Joint and Common Market Update: Interface Pricing Flaw

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David Patton
President, Potomac Economics

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Introduction

- The Joint and Common Market process is essential because it is the primary means for resolving coordination issues that have large effects on the performance of the MISO and PJM markets.
- We are concerned about two primary issues:
  - ✓ Interface pricing flaws that are generating inefficient incentives to schedule imports and exports; and
  - ✓ Provisions that prevent efficient capacity imports and exports.
- In this update, I focus on the interface pricing issue because it is:
  - ✓ Undermining efficient scheduling of power between the RTOs;
  - ✓ Generating substantial costs for the customers of both RTOs; and
  - ✓ Must be resolved before coordinated scheduling can be pursued.
- We raised this issue more than two years ago and the JCM process has not been successful in addressing it.

Introduction: Interface Pricing

- Interface pricing is essential because:
  - ✓ It is the sole means to facilitate efficient power flows between RTOs.
  - ✓ Poor interface pricing can lead to significant uplift costs and other inefficiency.
  - ✓ They are an essential basis for "coordinated transaction scheduling" or "CTS" to maximize the utilization of the interface.
- One of the key components of the interface price is the congestion component, which reflects the estimated effect of transactions on any constraint in an RTO's market that is binding.
- M2M processes create interface pricing issues because they cause both RTO's to model the *same* constraint.
  - ✓ Hence, the interface prices must be coordinated to avoid duplicative settlements with the transactions.
  - ✓ This is illustrated in the following 2 slides.

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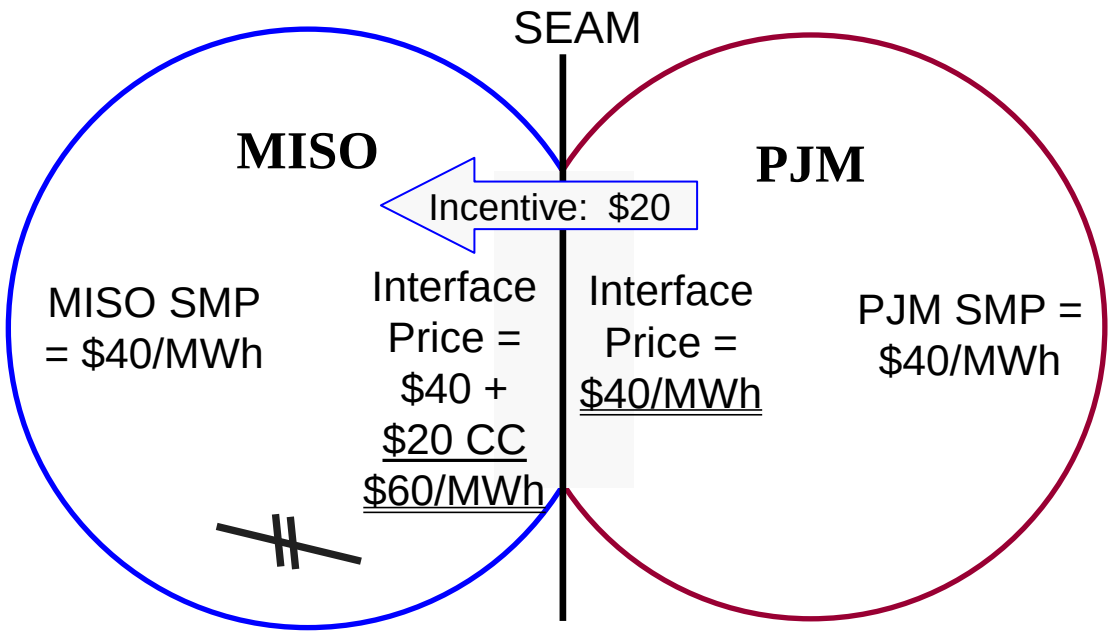
Interface Pricing *without* Market-to-Market (or TLR)



- Assume the binding constraint is *relieved* by an import from PJM.
  - ✓ Without M2M, MISO will estimate the value of the relief ($20 in this example) and the interface price will include a congestion component to incent participants to schedule the transaction.
  - ✓ PJM's interface price would not include a congestion component for this because it is an MISO constraint.

