MISO-PJM Joint and Common Market Drill-Down Report

May 21, 2019

The purpose of this document is to provide a brief description of each component listed on the Joint and Common Market (JCM) Work Plan Timeline compiled by PJM and MISO. This Drill-Down Report has been created in order to track the progress of the JCM stakeholder process as well as providing interested stakeholders with progress updates regarding stakeholder discussions. The Drill-Down Report will be updated as necessary to reflect the status of this effort on an ongoing basis.

CATEGORY I: MARKET OPERATIONS

RTO-to-RTO Data Exchange and Transparency

Description: PJM and MISO have implemented regular posting of the information requested by the stakeholders through the JCM process. Therefore, this item is considered to be completed. However, the RTOs recognize that additional transparency initiatives may arise as the JCM process proceeds, and they will be addressed as needed.

Deliverable(s): Public posting of data, process documentation, etc. that provides market participants with information and insight into the operation of the market-to-market coordination process.

Timeline: Ongoing

Status: Complete. MISO and PJM Market-to-Market Hourly Settlement Data, Active Flowgates, and Firm Flow Entitlements are available at the MISO and PJM Joint and Common Market Website at: http://www.miso-pjm.com/markets/jcm-settlement-data.aspx

Day-Ahead Market Coordination

Description: This item deals with both the near-term, day-to-day coordination between the two RTOs' Day-Ahead Markets as well as the longer term issue of whether and how the Day-Ahead Firm Flow Entitlement (FFE) exchange provisions in the JOA should be updated or redesigned. Day-to-day coordination improvements have been identified by stakeholders as a high priority area for examination, and the RTOs have made significant progress in that area. Analysis has shown that the FFE exchange provisions of the JOA could be potentially redesigned to maximize economic benefits and efficient utilization of transmission facilities on the seam of the two RTOs, and therefore it has been identified as a high priority issue. Addressing this issue will require significant RTO staff and stakeholder analysis and discussion.

Deliverables: JOA and process changes specific to Day-Ahead Market operation

Timeline: Parts of this exchange were implemented, at both RTOs, on January 28, 2016, however further refinement, if agreed to, will need to continue throughout 2016.

Status: Complete with on-going monitoring. Day-to-day coordination improvements have been completed between the two RTO's Day-Ahead Market operations. These coordinated efforts included the identification and communication of flowgates and constraints for any known or expected system conditions relative to the timing of each RTO's Day-Ahead Market.

A joint benefit study in support of potential improvements to day-ahead flowgate utilization on the seam has been completed. Development of detailed procedures and guidelines to facilitate a FFE exchange in the MISO/PJM Day-Ahead Markets has been completed. Also, the RTOs have identified metrics that will be measured and used to evaluate the effectiveness of the exchanges. PJM and MISO have completed development and testing of exchange and settlement systems and continue routine collaboration sessions aimed at developing and refining methods and approaches to minimize complexity and risk. The implementation of a Day-Ahead Market FFE Exchange between MISO and PJM began January 28, 2016 following FERC approval. Additional metric reporting will be provided periodically at future JCM meetings.

Transmission and Generator Outage Coordination

Description: Both RTOs recognized the opportunity to implement improved outage coordination. Additional coordination of outage schedules may allow the RTOs to reduce resulting congestion and provide additional transparency to market participants through modeling of outages in their respective FTR auctions. Staffs are in the process of exchanging data, evaluating and validating potential impacts, and will report these results to stakeholders along with developing additional proposals as warranted for stakeholder consideration.

Deliverable(s): Potential process changes regarding outage information exchange or outage scheduling timelines pending analysis of costs/benefits.

Timeline: The goal is to reach resolution by February 2014, which will facilitate implementation of process changes prior to the PJM and MISO 2014/2015 annual ARR allocations and FTR auctions.

Status: Complete with on-going monitoring. MISO and PJM provided a final update at the January 2014 JCM meeting and agreed that the enhanced coordination between FTR groups will further improve PJM's FTR funding. MISO

Transmission Owners have agreed to submit planned transmission outage requests for critical facilities further in advance that will facilitate increased coordination of outage schedules amongst the RTOs and further improve funding. The RTOs have agreed to continue analysis of reasons for short-term flowgate requests and investigate ways to reduce the volume.

