MISO-PJM JOA Biennial Review

Midcontinent ISO
PJM Interconnection
02/25/2020

1. Background

On January 4, 2011, Midcontinent Independent System Operator, Inc. (MISO) and PJM Interconnection, LLC (PJM) filed a joint Settlement Agreement to resolve two MISO complaints against PJM and one PJM complaint against MISO. On June 6, 2011, the Federal Energy Regulatory Commission (FERC) approved the Settlement, and accepted the proposed tariff revisions, effective the date of the order, subject to a compliance filing.

In the Settlement, MISO and PJM agreed to conduct a review of the processes and procedures used to implement the Joint Operating Agreement (JOA) between the two organizations. Accordingly, Utilicast, LLC was retained jointly by MISO and PJM to conduct this review. Utilicast completed the JOA Baseline Review report on January 20, 2012. This review found that both MISO and PJM were in conformance with the JOA provisions, but that there were opportunities for increased communication and documentation that might proactively prevent future conflicts. These items were detailed in a series of eighteen findings and recommendations.

The Settlement Agreement also specifies that beginning two years after the issuance of the JOA Baseline Review and every two years thereafter, MISO and PJM shall conduct a review of the changes made to each Party's processes used to implement the JOA since the previous review, or in the case of the first review, since the JOA Baseline Review. The first MISO-PJM Biennial Review was finalized on January 20, 2014, and addressed the following items: Change Management Logs, status of JOA baseline review recommendations, and FERC Orders.

This report is the fourth MISO-PJM JOA Biennial Review, and follows a similar format as the report published in 2018 with sections addressing the following items: Change Management Logs, status of 2018 MISO-PJM Biennial Review recommendations, and FERC filings.

The Change Management Log is a document which is jointly maintained by PJM and MISO and tracks systemic changes and process and procedure changes on an ongoing basis. That Log is detailed in section 2 of this report. The status of the recommendations included in the 2018 Biennial Review is discussed in Section 3. Section 4 covers the FERC Orders received relating to the MISO-PJM JOA that has been implemented since the 2018 Biennial Review.

2. Change Management Log

2.1. Change Management Log Summary

The following table is a summary of the implemented changes in processes or systems as detailed in the Change Management Log.

Item	Name	Description	Status	Date
1	MISO Real-time Data Exchange	Enhancements made include sending MRTO actual post contingency flows in real-time data exchange when MISO is NMRTO. Changes allow for a comparison of flows between the MRTO and NMRTOs.	Complete	4/10/2018
2	MISO Relief Request	This enhancement changes how relief request adders are applied when the NMRTO can control a MISO owned flowgate. It allows for the NMRTO with cheaper generation to receive a potentially larger relief request for scenarios when MRTO fully not solving the flowgate.	Complete	4/10/2018
3	PJM Relief Request	This enhancement changes how relief request adders are applied when the NMRTO can control a PJM owned flowgate. It allows for the NMRTO. With cheaper generation to receive a potentially larger relief request for scenarios when MRTO fully not solving the flowgate.	Complete	7/25/2019
4	OVEC	PJM updated how load is adjusted for control zone loss in its marketflow calculation. These adjustments include how to handle losses within generation only control zones.	Complete	12/1/2018

5	GLH	GridAliance (GLH) is a new LBA joining MISO on 3/1/2020. There might be scenario when new LBA will not have any load in its LBA other than station load. MISO has updated its Market Flow Calculator engine to handle 0 load MW scenarios to avoid potential divide by zero instances. Updates were implemented on 10/8/19.	Complete	10/8/19

Discussion

The Change Management Log is a jointly maintained document that details any system or process change related to the MISO/PJM Joint Operating Agreement. Each entry on the Change Management Log is agreed to by MISO and PJM, and it is used as a vehicle to ensure all parties are informed of changes that could potentially impact the implementation of the JOA. Items in the log are classified as open or closed. Open items are undergoing discussion or are in the process of being implemented. Closed items are assigned a status of approved if implemented. The Change Management Logs are discussed on a weekly basis and posted to the MISO and PJM websites on a quarterly basis.

The following section summarizes the implemented changes per the log:

1. MISO Real-time Data Exchange – Pre-existing functionality sent PJM only marketflow values in the real-time data exchange when MISO was the NMRTO, and controlling the PJM flowgate using marketflow. This enhancement allows MISO to send both marketflow and real-time post-contingency flows to PJM, which gives the RTO's the ability to compare real-time post contingency flows calculated by each of their EMS systems, furthering transparency between the RTOs.

