



Joint and Common Market
PSEUDO TIE UPDATE

AUGUST 22, 2017



Agenda

1.	Overview
2.	MISO Update
3.	PJM Update
4.	JOA Changes – Joint Filing
5.	Congestion Overlap
6.	Next Steps
	Appendix

Overview

Purpose

- Provide a status update on MISO-PJM efforts to address pseudo tie issues

Goals

- Address enhancements/alternatives for pseudo tie challenges

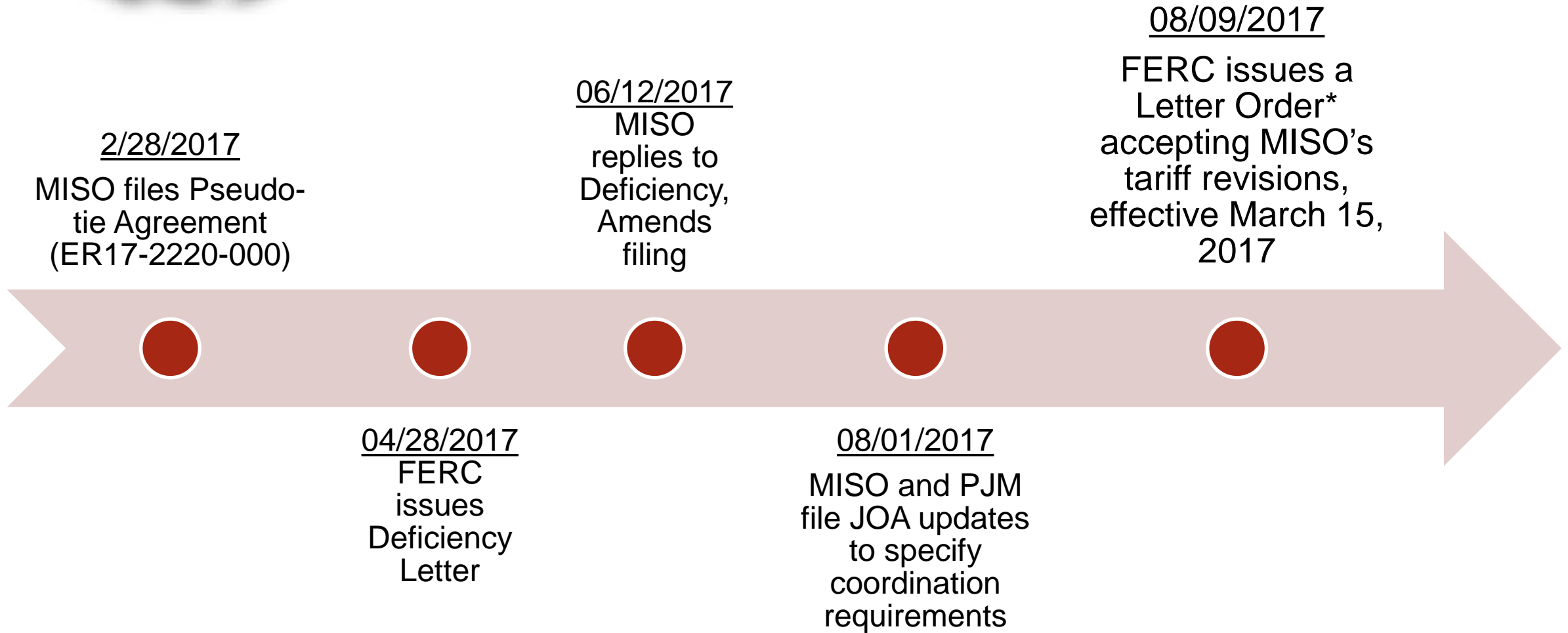
Key Takeaways

- MISO and PJM recently filed JOA updates as part of implementing enhanced pseudo-tie administration processes
- PJM enhancing pseudo-tie capacity requirements
- MISO and PJM jointly developed a solution for congestion overlap to resolve Section 206 Complaints

Background

- PJM and MISO have reliably administered a significant increase in pseudo-ties since start of the 2016-2017 planning year
- Additional administrative enhancements pending or approved for future planning years
- Congestion Overlap issue has led to FERC complaints

MISO Pseudo Tie Administration Update



*Subject to refund and further Commission Order

MISO Status Update

- Make whole payments for commitment/dispatch for local reliability issues – on hold
- NAESB/NERC – Pseudo-Tie Guidelines document were out for comments due 08/09/2017
- Congestion Overlap – included in another section

PJM Overview: Main Challenges with Pseudo-ties

- Network Model Expansions - EMS and Markets Modeling Challenges adhering to NERC and FERC compliance standards
- Planning Analysis – External entity planning analysis comparability to PJM planning criteria
- Congestion Management – Local and Regional external system Congestion Management challenges