Interchange Scheduling Business Rule Alignment

Description: RTO staffs and stakeholders have indicated that market participants would have more flexibility in scheduling interchange between the PJM and MISO markets if the rules for submitting interchange schedules were better aligned. MISO has determined that a reduction of the real-time schedule notification deadline from 30 minutes to 20 minutes can be supported, which will align with PJM's current rule in that aspect. MISO plans to submit a compliance filing to FERC in the Order 764 docket that will clarify and solidify its current scheduling rules. PJM will approach its stakeholders to move to the MISO rules for intra-hour interchange scheduling and remove the 45-minute duration requirement if FERC approves the MISO filing.

Deliverable(s): MISO compliance filing in FERC Order 764 Docket; potential MISO and PJM interchange scheduling rule changes for improved alignment.

Timeline: MISO has implemented 20 minute notification period as of October 15, 2013. Per FERC's direction under Order 764 proceedings, MISO will allow intra-hour schedule changes along with intra-hour settlement process expected to be implemented in 2015. PJM has completed its compliance filing process with respect to FERC Order 764.

Status: Complete. MISO has implemented 20 minute notification period as of October 15, 2013. Per FERC's direction under Order 764 proceedings, MISO allows intra-hour schedule changes along with an intra-hour settlement process that was implemented June 30, 2015. PJM has removed its minimum, 45-minute duration requirement as a result of compliance with FERC's orders in the 764 proceeding. MISO's changes are complete and PJM and MISO scheduling rules are aligned. The software has been tested and was implemented effective June 30, 2015 at which time MISO become aligned with PJM in allowing intra-hour physical schedules. This completes the items identified for scheduling rules changes.

Freeze Date for Firm Flow Entitlement Calculations

Description: Certain components of the calculations utilized to determine the Firm Flow Entitlements that are in turn used to, among other things, determine market-to-market settlements rely on the establishment of a historic reference date on which Firm Point-to-Point reservations and Network resources are based. This historic reference date is known as the "Freeze Date" and is currently

established as April 1, 2004 based on the date that PJM and MISO began market-to-market coordination. The RTOs and their stakeholders have agreed that the concept of using a freeze date, as well as what specific date to use should be revisited given the period since the current freeze date is well over 10 years. This is a very complex subject, and as such will require in-depth stakeholder education and discussion. Further, the alternatives to the current approach will be equally complex, as will determining the impacts of potentially moving to an alternative approach.

Deliverables: Potential JOA and Interregional Coordination Process (ICP) changes regarding the development of historic allocations of transmission capability.

Timeline: Given its complexity, the RTOs expect that discussion of this issue will extend through the end of 2019.

Status: The RTOs, with inputs from stakeholders, are currently working with the Congestion Management Process Working Group (CMPWG) on Freeze Date Alternatives. The Congestion Management Process Council (CMPC) approved guiding principles for freeze date replacement. In May 2015 MISO and PJM submitted a joint filing to FERC. MISO and PJM staffs provided a status update to FERC Staff on September 18, 2017. The RTOs have developed timelines for a phased implementation in 2018 and 2020. The phase 1 solution was implemented in June 2018. Status updates on this item, with a focus on the phase 2 solution, will be provided at future JCM meetings.

Interface Pricing

Description: The RTOs and stakeholders have identified opportunities for increasing the effectiveness of the interface prices established to price interchange between the RTOs. The RTO staffs have produced analysis of the current interface price performance, and will discuss proposals with stakeholders as to how the interface definitions could be updated to improve the effectiveness of the price signals provided to market participants.

Additionally, the MISO IMM has indicated a concern with respect to the inclusion of external constraint congestion impacts in interface prices. The RTOs agree that the identified issue is a high priority for investigation and if necessary, resolution.

Deliverable(s): Potential rule, JOA and/or Tariff changes regarding how interface prices are established and how congestion prices are included in interface price calculations.

Timeline: The common interface definition solution was implemented on June 1, 2017.

Status: Complete. PJM and MISO implemented the collaborative solution effective on June 1, 2017. This solution includes a common interface definition as well as the ability to modify FTR and DA limits to reflect any transaction's impact. MISO presented post-implementation analysis, including metrics at the November 29, 2017 JCM. No JOA revisions were necessary to implement the common interface definition, while allowing for modification of FTR and DA limits to account for transactions did require revisions that were approved by FERC.