2. MISO Relief Request (RR) Change – When calculating a relief request for the NMRTO, MISO's pre-existing functionality would award the NMRTO additional relief when it was more economic than the MRTO only if the MRTO was solving the flowgate. This enhancement would award the NMRTO additional relief when it was more economic than the MRTO. This will allow the NMRTO to put use its more economic flow to relieve the flowgate when its shadow price is less than the MRTO and the MRTO cannot fully solve the constraint. This should enhance the economic outcomes of M2M.

3. PJM Relief Request (RR) Change – When calculating a relief request for the NMRTO,

PJM's pre-existing functionality would award the NMRTO additional relief when it was more economic than the MRTO only if the MRTO was solving the flowgate. This enhancement would award the NMRTO additional relief when it was more economic than the MRTO. This will allow the NMRTO to put use its more economic flow to relieve the flowgate when its shadow price is less than the MRTO and the MRTO cannot fully solve the constraint. This should enhance the economic outcomes of M2M.

4. OVEC - PJM updated how load is adjusted for control zone loss in its marketflow calculation. These adjustments include how to handle losses within generation only control zones. These changes distribute the control zone losses throughout the RTO on a pro-rata basis whenever the control zone consists of only generation, and no load.

5. GLH – GridAliance (GLH) is a new LBA joining MISO on 3/1/2020 tentatively. There might be scenario when new LBA will not have any load in its LBA other than station load. Change has been deployed as of 10/8/19 in MISO's MFC engine to avoid divide by 0 scenarios when Load is zero.

3. Status of 2018 Biennial Review Recommendations and MISO/PJM Responses

In the 2018 JOA Biennial Review report, issued February 28, 2018 MISO and PJM staff identified multiple recommendations to improve the coordination of M2M activities between MISO and PJM. The following section summarizes the recommendations and their current status. When necessary, section 3.2 provides a narrative description of recommendation language and MISO's and PJM's responses to those recommendations and corresponding action items:

3.1 Summary

Topics are ordered based on Status in following table. Ongoing items are listed first and Completed items listed later.

The status Complete means the initial scope as identified by previous Biennial Review has been completed and any future scope of work will be developed as needed. Regardless of status, PJM and MISO are always looking to appropriately enhance any aspects of their joint coordination defined in the JOA.

2018 Biennial	Topic	2018 Biennial Recommendation	Description	Status
3.2.1	Documentation	Continue Discussions on the following documents: • Outage Coordination • Dynamic Flowgate Procedure • M2M Flowgate Process Document • Less-than-Optimal Dispatch Procedures • Flowgate Determination Guides	Outage Coordination is outlined in PJM Manual 03, MISO hosts weekly meeting to discuss short term outages	**Ongoing**

2018 Biennial	Topic	2018 Biennial Recommendation	Description	Status
3.2.2	Pseudo-Tie Coordination	None	MISO and PJM have taken measures to update the JOA to incorporate provisions for Pseudo-Tie coordination as well as develop joint operating guides to address local reliability and modeling concerns.	Completed
3.2.3	Overlapping Congestion	None	MISO and PJM have developed a joint solution for the Pseudo-Tie Overlapping Congestion Issue.	Completed
3.2.4	Freeze Date		Working with the CMPWG, MISO and PJM are working on updating the various components of Firm Flow Limits (FFLs) and Firm Flow Entitlements (FFEs) utilized in the Congestion Management Process (CMP) and Joint Operating Agreements (JOA), respectively. In 2004, a Freeze Date was established to preserve the historical firm rights of the transmission system prior to the formation of organized markets based on the flows that existed in 2004. The Freeze Date represents a compromise solution. Since 2004 there have been changes in topology, operations and planning not contemplated by the Freeze Date solution.	**New**

2018 Biennial	Topic	2018 Biennial Recommendation	Description	Status
3.2.5	Energy Price Formation		MISO and PJM are evaluating what price formation changes in both markets means for the Market-to-Market Process. These changes are likely to be a subset of a broader set of enhancements to the Market-to-Market process in the distant future	**New**
3.2.6	TUS		Enhance the MISO-PJM Transmission Upgrade Study process to account for entitlements associated with approved PJM and/or MISO transmission upgrades. Transmission Upgrade Studies are detailed in Appendix G of Attachment II of the JOA.	**New**
3.2.7	Constraint Relaxation		MISO and PJM are drafting JOA language changes and developing software implementations that will change how Constraint Relaxation Logic is applied in the real-time Market-to-Market coordination process. These changes are expected to be effective in Q1 of 2020 (FERC filings ER20-34, ER20-648 refer Section 4).	**New**
3.2.8	Power Swings		MISO and PJM are looking to implement changes to M2M process to mitigate power swings. Similar changes were implemented on MISO/SPP M2M flowgates in Jan 2018.	**New**