PJM Pseudo-tie Initiatives

Pseudo-tie Initiative	Description	Required Changes	Status
Pseudo-tie requirements for new and existing resources	Rules for external capacity eligibility in PJM capacity market	Tariff & RAA	<ul style="list-style-type: none"> • Filed March 9, 2017 • Deficiency notice on May 5, 2017 • PJM response due on September 17, 2017
Pro-Forma Agreement	<ul style="list-style-type: none"> • Operational and implementation agreement between PJM, external entity, and pseudo-tie owner • Operational and implementation agreement between PJM and pseudo-tie owner (Pseudo-ties located in MISO) 	Pro-Forma Agreement	<ul style="list-style-type: none"> • Filed August 11, 2017
PJM-MISO JOA changes	PJM-MISO changes in lieu of MISO signing pro-forma agreement	JOA (MISO)	<ul style="list-style-type: none"> • Filed August 1, 2017
Overlap of Congestion (PJM-MISO joint initiative)	Solution for resolving the over or under collection of congestion for pseudo-tie resources	<ul style="list-style-type: none"> • JOA • Tariff/OA 	<ul style="list-style-type: none"> • Phase 1: JOA changes (Tentative ISD 12/1/17) <ul style="list-style-type: none"> ➤ Expected JOA filing in September • Phase 2: Tariff/OA changes (Tentative ISD 6/1/18)

PJM Pseudo-tie Proposed requirements

PJM has proposed, and filed with FERC, the following for the treatment of new external resources.

Modeling Requirements

- Limitation on the electrical distance a resource can be from PJM and be able to provide capacity.
- Network models for PJM and external area need to be aligned for potential coordinated flowgates

Deliverability Analysis

- Require that external capacity resources have firm transmission service that was studied using the standards that PJM applies for internal resources.

Market Requirements

- Require that for external capacity resources, PJM obtains firm rights for its impacts.
- Require that resource does not result in less than optional dispatch, as a result of being the only resource with any impact on additional coordinated flowgates. (1.5% Test)

PJM Pseudo-tie Proposed Requirements(cont)

PJM has proposed, and filed with FERC, the following for treatment of existing external resources*

- External resource owners with long term contracts with PJM load may be permitted to participate for the life of the asset
 - Evidence needed of a long-term contract or equivalent documented agreement with internal PJM load to sell the capacity and energy of the external resource 10 years or longer and was entered into on or before June 1, 2016
- External resource owners without long term contracts with PJM load may be permitted to participate for the next two RPM auctions (thru 2021/2022 Delivery Year)

*Subject to Operational Deliverability

Pseudo-tie JOA Changes: Joint Filing

PJM and MISO have coordinated and developed a set of standard definitions, rules, and responsibilities associated with Pseudo-ties between PJM and MISO.

- Language removes the need for MISO to sign PJM proposed Pro-forma Pseudo-tie agreement
- Filed on August 1, 2017

