MISO-PJM JOA Biennial Review

Midcontinent ISO
PJM Interconnection
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Contents

1. Background 3
2. Change Management Log 2
   2.1. Change Management Log Summary 2
   2.2. Discussion 3
3. Status of 2024 Biennial Review Recommendations and MISO/PJM Responses 5
   3.1. Summary 5
   3.2. Discussion 7
4. FERC Filings 18
   4.1. Freeze Date 19
   4.2. FERC Order 881 19
5. Summary 19
6. Acronym List 20

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 sixth 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 2024 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 2024 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 2024 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	Generator Contingency	PJM and MISO MFC logic enhancement to account for generator contingency. This change improves shift factor handling for flowgates with unit contingencies to island generation resources.	Implemented	**MISO: 12/08/2022** **PJM: 07/20/2023**
2	M2M Relief Request adder changes – separate global parameters for PJM/SPP	MISO implemented M2M Relief Request adder changes – to have separate global parameters for PJM/SPP.	Implemented	**06/27/2023**
3	MISO MFC – BDE update	MISO implemented the MFC logic update to exchange islanded unit file through Bulk Data Exchange (BDE) process.	Implemented	**01/10/2024**
4	PJM M2M FACE job migration	PJM upgraded "FACE" (flowgate allocation calculation engine) job from the legacy framework to a node-based calculation framework.	Implemented	**03/2024**
5	RTC Data Exchange	MISO implemented platform upgrades successfully to Real Time Congestion (RTC) data exchange process that is used in M2M coordination between MISO and its M2M Partners (PJM and SPP).	Implemented	**4/29/2025**

6	MISO MFC – JOA Engine platform changes	MISO upgraded our application framework to newer ones to enable IT and product support. As part of these enhancements, we upgraded the Market Flow Calculator (MFC) platform without changing any functionality.	Implemented	**10/2025**
7	MISO NNL – JOA Engine platform changes	MISO upgraded our application framework to newer ones to enable IT and product support. As part of these enhancements, we upgraded the Native Network Load (NNL) Allocation Calculation platform without changing any functionality.	Implemented	**10/14/2025**
8	MISO MFC – HVDC line format fix	MISO's MFC ShiftFactor input file format fix for HVDC Line	Implemented	**10/15/2025**
9	MISO JOA – M2M Settlement platform changes	MISO upgraded our application framework to newer ones to enable IT and product support. As part of these enhancements, we upgraded the M2M Settlement platform without changing any functionality.	Implemented	**11/19/2025**
10	MISO Next Hour Market Flow calculation retirement	MISO is planning to retire the Next Hour (NH) Market flow calculation process.	NEW	**2026 Q2**

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. Generator Contingency - MFC LOGIC ENHANCEMENT. Both PJM and MISO implemented an enhancement to their respective Market Flow Calculator (MFC) logics to better manage flowgate contingencies that include or island generation resources. Market flow calculations now include logic to remove the market flow contributions of generation resources that are explicitly included or islanded in a flowgate contingency. This change is a step forward in improving a long-standing limitation in impact calculations and results in improved accuracy in the calculation of Market Flows and allows for better alignment with settlements.

2. M2M Relief Request adder changes – separate global parameter for PJM/SPP - During M2M operation, the entity acting as controlling entity (FG owner in case of normal M2M flowgate, or FG non-owner in case of reverse role enabled flowgates) will calculate relief request and send it to M2M partner entity every few minutes

3. MISO MFC – BDE Update - Currently if a flowgate contingency definition includes or islands a generation resource, the impacts of the generator are excluded from MISO Market Flow calculation, but SPP & PJM cannot shadow calculate MISO market flow accurately as the islanded unit information is not exchanged in BDE. Change - MISO MFC logic update will include the islanded unit file in the Bulk Data Exchange (BDE) process for shadow calculations.

4. PJM M2M FACE job migration - PJM upgraded the “FACE” (flowgate allocation calculation engine) job from the legacy framework to a node-based calculation framework. The new framework allows PJM to more easily identify issues and triage more expeditiously. In addition, this change provides more granular intermediate values (i.e., calculated values will retain full numeric precision) prior to being rounded and shared with MISO.

5. RTC Data Exchange - MISO implemented platform upgrades successfully to Real Time Congestion (RTC) data exchange process. RTC acts as an interface between Seams Partners (MISO/SPP/PJM) and DART for exchanging data about flowgate congestion and performs validation and completeness checks on Market-to-Market data submitted to the DART system.

6. MISO MFC – JOA Engine platform changes – MISO upgraded its application framework to enhance IT support, as the previous platform uses older technologies and no longer had product support.

7. MISO NNL – JOA Engine platform changes – MISO upgraded its application framework to enhance IT support, as the previous platform uses older technologies and no longer had product support.

