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Re: Comments of the MISO Independent Market Monitor on the RTO Configuration

Dear James:

This letter provides a brief assessment of the market issues related to the proposed RTO membership elections made by the former Alliance RTO members. Most of the discussion of these elections has previously focused on their potential reliability effects rather than the market effects. However, the market issues related to the resulting RTO configuration are significant and will hopefully be considered by the Federal Energy Regulatory Commission ("FERC").

The configurations that result from the proposed elections create a highly irregular seam between PJM and the MISO, including the creation of non-contiguous areas within the MISO. This configuration raises two principal issues – the efficiency of the locational marginal prices ("LMP") and associated dispatch decisions, and the increased potential for strategic gaming.

Spot Market Efficiency

The spot markets conducted by each of the RTOs will serve to manage congestion and establish locational marginal prices, consistent with the FERC's Standard Market Design ("SMD"). These prices can be expected to be efficient when established for a contiguous area with minimal loop flows. In this case, the supplies that are essential for managing system congestion in an area are all dispatched by the RTO in that area.

This system will also naturally collect sufficient congestion revenue to meet the financial obligation to the holders of firm transmission rights (sometimes referred to as "revenue-adequacy"). When an LMP system is subject to substantial loop flows, however, the system may no longer be revenue-adequate. In this case, substantial uplift can be required to compensate for the fact that those causing the loop flow are not paying to use the system.

In addition to the uplift, poorly configured RTOs, where a large share of the generating resources located on one RTO impact transmission constraints in another RTO, can lead to inefficient dispatch and inefficient locational prices. These inefficiencies occurs when the RTO with the limiting transmission facility is not dispatching the resources that are the most economic for resolving the congestion (because they are located in another RTO area). To assess this issue, I have conducted a preliminary analysis of the MISO and PJM configuration that would result from the proposed elections.

This analysis is focused on selected flowgates in the Midwest that have been the source of congestion in the region.[1] This selection was made based on Transmission Line-Loading Relief ("TLR") calls associated with the flowgates or the identification of the flowgates as limiting transmission elements in recent transmission studies. These flowgates are located throughout the MISO and the former Alliance RTO control areas.

In addition to identifying these flowgates, this analysis required estimated generation shift factors ("GSF") for each generating resource in the region. A GSF indicates what portion of the flow will occur on each transmission facility. A positive GSF indicates that incremental production from the unit will increase the flow in the direction that the flowgate is defined (i.e., congestion on the facility would be managed by reducing the unit's output). A negative GSF indicates that incremental production from the unit will create flows in the opposite direction of the flowgates' definition, or "counter-flow", so managing congestion on the interface would require increasing output from this generator. Potomac Economics estimated the GSF values used in this analysis using the results of the Midwest ISO AFC Load Flow Case for July 2002 and the PowerWorld Transmission Simulation Model.[2] The GSFs are produced by assuming than any change in the output of one generator is replaced by changes in all generators within the Eastern Interconnect.

Using the flowgates and GSFs, I have attempted to identify the share of generation resources that would be located within the MISO versus PJM that would impact each flowgate. For each flowgate, I estimate the percentage of the capability with a GSF greater than 5 percent that would be located in MISO and in PJM.[3] This criteria is employed to focus the analysis on those generating resources that are most likely to be redispatched to manage congestion on the particular flowgate. This analysis was performed on roughly 70 flowgates, of which less than half indicate potential market issues. This analysis is summarized in Table 1 for those flowgates that show a significant level of electrical interaction between the two RTO areas as proposed.

This table shows that there are a number of flowgates within the expanded MISO and PJM areas that are substantially impacted by generation in the other RTO. For example, 78 percent of the generation affecting flows on the Bunsonville-Eugene flowgate on the Illinois Power-AEP systems would be dispatched by the MISO. Likewise, 41 percent of the Paddock Transformer flowgate on the Alliant East system in MISO would be dispatched through the PJM spot market.

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1 Flowgates are individual or grouped transmission facilities (e.g., transmission lines, transformers) that are known or anticipated to be limiting elements in providing transmission service.

2 PowerWorld Simulator, Version 8.0, PowerWorld Corporation.

3 This criteria is applied on an absolute value basis so that generators that can relieve a constraint by reducing their output are treated comparably to generators that can relieve a constraint by increasing their output.

