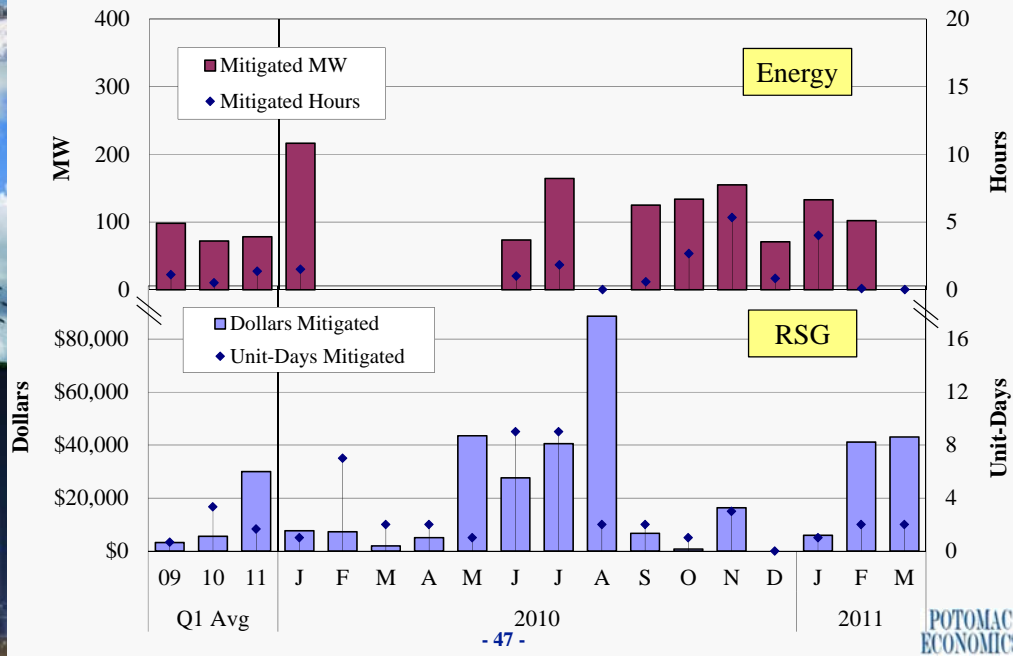
- The next figure shows the frequency with which mitigation has been imposed in the real-time market and for RSG payments.
 - ✓ The top panel shows the frequency of mitigation in the energy market, including the number of hours in which mitigation took place and the average quantity mitigated.
 - ✓ The bottom panel shows the frequency and quantity of RSG mitigated.
- There were only 49 unit-intervals (1.36 hours) of energy mitigation in the quarter.
- Mitigation in both the day-ahead and real-time markets continues to be rare due to:
 - ✓ Minimal price impacts because the market in the first quarter cleared in supply ranges that are highly elastic (causing withholding to have a lesser impact); and
 - ✓ The majority of resources are offered competitively in the Midwest ISO markets.
- RSG mitigation rose to approximately \$30,000 on average per month, which remains very low.
- Although mitigation levels indicate that these events continue to be rare, local market power continues to be a significant concern.
 - ✓ Market power mitigation measures therefore remain critical.

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Real-Time Market Power Mitigation 2010 – 2011



Issues with Mitigation in the Real-Time Energy Market

- In late 2010, IMM reviews of AMP mitigation resulted in the identification of two issues in Midwest ISO's implementation of the Module D tariff provisions.
 - ✓ The Midwest ISO subsequently made informational filings to FERC and the issues were immediately corrected.
- The first issue involved a problem with the data feed to the AMP software that resulted in a failure to transfer all updates made to energy offers.
 - ✓ With corrected data the IMM re-executed conduct tests and screened the results for possible over and under mitigation and found one instance of over-mitigation.
 - ✓ The IMM screened the results for possible under-mitigation and, while additional conduct test failures were indicated with corrected data, none of these were found to have significant impact.
- The second issue involved an incorrect threshold in the RSG impact test. The Midwest ISO recomputed the RSG impact tests with the correct threshold and identified instances of over-mitigation for which resettlements were made.
- The IMM continues to monitor the AMP results for accuracy in accordance with Module D.



Voluntary Capacity Auction

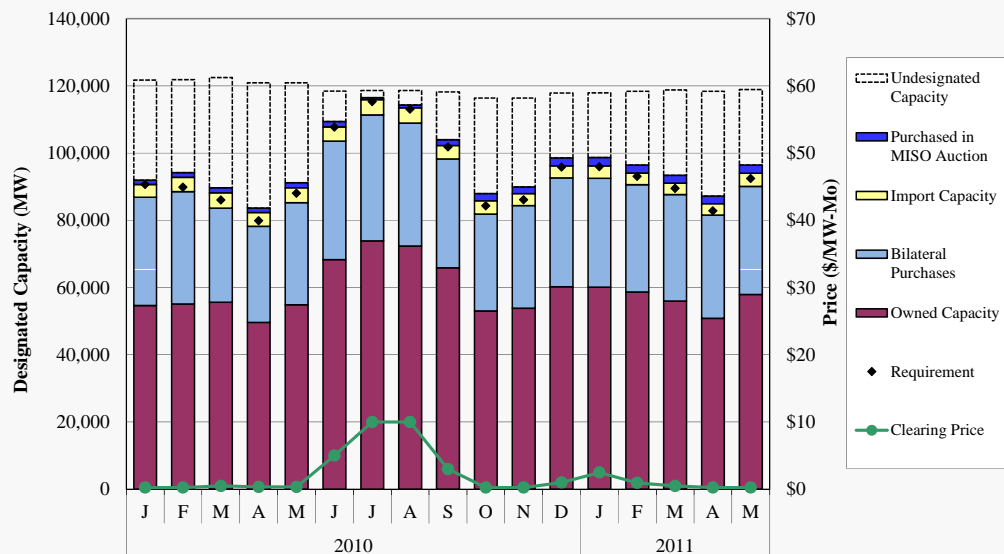
- Beginning in June 2009, the Midwest ISO began a monthly Voluntary Capacity Auction (VCA) to allow load-serving entities to procure residual capacity to meet their Module E capacity requirements.
- The following figure shows the monthly capacity requirements, designated capacity and VCA clearing price in 2010 and the first quarter of 2011.
 - ✓ The capacity cleared in the VCA remains a very small portion of the total designated capacity, and averaged 2.5 percent in the first quarter of 2011.
 - ✓ This is consistent with the expectation that this market would only be a balancing market, with LSEs' needs satisfied through owned capacity or bilateral purchases.
- The figure also shows how LSEs are satisfying those requirements. It shows:
 - ✓ Capacity designations continue to meet or exceed requirements – in the first quarter of 2011 designations exceeded the requirement by 3.6 percent on average.
- The total capacity available exceeded the requirement by 23 to 33 percent.
 - ✓ As a result, VCA clearing prices remain extremely low (less than \$10 per MW-month).

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Capacity Market Results January 2010 – March 2011



Note: Total column height represents the total designated capacity, including imports.

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