Treatment of Ontario-ITC PARs in the Market-to-Market Process

Description: The Ontario-ITC PARs are currently modeled in the Market Flow and Firm Flow Entitlement calculations as free-flowing ties. Conversely, the PARs are modeled as open circuits in the Interchange Distribution Calculator (the industry tool used to determine transaction curtailments through the NERC TLR process) during times when they are determined to be adequately controlling flows across the interface. The RTOs have committed to work with the other Balancing Authorities around Lake Erie to evaluate the performance of the PARs as the devices are used to manage Lake Erie loop flows for a period of one year. The analysis will help determine whether modeling in the Market Flow and Entitlement calculations should be changed to better reflect their actual operation.

Deliverable(s): Analysis of the performance of the PARs through the first year of operation; potential changes to how the PARs are modeled in the Market Flow and FFE calculations.

Timeline: The RTOs completed the analysis at the end of 2013, and are engaged in ongoing stakeholder discussion through the JCM process. Discussions were held and agreement was reached in November 2014. Project scoping and implementation is planned for 2015.

Status: Complete. Incorporation of the Michigan-Ontario PARs into the MISO-PJM market-to-market process was successfully implemented on July 28, 2016.

Use of the Ontario-ITC PARs for Congestion Management

Description: The Ontario-ITC PARs are currently operated in a manner such that actual flows across the Ontario-ITC interface are aligned with the scheduled values to the greatest extent possible. The potential may exist to implement an alternative operating protocol for the Ontario-ITC PARs such that instead of the current operating protocol of the intent to match the flow across the interface to the scheduled amount, they could be operated to minimize congestion on facilities that experience flow impacts around Lake Erie. Analysis will be required to determine the costs and benefits of changing the current complex operating protocol, there are multiple entities around Lake

Erie that will need to be involved in the analysis and discussion, and multiple regulatory authorities will need to approve any change to the operating protocol (FERC as well as the DOE).

Deliverable(s): Cost/benefit analysis of changing the operating protocol for the Ontario-ITC PARs; potential operating protocol changes pending the results of the cost/benefit analysis.

Timeline: TBD.

Status: On-hold. This effort is currently not being pursued as MISO only has operational control of the PARs on one of the four lines making up the interface. The others are controlled by IESO, who also takes the lead in managing congestion across the interface.

Coordinated Transaction Scheduling

Description: Both MISO and PJM Independent Market Monitors have stated in their respective State-of-the-Market reports that real time interchange between PJM and MISO could be accomplished more efficiently and the Participants have not been fully effective in arbitraging the price differences in real time. Other analysis suggested that Participant scheduling in reaction to price differential leads to significant volatility of the energy transfers (Net Interchange) across the seam and creates operational challenges and market impacts. In addition, the RTO staffs have been analyzing instances where it appears that interchange between the markets could have been coordinated more efficiently. The results of that analysis, which were concluded in the Fall of 2013, has been utilized to develop recommendations as to how the RTOs could achieve more optimal coordination of interchange in the future. The work currently ongoing between PJM and NYISO with respect to Coordinated Transaction Scheduling will also inform the PJM/MISO JCM process on this issue.

Deliverable(s): Analysis of operating events; potential JOA and/or Tariff rule changes to implement procedures or market rules to better optimize interchange between PJM and MISO.

Timeline: The JCM effort on this issue was concluded in November of 2014, and the individual RTO stakeholder processes were completed in February of 2015. A joint FERC filing will be submitted in the second quarter of 2015.

Status: Complete. MISO and PJM staffs have developed a Coordinated Transaction Scheduling (CTS) design to achieve more optimal coordination of interchange in real time across the MISO-PJM interface. CTS was successfully implemented on October 3, 2017. MISO and PJM will provide a metrics update at the November 2019 JCM.

Use of Commercial Flow in M2M Process

Deliverable(s): In the M2M process, Market Flow (MF) is the flow on a specified flowgate as a result of dispatch of generating resources serving market load within a Market-Based Operating Entity's market. The calculation of the Market Flow is important because it determines the flow contribution on each flowgate which ultimately is used for determining the M2M payments associated with under or over usage of the system. The Market Flow calculations specific to the treatment of imports and exports needs to be reexamined in order to ensure consistency with the flow-based pricing systems utilized by the RTOs, Commercial Flow ("CF"). Proper alignment of Commercial Flow with M2M Market Flow ensures that Balancing Congestion and M2M payments can offset each other when each RTO keeps to their entitlement values.

Timeline: TBD.

Status: On-hold. The RTOs decided to exclude commercial market flow in the PJM and MISO interface pricing collaborative approach in an attempt to work towards a near term solution to address interface pricing. Once a near term solution is introduced for interface pricing RTOs will re-evaluate this initiative.

