

MISO-PJM JOA Biennial Review

Midcontinent ISO
PJM Interconnection
02/15/2022

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 fifth MISO-PJM JOA Biennial Review and follows a similar format as the report published in 2020 with sections addressing the following items: Change Management Logs, status of 2020 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 2020 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 2020 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	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 MRT0 fully not solving the flowgate.	Implemented	7/25/2019
2	GLH	GridAliance (GLH) is a new LBA joined 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.	Implemented	3/1/2020
3	PJM GSF Cutoff Adjustment	PJM implemented moving GSF (Generation Shift Factor) Cutoff to 0.0% in RT/DA dispatch and commitment engines	Implemented	11/20/2019

4	Constraint Relaxation	MISO and PJM turned off application of constraint relaxation on M2M flowgates.	Implemented	7/13/2020
5	MISO GSF Cutoff Adjustment	On October 1 st , MISO began reducing the GSF (Generation Shift Factor) Cutoff limit used in the DA/RT dispatch and commitment market engines.	Open	10/2021

2.2 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, closed or implemented. Open items are undergoing discussion or are in the process of being implemented. Items that work stopped with no further intention of implementation are marked closed and Implemented Items are finalized in the systems/processes. 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. 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.
2. GLH – GridAliance (GLH) is a new LBA joined MISO on 3/1/2020. 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. PJM GSF Cutoff Adjustment – PJM reduced the Generation Shift Factor (GSF) Cutoff in its market commitment and dispatch engines to from 1.5% to 0%. This change was implemented in the PJM market systems on November 20, 2019.
4. Constraint Relaxation - Based on FERC approved MISO/PJM JOA filings (filed Dec 2019, approved March 2020) MISO and PJM turned of application of constraint relaxation in the M2M binding process on July 13th, 2020. MISO and PJM will use the Transmission Constraint Penalty Factor (TCPF) when the MRTO is not able to solve the constraint. TCPF value is \$2000 for MISO owned M2M constraints and \$1,000 for PJM owned M2M constraints. This logic change also allows the MRTO to use the NMRTO shadow price as the Marginal Value Limit when the MRTO is not solving but the NMRTO can solve the constraint at a value below the MRTO TCPF.
5. MISO GSF Cutoff Adjustment – On October 1st 2021, MISO initiated the first phase of this project by reducing the Generator Shift Factor (GSF) Cutoff from 1.5% to 1.25% in its dispatch and commitment market engines. Quarter percent reduction are anticipated every quarter until a base of 0.5% is reached or system performance limitations prevent further reduction.

3. Status of 2020 Biennial Review Recommendations and MISO/PJM Responses

In the 2020 JOA Biennial Review report, issued February 28, 2020 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.

Biennial Report	Topic	2020 Biennial Recommendation	Description	Status
3.2.1	Documentation		Documentation is complete, MISO & PJM are currently reviewing the Michigan Ontario PAR document for any needed revisions.	Ongoing
3.2.2	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	Ongoing
3.2.3	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 as well as relief request enhancements in 2020.	Ongoing

Biennial Report	Topic	2020 Biennial Recommendation	Description	Status
3.2.4	Freeze Date		MISO and PJM, in conjunction with the rest of the CMPWG are working on updating the various components of Firm Flow Limits (FFLs) and Firm Flow Entitlements (FFE) utilized in the Congestion Management Process (CMP) and Joint Operating Agreements (JOA), respectively.	Ongoing
3.2.5	TUS		Enhance the MISO-PJM Transmission Upgrade Study process to account for entitlements associated with approved PJM and/or MISO transmission upgrades.	Completed
3.2.6	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).	Completed
3.2.7	M2M Flowgate Criteria	New 2021	Improve the testing criteria for defining Market-to-Market constraints.	New

3.2 Discussion

3.2.1 Documentation:

3.2.1.1 2020 Biennial Report Recommendation:

This recommendation originated in the 2016 Biennial Report, with the recommendation coming from the latest report future actions items indicates that MISO and PJM to continue to enhance documents and process guides as needed.

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.

The procedure that documents flowgate coordination between MISO and PJM have been completed and includes updates as needed in 2019 and 2020. Similar for Outage Coordination practices. As of this writing, the Michigan Ontario PARS (MOPI) Document is expected to be completed Q1 of 2022.

3.2.1.3 Future action items:

In addition to finalizing the MOPI document, MISO and PJM will continue to enhance documentation and process guides as needed.

3.2.2 Price Formation:

3.2.2.1 2020 Biennial Report Recommendation:

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

3.2.2.2 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.