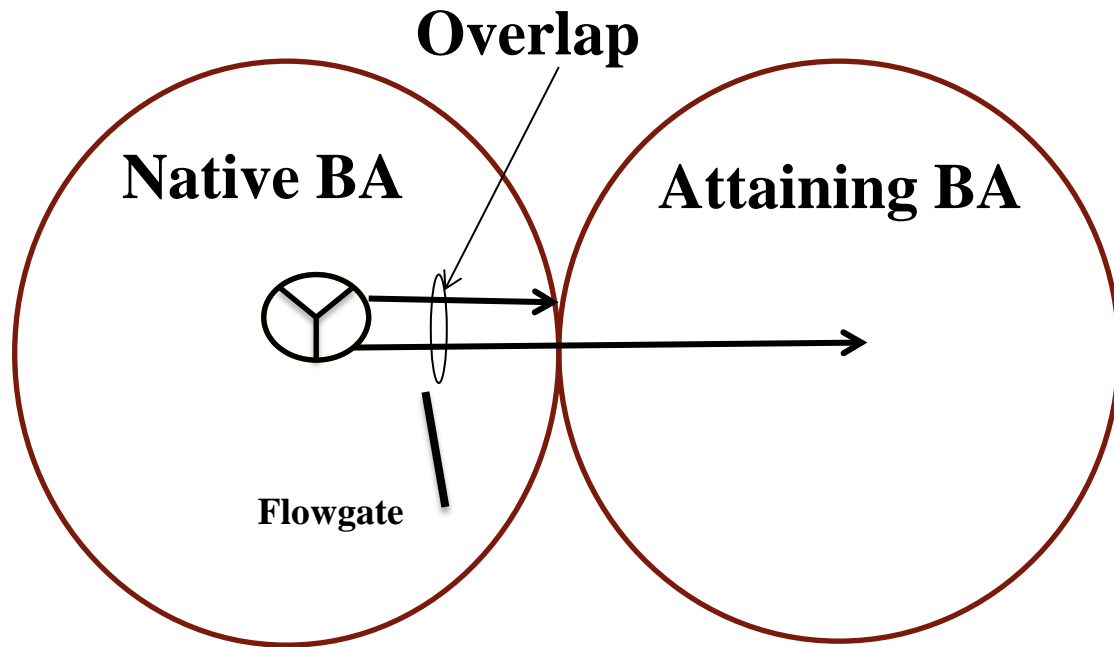


PSEUDO TIES: CONGESTION OVERLAP

Congestion Overlap: Background

- Pseudo-Tie Market-to-Market congestion overlap between two RTOs is a complex issue and has led to FERC Complaints
- RTO Joint Operating Agreements (JOAs) and included Market-to-Market coordination and settlement rules may not appropriately accommodate the unique modeling, implementation and settlement circumstances associated with Pseudo-Tie Assets (Load or Generation)
- MISO and PJM are working to better administer Pseudo-Ties as well as mitigate modeling and market impacts that have been identified

Pseudo-tie Overlap: Issue Explanation



- Current settlement process
 - Native BA creates a financial schedule to capture the congestion and loss between the source and interface point.
 - Attaining BA models the unit like any other asset in its market and establishes an LMP to settle in the energy market.
- Clarification of the congestion cost overlap
 - The congestion cost overlap only occurs when an associated M2M constraint binds in both markets (i.e. both markets are binding on same constraint)
 - The overlap could be a payment or a charge depending on the location of the constraint and the pseudo-tied unit.

Congestion Overlap Solution

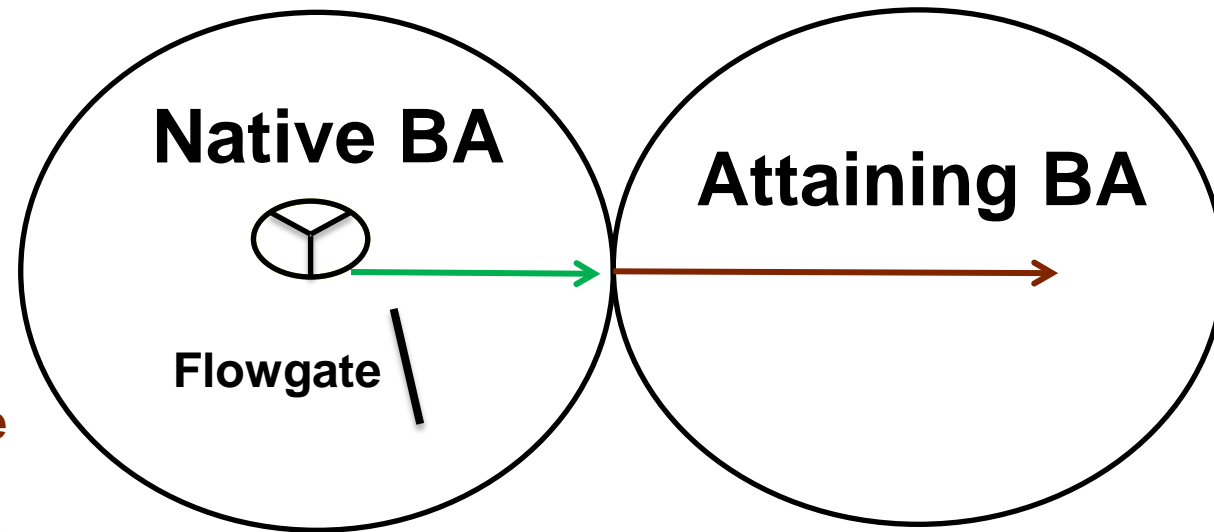
The MISO PJM Joint solution settles Pseudo-tie Transactions similar to dynamically scheduled interchange for M2M constraints

Native BA

- Interchange Transactions pay the Native BA congestion costs between the Asset in the Native BA and the border (LMP differences)
- Interchange Transactions have congestion rights available in the Native BA to hedge congestion between Asset in the Native BA and the border. (FTRs and/or ARR)

Attaining BA

- Interchange Transactions pay the Attaining BA congestion costs between border and the Asset in the Attaining BA (LMP differences)
- Interchange Transactions may have congestion rights available to hedge congestion between border and the Asset in the Attaining BA. (FTRs and/or ARR)