3.2 Discussion

3.2.1 Documentation

3.2.1.1 2018 Biennial Report Recommendation:

The recommendation coming from the latest report directs MISO and PJM to continue discussions on the following joint documents:

- Market Flow Methodology Document
- DA M2M FFE Exchange Document
- Outage Coordination Procedure
- Michigan-Ontario PARS Document

As Pseudo-Ties have impacted congestion management, the following documentation has been created by PJM and MISO to enhance the MISO-PJM Pseudo-Tie Coordination Process:

- Pseudo-Tied Units Operating Procedure
- Pseudo-Tied Units Benchmarking Procedure

3.2.1.2 MISO and PJM Joint Response and Changes:

With improved coordination and incremental changes, additional documents may be identified as needed. MISO and PJM continue to work together to identify new documents as well as to update existing documents to reflect the new changes.

PJM outage coordination is covered in PJM Manual 03. Additionally MISO hosts an outage coordination call which includes PJM, MISO, SPP, and TVA. The Weekly MISO/JOA Outage Coordination call happens every Thursday at 14:00 to discuss near term outages for the next two weeks.

3.2.1.3 Future action items:

In addition to Outage Coordination, MISO and PJM will continue to enhance documentation and process guides as needed.

3.2.2 Pseudo-Tie Coordination

3.2.2.1 2018 Biennial Report Recommendation:

This was a recommendation as of the 2018 Biennial Review.

3.2.2.2 MISO and PJM joint response and changes:

MISO and PJM have taken measures to update the JOA to incorporate provisions for Pseudo-Tie

coordination as well as developed joint operating guides to address local reliability and modeling concerns.

3.2.2.3 *Future action items:*

MISO and PJM will continue to review and continuously improve the Pseudo-Tie coordination process.

3.2.3 Overlapping Congestion:

3.2.3.1 2018 Biennial Report Recommendation:

This was a recommendation as of the 2018 Biennial Review.

3.2.3.2 MISO and PJM joint response and changes:

MISO and PJM have developed a joint solution for the Pseudo-Tie Overlapping Congestion Issue. PJM implemented Phase 1 and Phase 2 on 8/1/2018. MISO implemented Phase 1 on 8/1/2018 and Phase 2 on 3/1/2019.

3.2.3.3 Future action items:

MISO and PJM are currently evaluating.

3.2.4 Freeze Date:

3.2.4.1 2018 Biennial Report Recommendation:

This is a new recommendation as of the 2020 Biennial Review.

3.2.4.2 MISO and PJM joint response and changes:

Working with the CMPWG, MISO and PJM are working on updating the various components of Firm Flow Limits (FFLs) and Firm Flow Entitlements (FFEs) utilized in the Congestion Management Process (CMP) and Joint Operating Agreements (JOA), respectively.
In 2004, a Freeze Date was established to preserve the historical firm rights of the transmission system prior to the formation of organized markets based on the flows that existed in 2004. The Freeze Date represents a compromise solution. Since 2004 there have been changes in topology, operations and planning not contemplated by the Freeze Date solution.

3.2.4.3 Future action items:

CMPWG still working on a full solution.

3.2.5 Price Formation:

3.2.5.1 2018 Biennial Report Recommendation:

This is a new recommendation as of the 2020 Biennial Review.

3.2.5.2 MISO and PJM joint response and changes:

MISO and PJM are evaluating what price formation changes in both markets means for the Market-to-Market Process. These changes are likely to be a subset of a broader set of enhancements to the Market-to-Market process in the distant future.

3.2.5.3 Future action items:

MISO and PJM are currently evaluating.

3.2.6 TUS:

3.2.6.1 2018 Biennial Report Recommendation:

This is a new recommendation as of the 2020 Biennial Review.

3.2.6.2 MISO and PJM joint response and changes:

Enhance the MISO-PJM Transmission Upgrade Study process to account for entitlements associated with approved PJM and/or MISO transmission upgrades.

3.2.6.3 Future action items:

MISO and PJM are still evaluating.

3.2.7 Constraint Relaxation:

3.2.7.1 2018 Biennial Report Recommendation:

This is a new recommendation as of the 2020 Biennial Review.

3.2.7.2 MISO and PJM joint response and changes:

MISO and PJM have drafted and filed JOA language changes and developing software implementations that will change how Constraint Relaxation Logic is applied in the real-time Market-to-Market coordination process. These changes are expected to be effective in Q1 of 2020.

3.2.7.3 Future action items:

MISO and PJM are currently working on.