3.2.2.3 Future action items:

MISO and PJM are currently evaluating.

Latest information on MISO side is available here:

- <https://www.misoenergy.org/stakeholder-engagement/MISO-Dashboard/continued-reforms-to-improve-scarcity-pricing-and-price-formation/>

Latest information on the PJM side is available here:

- <https://www.pjm.com/committees-and-groups/issue-tracking/issue-tracking-details.aspx?Issue=6decc213-ec91-4ccf-b75c-3be72fe0d347>
- <https://pjm.com/committees-and-groups/task-forces/epfstf>

3.2.3 Power Swings:

3.2.3.1 2020 Biennial Report Recommendation:

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

3.2.3.2 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.

3.2.3.3 Future action items:

The Power Swing impacts on the MISO-PJM seam is minimal compared to the MISO-SPP seam and has remained a lower priority to implement over the last couple of years while PJM has worked to implement other market improvements for price formation. MISO and PJM are currently reviewing and are hopeful to take up this effort in 2023.

3.2.4 Freeze Date:

3.2.4.1 2020 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:

MISO and PJM, in conjunction with the CMPWG, are currently working on updating the various components of Firm Flow Limits (FFLs) and Firm Flow Entitlements (FFE) 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:

The CMPWG is in final negotiations for new FFE/FFL methodology and is anticipating a 2022 FERC filing.

3.2.5 TUS:

3.2.5.1 2020 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:

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

3.2.5.3 Future action items:

This item was related to a specific PJM customer request for guaranteed entitlement Rights on transmission upgrades. MISO cannot support this request and the issue has closed. No enhancements are anticipated at this point.

3.2.6 Constraint Relaxation:

3.2.6.1 2020 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:

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.

3.2.6.3 Future action items:

This item is complete, Constraint Relaxation was disabled on MISO-PJM M2M flowgates on 7/13/2020

3.2.7 M2M Flowgate Criteria:

3.2.7.1 2020 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:

In its 2019 SOM Report, the MISO IMM recommended that MISO improve the testing criteria for defining Market-to-Market constraints. The original intent of the M2M testing criteria was to identify constraints that will benefit from M2M coordination or for which the NMRTO's market flows are a substantial contributor to the congestion. Coordinating on such constraints improve price signals in the NMRTO area and lower the cost of managing congestion. However, the tests are not optimal in identifying constraints that would benefit from coordination because they do not consider the economic relief the NMRTO will likely have available. Accordingly, we recommend that MISO work with PJM and SPP to introduce a test based on the available flow relief that can be provided by the NMRTO.

MISO currently lists this project recommendation as on hold with a Low on the MISO Integrated Roadmap. This project is a lower priority and has not progressed as neither MISO nor our Seams partners (SPP/PJM) have the resources to address this item at this time.

3.2.7.3 Future action items:

The expectation is once Freeze Date work winds down, MISO along with SPP and PJM will pick this item up. Earliest projection is Q3 of 2022 dependent on Freeze Data project impacts.

4. FERC Filings

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

4.1 Summary

No	FERC Order	Description	Status
1	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 July 13, 2020
2	RM05-5-029 RM05-5-030	NAESB WEQ Version 3.3	Compliance filing for cybersecurity and PFV standards due March 2, 2022 Implementation June 2, 2022
3		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 (FFE) 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.	TBD

4.2 Discussion

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

1. 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.

Effective date: July 13, 2020

2. PFV - NAESB WEQ Version 3.3 Standards

Per the latest approved v3.3 NAESB Standards, Parallel Flow Visualization will be implemented on 6/2/2022. Parallel Flow Visualization enhances the curtailment priorities assigned by the IDC under a TLR by incorporating GTL impacts and Intra-BA Transactions based on real-time information, in conjunction with Interchange Transactions. In addition to OATT compliance filings, the CMPWG entities will need to submit CMP language changes that comply with the new standards.”

3. 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 (FFE) 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.

5. Summary

MISO and PJM have completed our fifth 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 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 monthly 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. Implementing Power Swings Mitigation software for better M2M coordination
- b. Price Formation
- c. Freeze Date Solution
- d. PFV
- e. M2M Flowgate Criteria

MISO and PJM have worked diligently in addressing and implementing the recommendations outset in the Baseline 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
PFV	:	Parallel Flow Visualization
POD	:	Point of delivery
POR	:	Point of receipt
PTP	:	Point to Point
Q1, Q2...Etc..	:	Quarter 1, Quarter 2, etc....
RTO	:	Regional Transmission Organization
SPP	:	Southwest Power Pool
SOM	:	State of Market