Alternatives for Addressing the Interface Pricing Flaw

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Introduction

- MISO and PJM's interface prices are currently flawed when a market-to-market constraint is binding.
  - ✓ Transactions are over-paid/over-charged when they settles with both RTOs because both RTO's are pricing its full effect on the constraint.
  - ✓ In other words, *every dollar paid by the non-monitoring RTO for the same relief is redundant with the payment made by the monitoring RTO.*
- We have been working with the RTOs to understand the flaw and develop alternative solutions that can be implemented quickly.
- We believe there is now consensus between the RTOs and market monitors on the existence and nature of the flaw.
- This presentation provides an update on this issue and the potential alternatives for addressing the flaw.

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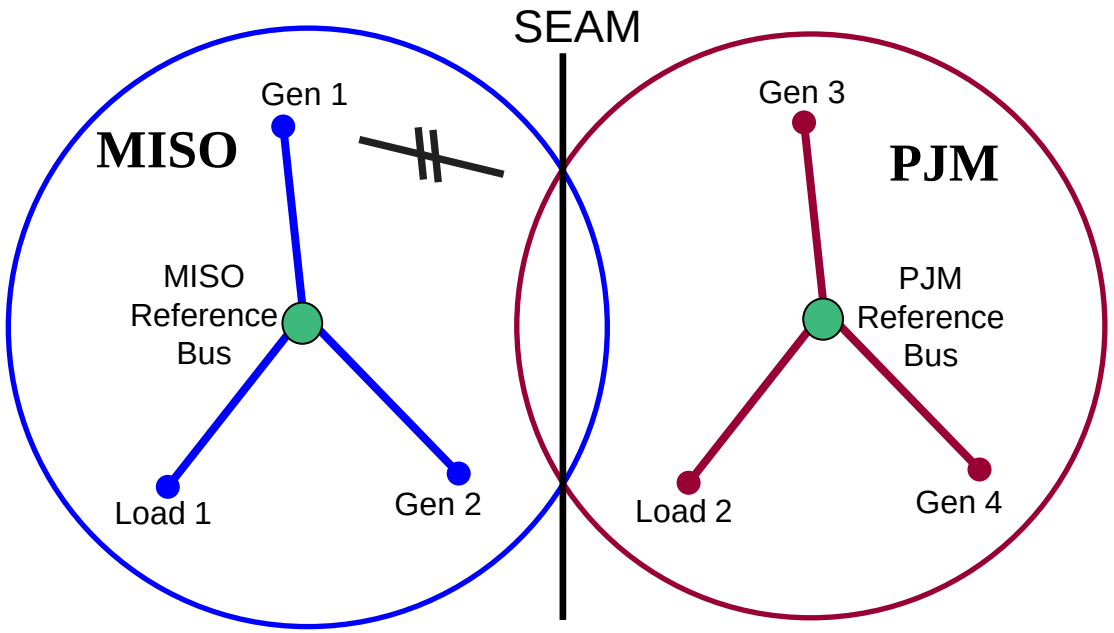
Does the Interface Pricing Flaw Raise Substantial Concerns?

- **Yes.** Our primary concern with this error is that it provides inefficient scheduling incentives and, therefore, will cause:
  - ✓ Efficient transactions to not be scheduled; and
  - ✓ Inefficient transactions to be scheduled.
  - ✓ These inefficient transaction patterns lead to higher production costs and, ultimately, to higher costs to the RTO's consumers.
  - ✓ Although these effects would be very difficult to quantify, we believe the costs are large.
- It also raises substantial equity concerns because the redundant payments by the non-monitoring RTO results in:
  - ✓ Balancing Congestion (called negative ECF in MISO);
  - ✓ FTR underfunding.