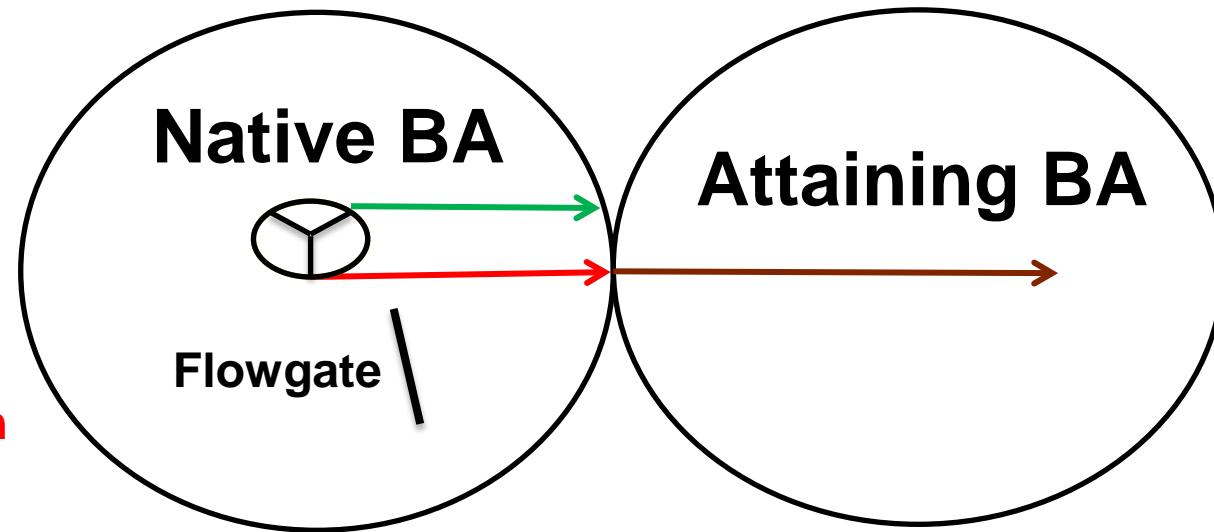


Congestion Overlap Solution

Joint solution addresses unique Pseudo-Tie modeling elements that achieve outcomes similar to dynamically scheduled interchange for M2M constraints

Unique to pseudo-tie modeling

- **Pseudo-Tie transactions pay the Attaining BA congestion costs (on M2M flowgates) between Asset in the Native BA and the Border**
- **Pseudo-Tie transactions may not have congestion rights (or another refund mechanism) available to hedge (or rebate) congestion between the Asset in the Native BA and the border. (FTRs and/or ARRs, or special refunds mechanism) [Solution element]**
- **Pseudo-Tie transactions are not able to schedule in the Native BA Day-Ahead Market to align hedges with congestion exposure [Solution element]**
- **There are no Market-to-Market payments for dynamically scheduled transaction Gen-to-Load (Market Flow) impacts [Solution element]**



Congestion Overlap: Updated Solution

Phase 1 (December 2017)

- The RTOs will coordinate and model firm flows impacts before the Day-ahead run so that the congestion and the Day-ahead LMPs for the Pseudo-Tie Resources will better reflect expected Real-Time congestion. This removes the majority of overlapping congestion.
- In RT, Market-to-Market settlements will be adjusted to account for Pseudo-tie impacts. This will ensure the Attaining BA receives credit for Pseudo-tie resource flow from the unit to the interface.

Phase 2 (June 1, 2018)

- Future systems, Tariff and JOA enhancements will allow for optional scheduling and settlement of pseudo-tie transactions in the Native BA's Day-Ahead Market, in order to more effectively coordinate, administer markets, and align congestion charges with available hedges.
- Pseudo-Tie owners with historic load obligations will obtain Day-ahead congestion credit for the path from the unit to interface in the Attaining BA.
- Pseudo-Tie owner will be refunded/charged for deviations between Day-ahead and Real-time in the Attaining BA.

Congestion Overlap: Solution Phase 1

Requires JOA agreement and system changes only

Day-Ahead Markets

The RTOs will coordinate pseudo-tie FFE impacts. The Attaining BA will model flowgate capacity impact consistent with the pseudo-tied approved MW to better reflect congestion in the day-ahead market, including LMPs, for Pseudo-Tie Resources. The Native BA will model the Pseudo-Tie Resource impacts as loop flows.

Real-Time Markets

In Market-to-Market settlements, Market Flow calculations will be adjusted for Real-Time to credit the Attaining BA for Pseudo-Tie Resource flows on the path from Pseudo-Tie Resource to interface based on actual MW output of the unit.