Table 1

Flowgate Impacts for Generation in PJM and MISO

Base Case -- Assuming Proposed Elections

			Base Case	
Flowgate Name	**Control Area**	**RTO Area**	**MISO Percent**	**PJM Percent**
Bay_Sh_345_Mon12_345	FE,DECO	MISO	96%	4%
Bland_Franks_345_KV	AMRN,AECI	MISO	95%	5%
Breed_Casey_345_KV	AEP,AMRN	MISO	85%	15%
Cayuga_345_230XFMR	CIN	MISO	89%	11%
Mntzuma	MEC	MISO	97%	3%
Paddock_XFMR_1_Paddock_Rockdale	ALTE	MISO	59%	41%
Rush_Island_St_Francois_345_KV	AMRN	MISO	91%	9%
Rush_St_Francois_Blands_Franks	AMRN	MISO	86%	14%
Coffn_Roxfd_Ip	IP,AMRN	MISO-PJM	90%	10%
Quad_Cities_Rock_Creek_345	ALTW, CE	MISO-PJM	81%	19%
Bentnhrbr-Palisades345	MECS AEP	MISO-PJM	91%	9%
State Line To Wolf Lake 138	CE,NIPS	MISO-PJM	76%	24%
Sugrck_345_Foster_345	DPL,CIN	MISO-PJM	86%	14%
S Canton_Star_345	AEP,FE	MISO-PJM	84%	16%
Bunsonville_Eugene	IP,AEP	PJM	78%	22%
Cook_345_Benton_345	AEP	PJM	90%	10%
Dumont_765_Dumteq_999	AEP	PJM	79%	21%
Kyger_Sporn345	AEP,OVEC	PJM	39%	61%
Olive_345_138XFMR	AEP	PJM	84%	16%
Plano-Electric Junction 345 KV	CE	PJM	48%	52%
Sidney_XFMR_Bunsonville_XFMR	IP	PJM	48%	52%

Overall, the analysis shows:

- PJM would dispatch 3 % to 41 % of the generating resources affecting the flow on 8 MISO flowgates; and
- MISO would dispatch 39 % to 90 % of the generating resources affecting the flow on 7 PJM flowgates.
- The 6 flowgates that would represent various seams between the MISO and PJM generally are affected by generation in both RTOs, with the MISO generation having the largest effects.

This is not intended to be comprehensive analysis of all flowgates throughout the region. However, it does indicate that proposed configuration of the RTOs raises significant potential efficiency concerns. Some have argued that it is the electrical topology of the configuration of the RTOs that truly matters, not the geography of the configurations. I agree. This analysis is intended to evaluate the electrical topology of the RTOs as they would be configured under the proposed elections of the current Alliance RTO members. The analysis of topology is more important that the historical trade patterns because it is the topology that will determine the efficiency of the spot market. With regard to historical trade patterns, the RTO's rules and rates should be designed to facilitate trade between the RTO areas regardless of where the seam is ultimately located.

Others have argued that the implementation of the Standard Market Design will resolve these issues. Unfortunately, SMD will do little to address these issues. These issue arise because the dispatch decisions and congestion pricing signals in one RTO area will not be efficient when the market operations of the RTO cause (or could alleviate) congestion on the adjacent RTO's system.

The joint and common market proposals being developed by PJM and MISO will help address these concerns. However, the basis does not currently exist to simply assume that these proposals will be able to fully address the degree of electrical interactions along the seam that is currently proposed between PJM and the MISO. To efficiently address these seams issues would require extensive coordination at the dispatch level that has not been proven. In addition to the technical issues to be confronted, such an agreement will require economic arrangements to be negotiated between the RTOs to ensure that efficient economic signals are sent to loads and generators throughout the region. Finally, the infrastructure and processes to carry out this coordination will require years to establish.

Therefore, a comparative assessment of alternative configuration is warranted to determine the extent to which they may resolve these issues. It is important to recognize, however, that no one configuration is the "right" configuration for an RTO – only that some configurations raise relatively lower market risks than others. Regardless of the ultimate configuration, it will continue to be important to develop seams agreements that do not prohibit efficient trade between the RTO areas.

I used the same analytic approach described above to examine the effects of two alternative configurations on the flowgates shown in Table 1. The first alternative would place AEP, CE, IP, and DPL in the MISO with VAP remaining in PJM. The results of this analysis are shown in Table 2 below.