3.2.8 Power Swings

3.2.8.1 2018 Biennial Report Recommendation:

This is a new recommendation as of the 2020 Biennial Review.

3.2.8.2 MISO and PJM joint response and changes:

MISO and PJM are looking to implement changes to M2M process to mitigate power swings. Similar changes were implemented on MISO/SPP M2M flowgates in Jan 2018.

3.2.8.3 Future action items:

MISO and PJM are currently working on.

4. FERC Filings

This section includes FERC fillings that directly impact MISO-PJM Market-to-Market process.

4.1. Summary

No	FERC Order	Description	Status
1	ER18-136-000 ER18-137 ER18-137-003	Proposed revisions to the MISO-PJM JOA to address overlapping congestion charges to pseudo-tied generators.	**Filed October 23, 2017** **Effective August 1, 2018**
2	ER20-34 ER20-648	PJM and MISO have jointly filed to revise section 7 of the PJM-MISO JOA which prescribes how MISO and PJM handle insufficient redispatch. These changes default a given RTO to price flowgates at their constraint penalty factor when the given RTO cannot provide sufficient redispatch in real-time. This effectively removes the concept of constraint relaxation within the Market-to-Market process.	**Filed December 19, 2019.** **Effective TBD**

4.2. Discussion

Each of the orders listed above were initiated to ensure consistency and enhance coordination between both RTOs.

1. Overlapping Congestion - ER18-136-000 & ER18-137-000

   FERC Orders ER18-136-000 & ER18-137-000 propose to modify the JOA to provide for a phased resolution of certain issues involving overlapping congestion charges affecting pseudo-tied generation in MISO and PJM.

2. Constraint Penalty Factor Changes - ER20-647 & ER20-648

   PJM and MISO have jointly filed to revise section 7 of the PJM-MISO JOA which prescribes how MISO and PJM handle insufficient redispatch. These changes default a given RTO to price flowgates at their constraint penalty factor when the given RTO cannot provide sufficient redispatch in real-time. This effectively removes the concept of constraint relaxation within the Market-to-Market process. If operational issues arise, however, the RTOs can mutually agree to re-enable constraint relaxation and Shadow Price convergence logic will continue to apply in this operating mode.

5. Summary

MISO and PJM have completed our fourth biennial review per docket EL10-45-000, documenting the progress made from the initial recommendations stemming from the baseline review as well as additional recommendations identified by both parties as processes continue to evolve. MISO and PJM have made real progress in the areas of Real-Time and Pseudo-Tie coordination.

MISO and PJM continue to strive in communication excellence and full compliance of their Joint Market Agreement. In dedication to this agreement, PJM and MISO have continued to utilize weekly coordination calls to address any weekly coordination issues, as well as bi-weekly calls that address high-priority items and longer term planning.

Going forward, MISO and PJM are working towards discussing and implementing significant ideas and improvements recommended through the Joint and Common Market (JCM) efforts to enhance the Market to Market process:

a. Turning off constraint relaxation on M2M flowgates

b. Implementing Power Swings Mitigation software for better M2M coordination

c. Continue to improve Pseudo-Tie modeling

d. Freeze Date Solution

MISO and PJM have worked diligently in addressing and implementing the recommendations outset in the Baseline Review. The remaining pending recommendations are targeted for completion by the next biennial review. As more opportunities for improvement exist, both parties are committed to improving their adherence to the JOA through an evolving and enhanced communication process.

6. Acronym List

CMP	:	Congestion Management Process
DA	:	Day Ahead
eMFC	:	Enhanced Market Flow Calculator
ELMP	:	Extended Locational Marginal Pricing
EMS	:	Energy Management Systems
FERC	:	Federal Energy Regulatory Commission
FFE	:	Firm Flow Entitlements
FFL	:	Forward Flow limits
FTR	:	Forward Transmission Rights
GTL	:	Generator to load
ICAP	:	Installed Capacity
IDC	:	Interchange Distribution calculator
JCM	:	Joint Common Market
JOA	:	Joint Operating Agreement
M2M	:	Market to Market
MHEB	:	Manitoba Hydro Electric Board
MI-ONT PARS	:	Michigan Ontario Phase Angle Regulator transformers
MISO	:	Midcontinent Independent System Operator, Inc.
NMRTO	:	Non monitoring RTO
OA	:	Operating Agreement
OATT	:	Open Access Transmission Tariff
PARS	:	Phase Angle Regulator transformers
POD	:	Point of delivery
POR	:	Point of receipt
PTP	:	Point to Point
Q1	:	Quarter 1
QC	:	Quad City Units
RTO	:	Regional Transmission Organization
SPP	:	Southwest Power Pool