Congestion Overlap: Phase 2

Implementation in 2018 because of requirements for PJM/MISO Tariff changes and more extensive software changes. Solution extends Phase 1 with the addition of the following:

Attaining BA will issue refunds to Pseudo-Tie Transactions (those with load contracts) for congestion costs paid in the Day-Ahead Market. In the Real-Time Market, credits/charges will be issued to Pseudo-Tie Transactions based on deviations from Day-Ahead Scheduled Transactions.

The Native BA will provide an option for Pseudo-Tie Transactions to submit a pair of virtual transactions in the Day-Ahead Market to align Transmission Usage Charges with available FTR hedges.

Phase 2: Pseudo-Tie Virtual Capacity Transfer and Rebate

PJM RTO

Generator = 100 MW DA, 100 MW RT
 Shift Factor = 20%
 Pseudo-Tie FG impact= 20 MW DA, 20 MW RT

PJM/MISO Interface

Flowgate

Native FTR Path

- The proposal gives the pseudo-tie owner the option to clear offsetting virtual transactions in the Native BA and the Attaining BA to transfer RCF capacity.

Payment	PJM	MISO
FFE (MW)	40	60
Pseudo-Tie DA FG Flow (MW)	-20	0
Capacity Transfer Transaction modeling (MW)	+20	-20
DA Shadow Price	-\$50	-\$100
DA M2M Settlement	\$0	\$0
DA Congestion	\$2,000	\$6,000
Pseudo-Tie DA Revenue (Asset Congestion / Virtual Congestion)	\$1,000	\$2,000
Pseudo-Tie(Load) DA Refund/ FTR	\$1,000	\$2,000
RT Shadow Price	-\$200	-\$200
Pseudo-Tie RT Deviation value (MW)	0	N/A
Pseudo-Tie RT Congestion/TUC	\$0	\$4,000
Pseudo-tie RT Virtual Charge	N/A	-\$4,000
Pseudo-tie RT Congestion Rebate	\$0	N/A
RT Adjusted Market Flow	40	60
M2M Pseudo-tie Settlement	\$0	\$0

Assumption: DA Output = RT Output

Phase 2: Pseudo-Tie Virtual Capacity Transfer and Rebate

PJM RTO

Generator = 100 MW DA, 110 MW RT
 Shift Factor = 20%
 Pseudo-Tie FG impact= 20 MW DA, 22 MW RT

PJM/MISO Interface

Flowgate

Native FTR Path

- The proposal gives the pseudo-tie owner the option to clear offsetting virtual transactions in the Native BA and the Attaining BA to transfer RCF capacity.

Payment	PJM	MISO
FFE (MW)	40	60
Pseudo-Tie DA FG Flow (MW)	-20	0
Capacity Transfer Transaction modeling (MW)	+20	-20
DA Shadow Price	-\$50	-\$100
DA M2M Settlement	\$0	\$0
DA Congestion	\$2,000	\$6,000
Pseudo-Tie DA Revenue (Asset Congestion / Virtual Congestion)	\$1,000	\$2,000
Pseudo-Tie(Load) DA Refund/ FTR	\$1,000	\$2,000
RT Shadow Price	-\$200	-\$200
Pseudo-Tie RT Deviation value (MW)	2	N/A
Pseudo-Tie RT Congestion/TUC	\$400	\$4,400
Pseudo-tie RT Virtual Charge	N/A	-\$4,000
Pseudo-tie RT Congestion Rebate	\$-400	N/A
RT Adjusted Market Flow	38	62
M2M Pseudo-tie Settlement	-\$400	\$400

Phase 2: Pseudo-Tie Virtual Capacity Transfer and Rebate

PJM RTO

Generator = 100 MW DA, 90 MW RT
 Shift Factor = 20%
 Pseudo-Tie FG impact= 20 MW DA, 18 MW RT

PJM/MISO Interface

Flowgate

Native FTR Path

- The proposal gives the pseudo-tie owner the option to clear offsetting virtual transactions in the Native BA and the Attaining BA to transfer RCF capacity.