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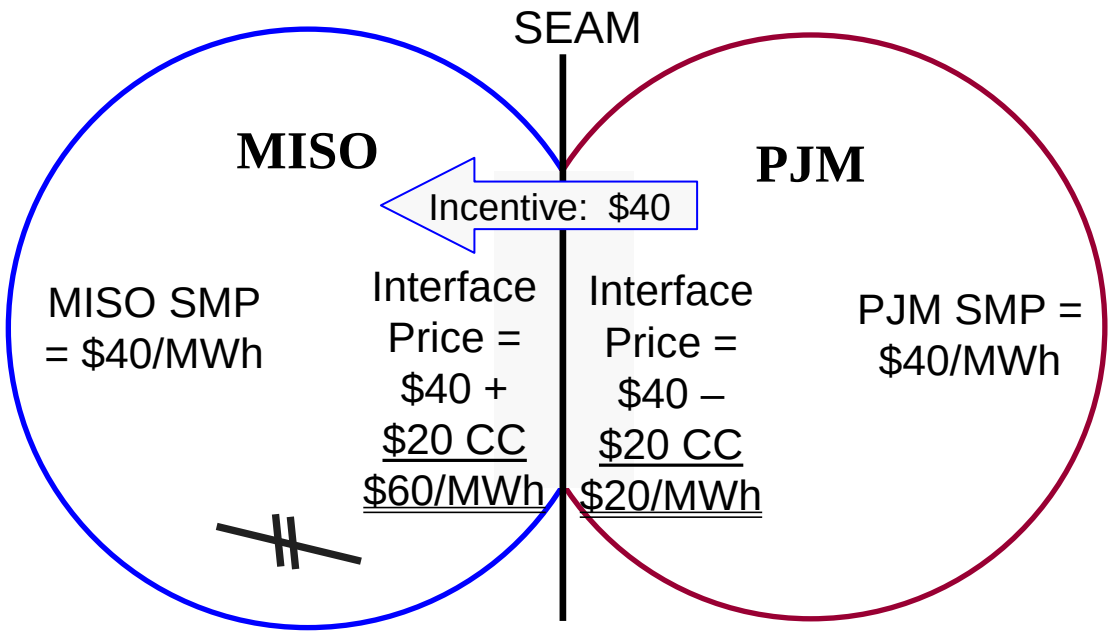
Interface Pricing with Market-to-Market



- Once M2M is initiated, this constraint will appear in both RTOs' dispatch and both will estimate the relief the transaction will provide.
- MISO's settlement is unchanged, but PJM now includes the $20 congestion component in its interface price also, doubling the incentive provided to participants to schedule the transaction ($60-$20).
- PJM's $20 payment will be uplifted to its customers.

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Progress to Date

- After much discussion, the RTOs have agreed that the flaw exists and needs to be addressed.
  - ✓ The flaw is worse than described above because PJM's methodology for setting interface prices tends to exaggerate the effects of imports and exports on transmission constraints near the seam.
  - ✓ This caused MISO's most severe constraint to be over-priced by almost ***600 percent***.
- We proposed a solution that is efficient and equitable: *the monitoring RTO alone should price the constraint at the interface*.
  - ✓ No substantiated concerns has been raised against this proposal and it would not harm the non-monitoring RTO.
- PJM has proposed an alternative that would result in unstable and inefficient interface prices, and likely raise uplift costs.
- Given the seriousness of these concerns and the lack of progress in the JCM, we believe that FERC may need to mandate a resolution.