Pseudo-Tie Improvements

Deliverable(s): Pseudo-ties are utilized to incorporate load or generation into the attaining balancing area. MISO and PJM have observed a significant increase in the volume of pseudo-ties. MISO and PJM will collaborate on process improvements to ensure reliable operation of the transmission system with the larger volume of pseudo-ties.

Timeline: The first phase of this effort is focused on short-term deliverables to support efforts needed to facilitate implementation of pseudo-ties by June 1, 2016. The second phase of this effort will focus on criteria and improvements to support pseudo-ties by June 1, 2017.

Status: Phase 1 and 2 solutions are complete. No further actions planned. PJM and MISO received approval for the phase 1 solution for overlapping congestion charges effective August 1, 2018. PJM and MISO coordinated implementation of the phase 1 solution on August 1, 2018. PJM also received approval for its phase 2 solution and implemented the new process on August 1, 2018. MISO submitted its phase 2 solution on October 2, 2018 with expected implement on March 1, 2019. ON January 18, 2019 MISO responded to a deficiency letter the FERC sent to MISO on December 20, 2019 related to the phase 2 solution. MISO received approval of the phase 2 solution on March 19, 2019 with a March 1, 2019 effective date. In addition, MISO and PJM collaborated to file changes to the Joint Operating Agreement on August 1, 2017 to improve the administration and coordination by incorporating standard

definitions, rules, and responsibilities. On December 29, 2017, the Federal Energy Regulatory Commission ("Commission" or "FERC") issued an Order accepting MISO's August 1, 2017 filing, as amended on October 30, 2017, proposing revisions to the Joint Operating Agreement between MISO and PJM ("JOA") to improve the administration and coordination of pseudo-tied resources ("JOA Revisions").

2016 Biennial Review Report

Deliverable(s): Per MISO-PJM JOA article 21, complete the biennial review report for 2014 and 2015 M2M efforts.

Timeline: Complete the 2014 and 2015 report in Q1, 2016.

Status: Complete. PJM and MISO successfully completed their 2nd biennial review update. RTOs made significant progress since 2014 report; out of the 18 initial baseline recommendations 15 are complete and three are ongoing. Eleven Change Management Tickets have been implemented since the 2014 report. The 2016 report is posted for stakeholder review here.

2018 Biennial Review Report

Deliverable(s): Per MISO-PJM JOA article 21, complete the biennial review report for 2016 and 2017 M2M efforts.

Timeline: Complete the 2016 and 2017 report in Q1, 2018.

Status: Complete. PJM and MISO finalized their 3rd biennial review update. The RTOs worked with stakeholders to solicit feedback and incorporate additional edits on the report. The 2018 report is posted for stakeholder review here.

2018 Biennial Review Report

Deliverable(s): Per MISO-PJM JOA article 21, complete the biennial review report for 2018 and 2019 M2M efforts.

Timeline: Ongoing the 2018 and 2019 report in Q1, 2020.

Status: Ongoing. PJM and MISO will be initiating the 4th biennial review update during Q1, 2019.

Incremental ARR Coordination Enhancements

Description: PJM and MISO staffs are reviewing opportunities to improve the existing coordination of the Incremental Auction Revenue Rights (IARR) process.

Deliverable(s): Through this initiative RTOs intend to provide education to stakeholders and discuss IARR process improvements.

Timeline: Goal is to pursue any identified JOA revisions by Q4, 2018.

Status: MISO and PJM provided a high level education to stakeholders at the November 29, 2017 JCM. The RTOs provided a Transmission Planning portion update at the February 28, 2018 JCM. The Transmission Planning portion will be largely unchanged from past practice: when MISO receives a request from PJM, MISO will coordinate with its TO to identify necessary upgrades and will facilitate any Facility Study Agreements between the PJM customer and the MISO TO.

MISO and PJM will give an update on the market portion of the IARR coordination enhancement efforts at an upcoming JCM. An update will be provided during the May 21, 2019 JCM meeting.

CATEGORY II: TRANSMISSION PLANNING

Generation Interconnection and Transmission Service Request Queue Coordination

Description: The RTOs addressed improved coordination of these queue processes in 2012, and implemented changes to their respective business process manuals. The RTOs further agreed to revisit these processes after gaining experience with the improvements and recommend to the stakeholders whether further enhancements would be beneficial.