Payment	PJM	MISO
FFE (MW)	40	60
Pseudo-Tie DA FG Flow (MW)	-20	0
Capacity Transfer Transaction modeling (MW)	+20	-20
DA Shadow Price	-\$50	-\$100
DA M2M Settlement	\$0	\$0
DA Congestion	\$2,000	\$6,000
Pseudo-Tie DA Revenue (Asset Congestion + / Virtual Congestion)	\$1,000	\$2,000
Pseudo-Tie(Load) DA Refund/ FTR	\$1,000	\$2,000
RT Shadow Price	-\$200	-\$200
Pseudo-Tie RT Deviation value (MW)	-2	N/A
Pseudo-Tie RT Congestion/TUC	-\$400	\$3,600
Pseudo-tie RT Virtual Charge	N/A	-\$4,000
Pseudo-tie RT Congestion Rebate	\$-400	N/A
RT Adjusted Market Flow	42	58
M2M Pseudo-tie Settlement	\$400	-\$400

Tentative Next Steps Timeline

Due Date	Who	Action
Aug – Nov 2017	MISO, PJM, Stakeholders	MISO and PJM develop and present specific tariff changes to implement Solution (Draft JOA changes posted)
Sep 2017	MISO, PJM	MISO and PJM will file JOA changes to implement M2M adjustments
Nov-Dec 2017	FERC, MISO, PJM	Act on MISO and PJM JOA filings, MISO and PJM implement Phase 1 solution
Dec 1, 2017	MISO, PJM	MISO and PJM file additional JOA changes and Tariff changes
Feb 1, 2018	FERC	Act on MISO and PJM JOA and Tariff filings
Mar – May 2018	MISO, PJM	Deliver changes to DA, M2M, and settlement systems for Solution
Jun 1, 2018	MISO, PJM	Implement Phase 2 Solution

Contacts

Stakeholder feedback – send comments to:

- Kevin Vannoy kvannoy@misoenergy.org
- Tim Horger Tim.Horger@pjm.com



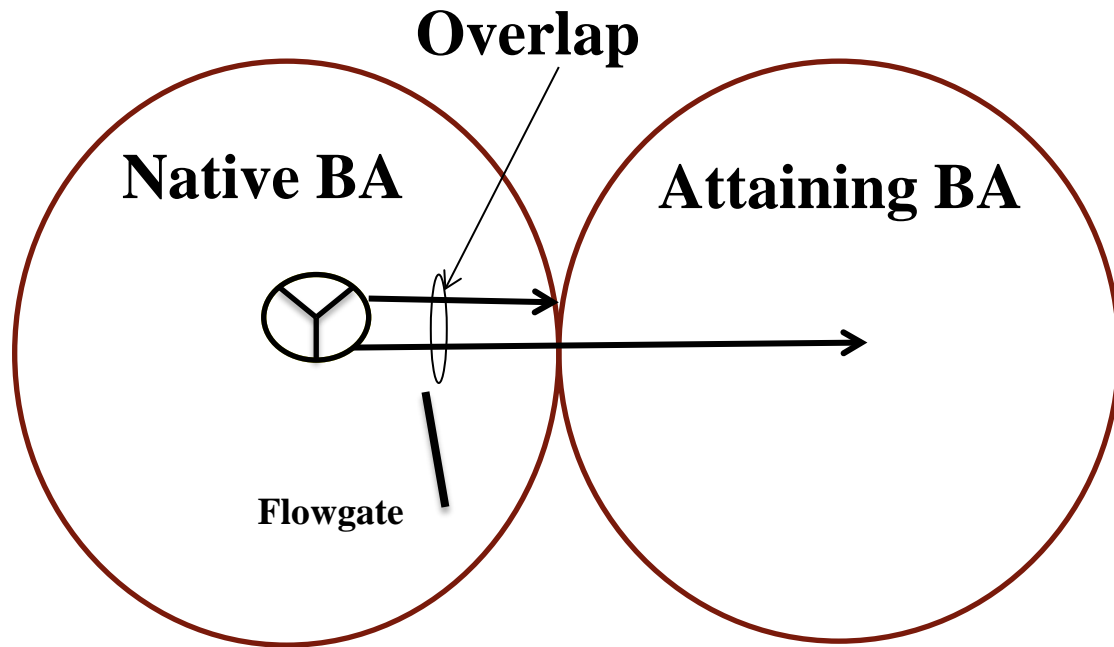
APPENDIX A: Issue Elaboration and Explanation