Interface Pricing and Alternatives for Resolving the PJM-MISO Flaw

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Calculating the Congestion Component at the Interface

- The issue in this case involves the congestion included in the interface price, which is reflected in the congestion component of the LMP.
- The congestion component is calculated by:
  - ✓ Estimating a "shift factor" that indicates the incremental change in flow over a constraint associated with a transaction.
  - ✓ The shift factor is multiplied by the marginal value of the constraint (i.e., the shadow price) to determine the congestion component.
  - ✓ Hence, if the shift factor = 10% and the shadow price = $150, the congestion component will equal $15 per MWh.
- The shift factor is estimated by assuming a source in the neighboring control area (referred to as the "interface definition") and a sink at the "reference bus" in the RTO's own area.

Alternatives for Eliminating Duplicative Settlements

- Two alternatives have been discussed for eliminating the duplicative settlements with PJM:

  1. The monitoring RTO reflects the congestion in its interface price

     ✓ This matches the settlements for non-M2M constraints.

     ✓ The non-monitoring RTO would not include the monitoring RTO's constraints in its interface price.

  2. Both RTO's implement a common interface bus at the seam.

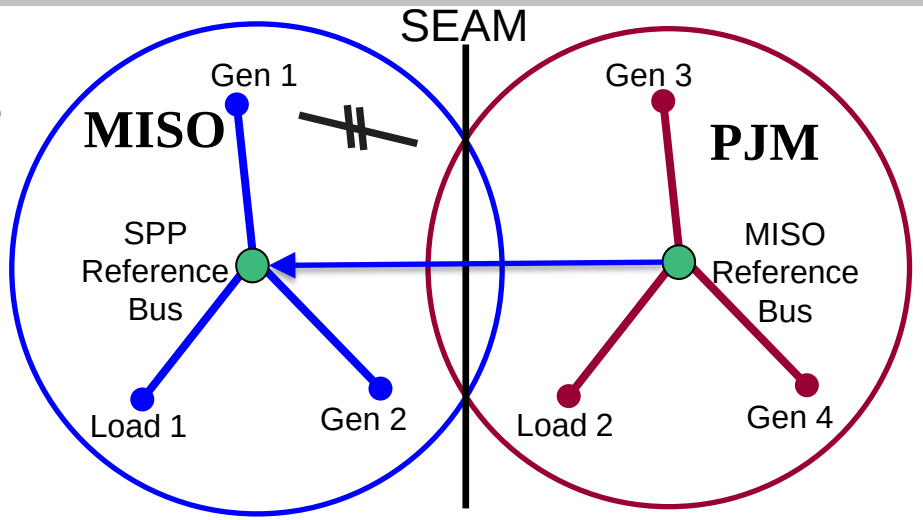
     ✓ Theoretically, this would cause the two shift factors to sum to the value the monitoring RTO would have gotten on its own.

     ✓ Hence, if both RTO's calculate the same shadow costs, their two congestion components should sum to create an efficient settlement.

Interface Pricing Alternatives under Market-to-Market

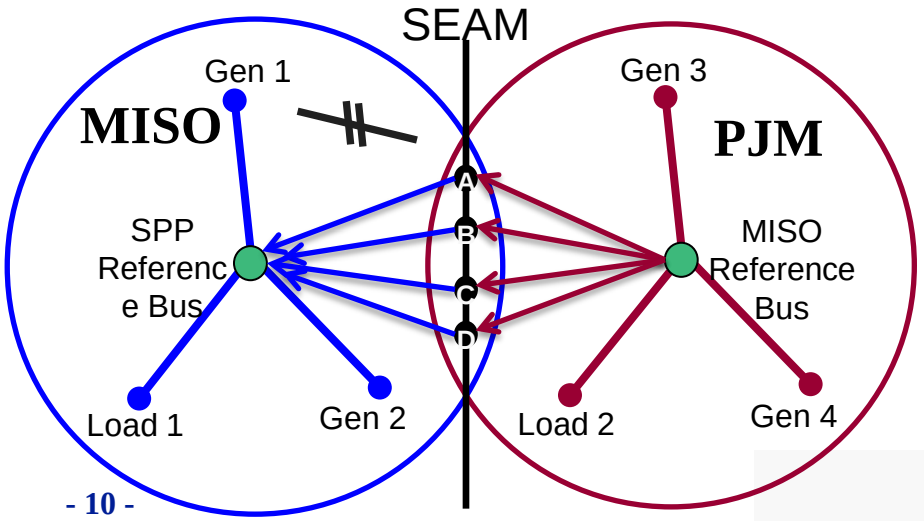
Alternative #1:

- Monitoring RTO prices the entire path from the NMRTO area.
- No payments made by NMRTO.
- No need for settlement adjustments through the JOA to account NMRTO payments.
- Gen and load LMPs



Alternative #2:

- Each RTO sets its interface price relative to a common set of interface points.
- JOA must account for the payments and receipts of the NMRTO.



Interface Pricing Alternatives: Examples

- The following examples show how both Alternatives can produce an efficient settlement with the transaction.
  - ✓ Examples assume a 1 MW export from PJM to MISO that relieves a binding MISO M2M constraint.
- While the net settlement is efficient, The inflated offsetting payments leaves MISO with a shortfall to be uplifted (balancing congestion).

Example 1- Alternative #1

	MISO	PJM	Balancing Congestion/FTR Underfunding
Shadow Cost	$500	0	
Shift Factor	-10%	0	
Congestion Payment	$50	0	None
Total Payment	**$50**		**Payment is efficient**

Example 2- Alternative #2 with Equal Shadow Prices

	MISO	PJM	Balancing Congestion/FTR Underfunding
Shadow Cost	500	500	
Shift Factor	-20%	10%	
Congestion Payment	$100	($50)	MISO= $50 shortfall, PJM= $50 surplus
Total Payment	**$50**		**Payment is efficient**

Interface Pricing Alternatives: Examples

- The following examples shows that when shadow prices do not converge, the incentive to schedule may be understated, overstated or in the wrong direction.

Example 3- Alternative #2 with Non-Convergent Shadow Prices

	MISO	PJM	Balancing Congestion/FTR Underfunding
Shadow Cost	500	100	
Shift Factor	-20%	10%	
Congestion Payment	$100	($10)	MISO= $50 shortfall, PJM= $10 surplus
Total Payment	**$90**		**Transaction overpaid**

Example 4- Alternative #2 with Non-Convergent Shadow Prices

	MISO	PJM	Balancing Congestion/FTR Underfunding
Shadow Cost	100	500	
Shift Factor	-20%	10%	
Congestion Payment	$20	($50)	MISO= $20 surplus, PJM= $50 shortfall
Total Payment	**($30)**		**Transaction Paid to Flow in the Wrong Direction**

Interface Pricing Alternatives: Non-M2M Constraints

- Alternative #2 can distort settlements on non-M2M constraints because there is no offsetting settlement from the neighboring RTO.

Example 5- Alternative #2 for Non-M2M Constraints

	MISO	Balancing Congestion/FTR Underfunding
Shadow Cost	500	
Shift Factor	-20%	
Congestion Payment	$100	MISO= $50 shortfall
Total Payment	**$100**	**Transaction significantly overpaid**

- We analyzed MISO's non-M2M constraints and found that 143 constraints of these would be substantially distorted:
  - ✓ For almost **one quarter** of the constraints, the incentive to schedule imports or exports would reverse direction.
  - ✓ For 60% of the constraints, the absolute value of the change in the shift factor was more than 200 percent of the original value.
- These are sizable distortions that will provide inefficient incentives to schedule transactions between MISO and PJM.

Cook-Palisades Example: February 23rd at 11 pm

- To illustrate these issues and evaluate alternative solutions, we use an example based on one M2M constraint in MISO: Cook-Palisades.
  - ✓ This constraint is in Michigan and was the most active M2M constraint last winter.
- This example illustrate two important issues:
  - ✓ Different interface definitions produce very different shift factors.
  - ✓ Non-convergent shadow prices raise serious pricing concerns with many common interface definitions (including PJM's).
- In the Cook-Palisades example, 20 percent of the hours exhibited PJM shadow prices that were less than 50 percent of MISO's shadow price.
- For illustration, we've select one hour in which PJM's shadow price was roughly half of MISO's.
- The following table shows how the settlement incentives would vary in this hour based on PJM's common interface proposal.