Solutions to the Interface Pricing Flaw

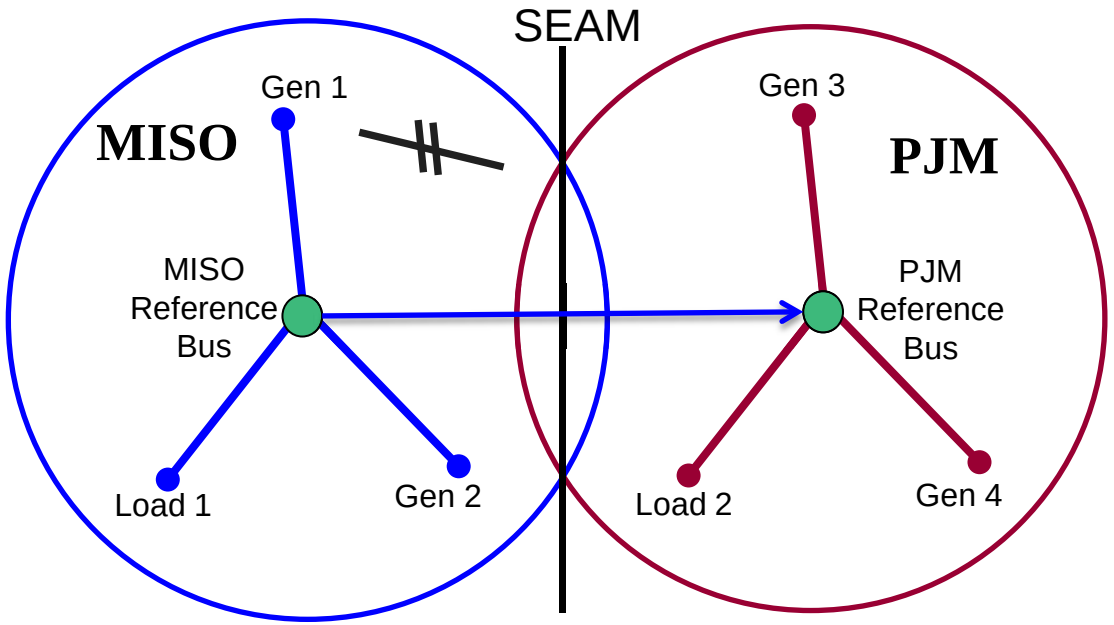
- The following figures show alternative means of addressing the pricing flaw by a combination of:
  - ✓ Changing the definition of the interfaces; and
  - ✓ Excluding congestion that is already priced in the interface prices of the adjacent RTO.
- The following figures show how all of the locational congestion effects are measured against a central "reference bus". These effects are reflected in the LMPs at all of the generation and load locations.
- The efficient settlement for transactions between PJM and MISO should price the congestion between the two reference buses.
  - ✓ The second and third figures show that there are two ways to accomplish this through alternative interface definitions.
  - ✓ The interface definition is the assumption an RTO makes about the source (or sink) for an import (or export) from the other RTO.
  - ✓ This choice determines the estimated effects of the transaction on any binding constraint

Market-to-Market Without External Transactions



- Each RTO estimates the relative flow effect of every generator and load on a binding constraint relative to its own reference bus.
- The congestion component at every node pays/charges each generator and load based on its marginal impact on the constraint.
- This outcome will be efficient as long as the non-monitoring RTO's shadow cost for the constraint converges with the monitoring RTO's.

Market-to-Market With External Transactions: Alternative #1



- Once external transactions are added, the RTOs must price the marginal impact on the constraint of moving power from one area to the other.
- Since the marginal impacts of all generators are already priced relative to each RTO's reference bus, the remaining task is to price the marginal effect of injecting at one reference bus and withdrawing at the other.
- In this example, MISO is pricing this effect by assuming the power is withdrawn at PJM's reference bus when pricing its PJM interface.

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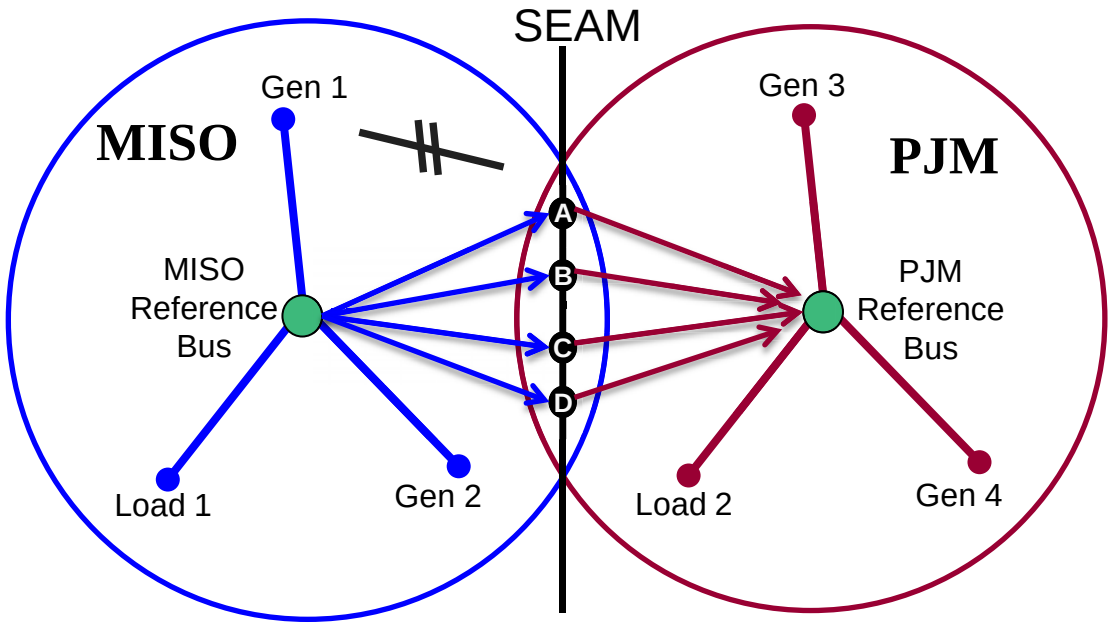
Market-to-Market With External Transactions: Alternative #2