Congestion Overlap: Issue Elaboration

Pseudo-Tie Discussion

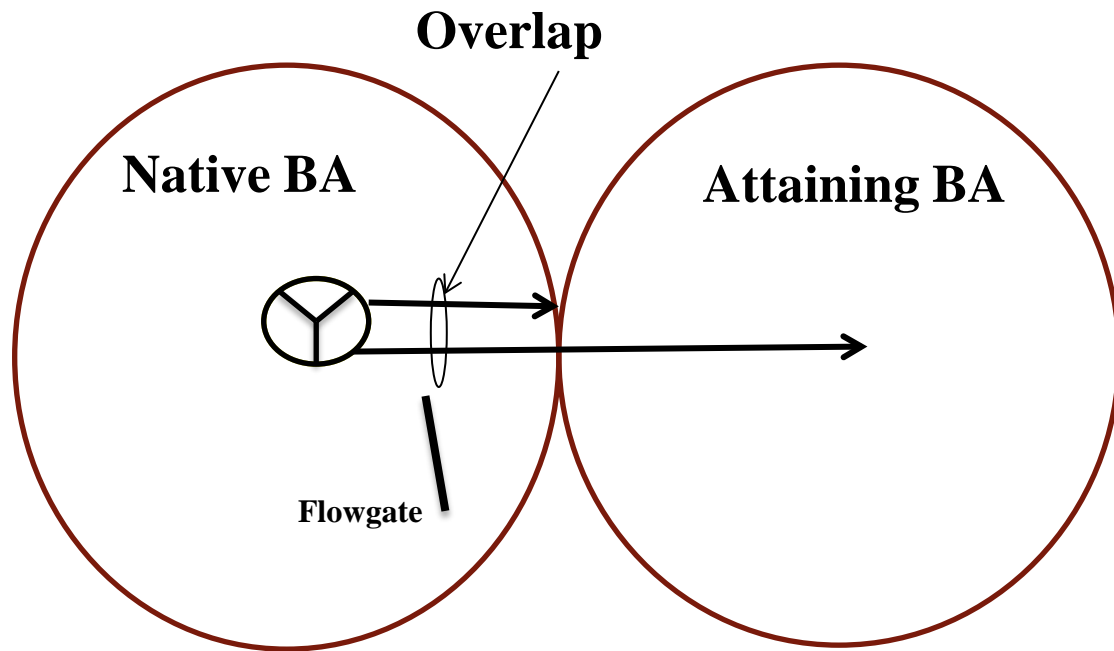
- Generation Resources that implement interchange via pseudo-tie between the Native BA and Attaining BA schedule and/or offer only in the ABA energy market. The transactions or offers are assessed charges based on the scheduled volume/offer and the Marginal Congestion Component (MCC) for the locational marginal prices (LMPs).
- Native BA assessed Transmission Usage Charges are comparable to those assessed to dynamic scheduled interchange. Pseudo-tie Transmission Customers are afforded the similar treatment as dynamic schedules with respect to Transmission Rights.
- The Congestion Overlap occurs on the pseudo-tie transaction path between the source Generation and sink Interface for congestion associated with Reciprocal Coordinated Flowgates coordinated between the RTOs under Market-To-Market.
- For Market-to-Market Coordination, the Pseudo-Tie transaction is included in the Market Flow calculation of the Attaining BA, and therefore may result in payments from the ABA to the NBA for congestion relief.

Pseudo-tie Overlap: Issue Explanation



- Current settlement process
 - Native BA creates a financial schedule to capture the congestion and loss between the source and interface point.
 - Attaining BA models the unit like any other asset in its market and establishes an LMP to settle in the energy market.
- Clarification of the congestion cost overlap
 - The congestion cost overlap only occurs when an associated M2M constraint binds in both markets (i.e. both markets are binding on same constraint)
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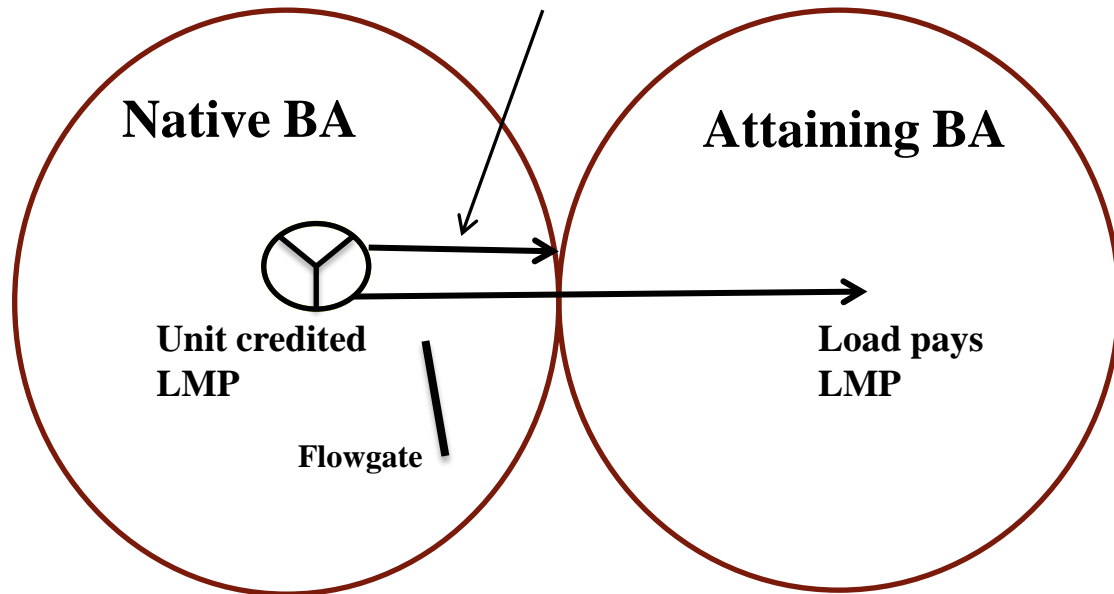
How are the markets impacted by overlap?