Table 2

Flowgate Impacts for Generation in PJM and MISO

Alternative 1 -- AEP, CE, IP and DPL in MISO

	Base Case			Alternative 1		
Flowgate Name	**RTO Area**	**MISO Percent**	**PJM Percent**	**RTO Area**	**MISO Percent**	**PJM Percent**
Bay_Sh_345_Mon12_345	MISO	96%	4%	MISO	100%	0%
Bland_Franks_345_KV	MISO	95%	5%	MISO	100%	0%
Breed_Casey_345_KV	MISO	85%	15%	MISO	100%	0%
Cayuga_345_230XFMR	MISO	89%	11%	MISO	100%	0%
Mntzuma	MISO	97%	3%	MISO	100%	0%
Paddock_XFMR_1_Paddock_Rockdale	MISO	59%	41%	MISO	100%	0%
Rush_Island_St_Francois_345_KV	MISO	91%	9%	MISO	100%	0%
Rush_St_Francois_Blands_Franks	MISO	86%	14%	MISO	100%	0%
Coffn_Roxfd_Ip	MISO-PJM	90%	10%	MISO	100%	0%
Quad_Cities_Rock_Creek_345	MISO-PJM	81%	19%	MISO	100%	0%
Bentnhrbr-Palisades345	MISO-PJM	91%	9%	MISO	100%	0%
State Line To Wolf Lake 138	MISO-PJM	76%	24%	MISO	100%	0%
Sugrck_345_Foster_345	MISO-PJM	86%	14%	MISO	100%	0%
S Canton_Star_345	MISO-PJM	84%	16%	MISO	84%	16%
Bunsonville_Eugene	PJM	78%	22%	MISO	100%	0%
Cook_345_Benton_345	PJM	90%	10%	MISO	100%	0%
Dumont_765_Dumteq_999	PJM	79%	21%	MISO	100%	0%
Kyger_Sporn345	PJM	39%	61%	MISO	100%	0%
Olive_345_138XFMR	PJM	84%	16%	MISO	84%	16%
Plano-Electric Junction 345 KV	PJM	48%	52%	MISO	100%	0%
Sidney_XFMR_Bunsonville_XFMR	PJM	48%	52%	MISO	100%	0%

Table 2 shows that most of the interactions identified in Table 1 are eliminated under this configuration. Again, this analysis is not comprehensive and does not rule out that electrical interactions on other flowgates could be created by this change, such as flowgates connecting AEP and PJM.

We also conducted this analysis for a second alternative assuming that AEP remains in PJM, that FE joins PJM, and that the Illinois companies join MISO. This configuration was alluded to by Chairman Wood these results are shown in Table 3.

Table 3

Flowgate Impacts for Generation in PJM and MISO

Alternative 2 -- AEP and FE in PJM, CE and IP in MISO

	Base Case			Alternative 2		
Flowgate Name	RTO Area	MISO Percent	PJM Percent	RTO Area	MISO Percent	PJM Percent
Bay_Sh_345_Mon12_345	MISO	96%	4%	MISO-PJM	75%	25%
Bland_Franks_345_KV	MISO	95%	5%	MISO	100%	0%
Breed_Casey_345_KV	MISO	85%	15%	MISO	90%	10%
Cayuga_345_230XFMR	MISO	89%	11%	MISO	100%	0%
Mntzuma	MISO	97%	3%	MISO	100%	0%
Paddock_XFMR_1_Paddock_Rockdale	MISO	59%	41%	MISO	100%	0%
Rush_Island_St_Francois_345_KV	MISO	91%	9%	MISO	100%	0%
Rush_St_Francois_Blands_Franks	MISO	86%	14%	MISO	100%	0%
Coffn_Roxfd_Ip	MISO-PJM	90%	10%	MISO	100%	0%
Quad_Cities_Rock_Creek_345	MISO-PJM	81%	19%	MISO	97%	3%
Bentnhrbr-Palisades345	MISO-PJM	91%	9%	MISO-PJM	85%	15%
State Line To Wolf Lake 138	MISO-PJM	76%	24%	MISO-PJM	100%	0%
Sugrck_345_Foster_345	MISO-PJM	86%	14%	MISO-PJM	86%	14%
S Canton_Star_345	MISO-PJM	84%	16%	PJM		100%
Bunsonville_Eugene	PJM	78%	22%	MISO-PJM	100%	0%
Cook_345_Benton_345	PJM	90%	10%	PJM	84%	16%
Dumont_765_Dumteq_999	PJM	79%	21%	PJM	79%	21%
Kyger_Sporn345	PJM	39%	61%	PJM	39%	61%
Olive_345_138XFMR	PJM	84%	16%	PJM		100%
Plano-Electric Junction 345 KV	PJM	48%	52%	MISO	100%	0%
Sidney_XFMR_Bunsonville_XFMR	PJM	48%	52%	MISO	100%	0%

This table generally indicates that alternative 2 is significantly less effective in resolving the electrical interactions than alternative 1. It also raises one additional concern. By placing FirstEnergy and AEP both in PJM, the primary paths to Michigan, which is now in the MISO, would be in a different RTO and subject to a higher degree of interactions than in the base case. The Bay_Sh_345_Mon12_345 and Cook_345_Benton_345 flowgate results in Table 3 are examples of this effect.