Cook-Palisades Example: February 23rd at 11 pm

		MISO	PJM	Total	Direction
Alternative #1	Shadow Price	$ 797	$ 399		
	Ref-to-Ref Shift Factor	-0.9%			PJM to MISO
	Congestion Payment based on MISO Shadow Price			**$ 7.17**	PJM to MISO
Alternative #2	PJM New Interface Shift Factor	4.2%	-5.1%		
	Congestion Payment ($/MWh)	$(33.47)	$ 20.35	**$(13.13)**	**MISO to PJM**
Actual Results	Actual Interfaces in Feb 2014	-1.1%	-8.3%		
	Congestion Payment ($/MWh)	$ 8.77	$ 33.04	**$ 41.81**	PJM to MISO

- Alternative #1 is the only alternative that provides an efficient incentive.
- Alternative #2 provides an incentive to schedule in the wrong direction.
- The actual pricing in February inflated the scheduling incentives by 600%.

Implications of Divergent Shadow Prices

- When the shadow costs don't converge, the incentive to schedule is distorted and can be in the wrong direction.
  - ✓ In real-time, participants respond to the price signals (with a 20-30 minute lag). We showed how this can result prices and incentives to schedule that are unstable.
- *This inefficiency is likely the largest in the day-ahead market where there is no mechanism to cause the shadow prices to converge.*
  - ✓ Most settlements take place through the day-ahead market.
- We've studied the day-ahead results for the Cook Palisades constraints that we have been examining in the real-time market.
  - ✓ The results on the following slide show the interface price effects of these constraints in January and February related to these constraints.

Day-Ahead Interface Pricing for Cook Palisades

- In January and February of 2014, the Cook-Palisades constraints were binding in MISO or PJM in 82 percent of all hours.
- We estimated the incentive to schedule related to these constraints (the difference in the 2 RTO's congestion components) under the PJM common interface versus allowing MISO to price the constraint, and found:
  - ✓ In **36%** of the hours, the incentive reverses direction;
  - ✓ In **53%** of the hours, the incentive should be zero but PJM is creating an inflated incentive to schedule from PJM to MISO;
  - ✓ In **8%** of the hours, the common interface more than doubles the incentive to schedule from PJM to MISO; and
  - ✓ In only **3%** of these hours is the incentive to schedule within 100 percent of being efficient (positive and less than double).
- Importantly…poor day-ahead scheduling leads to poor commitment, higher costs and more FTR underfunding.

Conclusions

- We have been analyzing these issues and alternative solutions for roughly two years and have the following conclusions:
- Alternative #1 (MISO IMM Proposal):
  - ✓ Ensures efficient interface pricing under all conditions.
  - ✓ Eliminates balancing congestion/FTR underfunding.
  - ✓ No potential unintended consequences have been identified.
  - ✓ There is no inconsistency for the NMRTO to price the M2M constraint at gen/load locations, but not at the interface.
- Alternative #2 (PJM Proposal):
  - ✓ When the shadow costs don't converge, the incentive to schedule is distorted and can be in the wrong direction.
  - ✓ Can be extremely inaccurate for non M2M constraints since there is no companion settlement from the NMRTO.
  - ✓ Requires inter-RTO settlements to account for the NMRTO payments and collections, which can result revenue inadequacies and uplift.

Conclusions

- We have validated the conclusions regarding these alternatives with empirical data on actual MISO and PJM M2M constraints.
- Making the MRTO responsible for pricing its own constraints at the interface (Alternative 1) has significant benefits and no costs in comparison to:
  - ✓ Dividing responsibility by adopting a “common interface” at the seam (Alternative 2), or
  - ✓ Allowing the RTO’s to engage in duplicative settlements at the interface (no common interface).
- Although only one efficient solution that has been established, the RTOs have been discussing these issues for over 2 years.
- We are not optimistic that an efficient solution will implemented without a FERC mandate to do so.