- Attaining BA is responsible for increased congestion on Native system associated with M2M as a result of the pseudo-tie
 - This cost is covered through M2M
- Native BA remains responsible for local congestion (non-M2M) as a result of the pseudo-tie
 - This cost is part of the RT transaction charge in the Native BA
- Both markets are accounting for the M2M congestion (Overlap)
 - Attaining in DA, RT, and M2M payments
 - Native through Real-time transaction charge

How is Pseudo-tie unit impacted by overlap?

RT Transaction charged to unit
(FTR valued in Day-ahead)

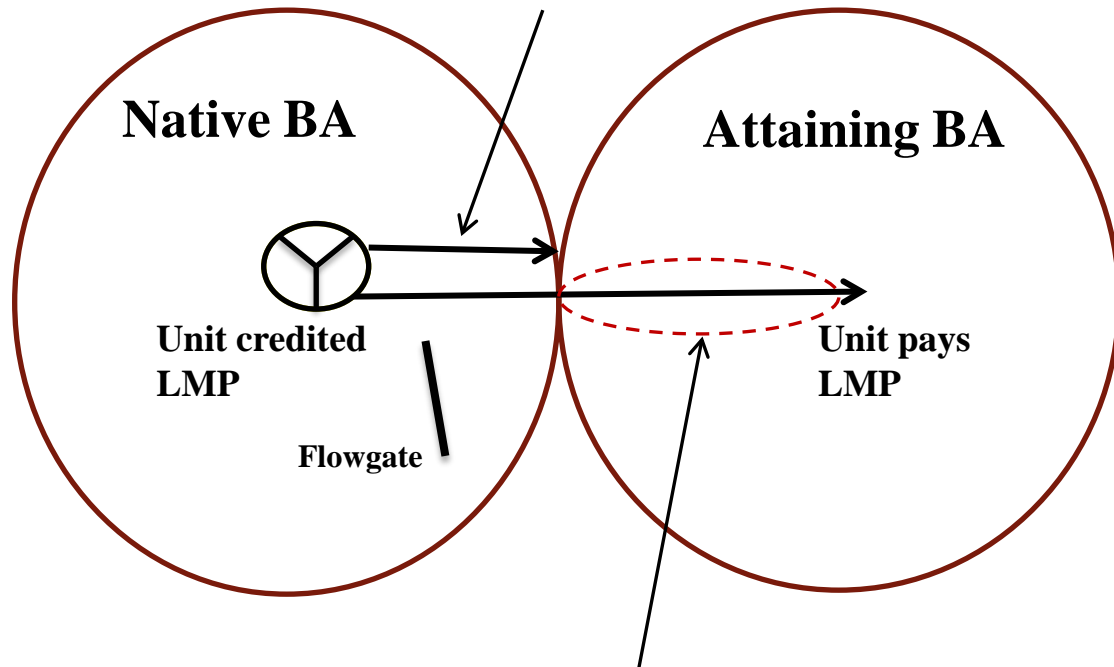


If pseudo-tie has no specific load obligation in attaining BA

- Unit receives DA LMP from Attaining that does not reflect congestion of RT usage because attaining BA does not receive Firm impacts from unit
- Load in Attaining BA is paying the Load LMP to transfer energy from unit that does not reflect RT usage
- Unit/Load charged/credited deviations in Attaining BA
- Unit pays RT transaction in Native that does reflect actual RT usage and may receive FTR that only hedges DA

How is Pseudo-tie unit impacted by overlap?

RT Transaction charged to unit
(FTR valued in DA)



FTR in Native only from
Interface to Load

If pseudo-tie has specific load
obligation in attaining BA

- Unit receives DA LMP from Attaining that does not reflect congestion of RT usage because Attaining BA does not receive FFE impacts from unit
- Unit receives FTR in Attaining for only the portion from Interface to load
- Unit charged/credited deviations in Attaining
- Unit pays RT transaction in Native that does reflect actual RT usage and may receive FTR that only hedges DA