8. MISO MFC – HVDC line format fix – MISO updated a script to process its Square Butte – Arrowhead HVDC line EMS export information. The script was updated to ensure the formatting was read accurately when processing through MISO's sensitivity calculation process.

9. MISO JOA - M2M Settlement platform changes – MISO upgraded its application framework to enhance IT support, as the previous platform uses older technologies and no longer had product support.

10. MISO Next Hour Market Flow calculation retirement - MISO is planning to retire the Next Hour Market flow calculation process. Next Hour market flow values are calculated every 15 minutes and are not being used by any processes after implementation of Parallel Flow Visualization Process. The Next hour market flows are not being exchanged between MISO/PJM so there are no process impacts in our MFC process after the retirement of this process.

3. Status of 2024 Biennial Review Recommendations and MISO/PJM Responses

In the 2024 JOA Biennial Review report, issued January 22, 2024, 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 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 the 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	2024 Biennial Recommendation	Description	Status
3.2.1	Documentation		Both Parties are updating processes and procedures to improve M2M coordination.	Ongoing
3.2.2	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
3.2.3	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 (FFEs) utilized in the Congestion Management Process (CMP) and Joint Operating Agreements (JOA), respectively.	Ongoing
3.2.4	M2M Flowgate Criteria		Improve the testing criteria for defining Market-to-Market constraints.	Ongoing
3.2.5	FERC Order 881		Discussions are ongoing to include AARs in congestion management processes (FFL/FFE and ASTFC). MISO is working on the design to implement AARs in the AFC process	Ongoing

3.2. Discussion

3.2.1 Documentation:

3.2.1.1 2024 Biennial Report Recommendation:

This recommendation originated in the 2016 Biennial Report, with the recommendation coming from the latest report future actions items indicate that MISO and PJM 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.

As of this writing, the MISO/PJM resettlement guide is under review and expected to be wrapped up by the end of 2025.

3.2.1.3 Future action items:

In addition to finalizing the M2M MISO-PJM Recalculation Guide, MISO and PJM will continue to enhance documentation and process guides as needed.

3.2.2 Power Swings:

3.2.2.1 2024 Biennial Report Recommendation:

This is a recommendation as of the 2020 Biennial Review.

3.2.2.2 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.

3.2.2.3 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 of taking up this effort in 2026.

3.2.3 Freeze Date:

3.2.3.1 2024 Biennial Report Recommendation:

This is a recommendation as of the 2020 Biennial Review.

3.2.3.2 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 (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.

3.2.3.3 Future action items:

The CMPWG are in negotiations for new FFE/FFL methodology

3.2.4 M2M Flowgate Criteria:

3.2.4.1 2024 Biennial Report Recommendation:

This is a recommendation as of the 2022 Biennial Review.

3.2.4.2 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 such constraints improve price signals in the NMRTO area and lowers 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.

3.2.4.3 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 Q4 of 2026 dependent on Freeze Data project impacts.

3.2.5 FERC Order 881

3.2.5.1 2024 Biennial Report Recommendation:

This is a new recommendation as of the 2024 Biennial Review.

3.2.5.2 MISO and PJM joint response and changes:

The Congestion Management Process Working Group (CMPWG) – of which both PJM and MISO are members – finalized a working agreement for the implementation of FERC Order 881. Consensus was reached on items such as allocation calculation process, flowgate ownership tie-line control, exchanging ambient adjusted ratings of facilities, in addition to the exchange of other data. PJM and MISO have been actively updating relevant processes and procedures to remain on track to meet the FERC Order 881 compliance deadline granted to each respectively.

3.2.5.3 Future action items:

PJM and MISO are continuing to work towards full FERC Order 881 compliance within its systems by including AARs in congestion management processes (FFL/FFE and ASTFC).

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		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.	TBD
2	ER22-2359-000 ER22-2359-001	FERC Order 881 - The Final Rule aims to improve the accuracy and transparency of thermal transmission facility ratings used by regional transmission organizations/independent system operators, and transmission owners.	Compliance Filing July 12, 2022 (complete) PJM Full Compliance 04/15/2026 MISO Full Compliance 12/31/2028

4.2 Discussion

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

4.1. 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.

4.2. FERC Order 881

FERC Order 881 - The Final Rule aims to improve the accuracy and transparency of thermal transmission facility ratings used by regional transmission organizations/independent system operators, and transmission owners. PJM filed for an Extension of Time to a date no later than 04/15/2026. MISO filed for an Extension of Time to a date no later than 12/31/2028.

5. Summary

MISO and PJM have completed our sixth 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. Freeze Date Solution

c. M2M Flowgate Criteria

d. FERC Order 881

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