- Defining a common interface definition accomplishes the same outcome.
  - ✓ MISO prices congestion effects ***from*** its Reference Bus to A, B, C, and D, while PJM prices the same effects from the seam ***to*** its Reference Bus.
  - ✓ Total Settlement for the transaction = $MISO_{reference}$ to $PJM_{reference}$
  - ✓ This interface definition sharply increases the interface congestion prices for many constraints. The net settlement is "reference to reference" because the RTOs' congestion effects will offset (only for M2M constraints).

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Why is Alternative #1 Better?

If both alternatives accomplish the same objective of pricing the transfer of power from one reference bus to the other, why not implement Alternative #2?

1. Defining the interface by the seam points A, B, C, D can be extremely inaccurate for non M2M constraints.
   - ✓ What makes this definition work for M2M constraints is that any inaccuracies in MISO's settlement will be offset by PJM's settlement.
   - ✓ For example, if the accurate total congestion payment is $20, MISO may pay $45 and PJM may collect $25, netting to a settlement of $20.
   - ✓ For a non-M2M constraint, MISO would just pay $45 with no PJM offset.
2. When the shadow costs don't converge, the settlement will not be efficient.
   - ✓ The monitoring RTO's shadow cost is the true marginal cost of managing the constraint and should be the basis for the entire settlement.
3. Alternative #2 requires complicated settlements between the RTO's to account for the payments and collections of the non-monitoring RTO.
4. The RTO's are likely to be revenue inadequate when the shadow costs don't converge (resulting in balancing congestion and FTR underfunding).

PJM's Concern with Alternative #1

- PJM remains concerned that Alternative #1 could result in unforeseen balancing congestion or FTR underfunding.
  - ✓ It has not produced any examples of how this could occur.
- We see no potential that Alternative #1 could produce these effects.
  - ✓ Balancing congestion arises when day-ahead modeling of constraints is inconsistent with real-time modeling.
  - ✓ FTR under-funding arises with the FTR modeling is inconsistent with the day-ahead modeling of transmission constraints.
  - ✓ Alternative #1 raises no such potential inconsistencies.
- As long as congestion effects of imports and exports on MISO M2M constraints are excluded from PJM's FTR market, and DA and RT markets, Alternative #1 cannot produce FTR underfunding or balancing congestion.
- In fact, Alternative #1 will lower balancing congestion and FTR underfunding:
  - ✓ PJM would no longer making payments for MISO M2M constraint relief.
  - ✓ Since PJM gets no market flow credit or other reimbursement from MISO for these payments, they translate directly into balancing congestion and FTR underfunding.

Interface Pricing Flaw Solutions: Examples

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

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 Flaw Solutions: Examples

- The following examples shows that when shadow prices do not converge, or the constraint is not a M2M constraint, the settlement is inefficient and the RTOs will incur net balancing congestion or FTR underfunding.

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 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**

Conclusion

- We have a number of substantial concerns with Alternative #2:
  - ✓ It produces inefficient interface prices under many conditions; and
  - ✓ It will produce balancing congestion and FTR underfunding.
- Alternative #1 ensures efficient interface pricing under all conditions, and eliminates balancing congestion/FTR underfunding.
- Hence, we are recommending that MISO:
  - ✓ Redefine its PJM interface to assume the injection/withdrawal at the PJM reference bus.
  - ✓ Define interfaces based on a centroid in the adjacent area.
  - ✓ Remove PJM M2M constraints from its PJM interface price.
  - ✓ Keep PJM M2M constraints in its other interface price and work out a market flow credit from PJM for these payments.
  - ✓ Remove all other external constraints (TLR) from its interface prices.
- Ideally PJM would do the same, which will lower its FTR underfunding and ensure efficient incentives for physical schedulers.