The Bay Shore-Monroe flowgate in the base case would be within the MISO with 96% of the generation impacting that flowgate located within the MISO. In alternative 2, the flowgate becomes a seam facility with 75 percent of the resources affecting the flowgate located in MISO and 25 percent in PJM.

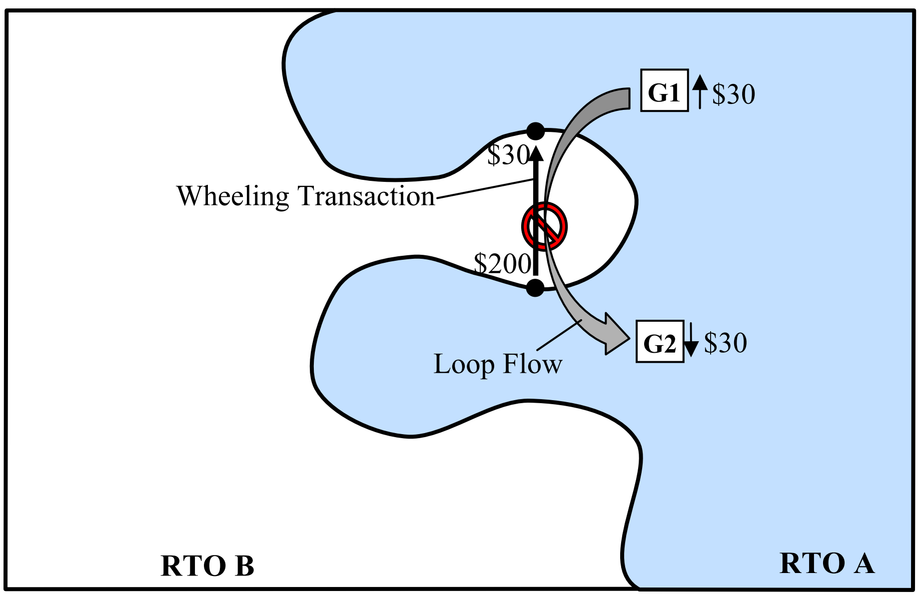
This analysis, though not comprehensive and conclusive, provides important insight regarding the electrical topology of the Midwest transmission systems and the potential market issues associated with membership elections being made by the Alliance RTO members.

Strategic Gaming and Market Monitoring

In addition to the potential efficiency concerns described above, poor configuration can create gaming opportunities that would not otherwise exist within the SMD markets. These gaming opportunities are similar to some of the strategies employed by Enron in the California markets. For example, variants on the "Death Star" strategy would be possible as illustrated in this section.

Assume that generation owner in an RTO (RTO A) can dispatch its units to cause congestion in (RTO B), which would be possible due to the configuration of the RTOs in this example. Having dispatched its units to create this congestion, the supplier could then schedule wheeling transactions across RTO B's system that would apparently help relieve the congestion. This strategy is illustrated in the following figure.

Strategic Gaming Example



In this example, G1 and G2 are generators owned by a single supplier with operating costs of $35 and $25, respectively. The figure also shows the locational prices at these generator locations, indicating that an economic dispatch of the units would reduce the output of G1 and increase the output of G2. However, by dispatching these units uneconomically, the supplier causes a constraint to bind in the RTO B area as shown. This constraint causes a locational price difference of $170 on either side of the constraint. Hence, by scheduling a wheeling transaction across RTO B to apparently relieve the congestion that it created, the supplier will be paid $170 less RTO B's transmission fee. This profit would be balanced against the cost to the supplier of the uneconomic dispatch which, in this case, is $10 for each MW dispatched uneconomically ($35 -$25).

This type of strategy would result in increased uplift charges billed to the RTO B load. What would make this strategy possible is the fact that the locational prices in RTO A do not reflect the constraint on RTO B's system, so that the economic consequences to the generators' dispatch is not borne by the generator as it would normally be in the LMP model.

This is simply one example of the risks that a more complex seam between RTOs will create, increasing the difficulty and importance of monitoring to quickly detect and address these strategies. In general, it is preferable to design market rules and configure the markets to discipline these types of strategies and facilitate efficient market outcomes rather than relying on market monitoring and intervention by the RTO. Please contact me if you have any questions or comments regarding this analysis.

Sincerely,

David B. Patton
President, Potomac Economics