Deliverable(s): Potential additional changes to the RTOs' generation interconnection and transmission service request queue processes.

Timeline: Stakeholder review of the current processes was initiated in the Spring of 2014 and is scheduled to conclude in the Fall of 2014.

Status: Complete. MISO and PJM staff will continue to monitor the existing coordination and propose future enhancements, as necessary, at future JCM meetings.

Order 1000 Interregional Compliance and Regional Planning Coordination

Description: FERC issued an order requiring further compliance primarily focused on interregional cost allocation regarding cross-border reliability projects and public policy projects.

Deliverable(s): Stakeholder updates on Order 1000 compliance filings.

Timeline: The compliance filing was filed on July 31, 2015 (FERC Docket EL13-88).

Status: Complete. FERC issued its 4th Order on January 9, 2017 accepting the filing. This constitutes final Agency action in this matter.

Market Participant Funded Upgrades and ARR Requests

Description: The JCM effort on this issue has begun. The RTOs have previously addressed increased coordination in this area in 2012 and 2013 and filed resulting JOA changes in December of 2013.

Deliverable(s): Potential additional JOA and/or Tariff rule changes pending stakeholder review of the current processes.

Timeline: The RTOs initiated stakeholder education on this issue in January of 2014. Given the level of coordination that has already occurred in this area, the RTOs expect that the JCM stakeholder discussion can conclude in March of 2014. The Work Plan included individual RTO stakeholder discussion through the summer 2014, in recognition that further coordination steps may have been identified through the JCM discussions that would have required consideration by the individual stakeholder processes.

Status: Complete. Depending on discussions at the future JCM meetings, RTOs can recommence this issue to further enhance the coordination steps.

Joint RTO Planning Committee (JRPC) & Interregional Planning Stakeholder Advisory Committee (IPSAC)

Description: The JRPC coordinates system planning under the Joint Operating Agreement (commonly referred to as cross-border planning) between MISO and PJM. The Order 1000 compliant Joint Operating Agreement (JOA) includes coordination of regional planning, model and data exchange and coordinated interregional studies. The JPRC facilitates the IPSAC, whose role is to provide stakeholder review and input into coordinated system planning.

Deliverable(s): An Order 1000-compliant process, recommended projects that address issues along the seam, potential changes to the RTOs' planning practices and coordination, and stakeholder updates on on-going planning coordination activities.

Timeline: On-going.

Status: MISO and PJM are currently developing the 2019 Coordinated System Plan. The CSP includes completion of the 2018-2019 Interregional Market Efficiency Project (IMEP) Study. The IMEP Study solution solicitation window closed in March 2019 with several stakeholder solutions submitted for study review. Regional and interregional benefit analysis will occur in the middle of 2019

with any potential IMEPs targeted for MTEP19/RTEP19 approval in December.

MISO and PJM, working with IPSAC stakeholders, have proposed JOA changes for interregional process enhancements. Draft redline JOA changes were posted with the August 8, 2018 IPSAC with follow-on in October 2018. The RTOs are targeting a Q2 2019 filing.

The last remaining compliance directive from FERC EL13-88 ("NIPSCO Order") is a MISO regional cost allocation issue for sub-345 kV Interregional Market Efficiency Projects (IMEPs). The filing was submitted to FERC on February 28, 2019. The filing made by MISO correlates with another filing submitted February 25, 2019 for changes to MISO's regional cost allocation and the two filings together create a comprehensive set of changes, along with the NIPSCO compliance. Relevant Dockets include ER16-1969 and ER19-1156.

Completed items:
MISO and PJM completed the 2018 TMEP study, with results and recommendations provided at the October 5, 2018 IPSAC meeting. The study resulted in the recommendation of two new projects, which were approved by the PJM and the MISO Board in December 2018.

JOA and Tariff changes to implement the Targeted Market Efficiency Project (TMEP) project type were accepted by the FERC on October 3, 2017. Subsequently, MISO and PJM recommended 5 TMEPs in December 2017 and received board approval for MTEP17 and RTEP17 inclusion.

Compliance directives from the January 19, 2017 Order on Rehearing and Compliance in Docket EL13-88 ("NIPSCO Order") were accepted by FERC on August 1, 2017. One remaining compliance directive in the docket is MISO's regional cost allocation of sub-345 kV Interregional Market Efficiency Projects (IMEPs), as mentioned above.

MISO and PJM concluded the 2016-2017 2-year Coordinated System Plan (CSP) Study, focused on identification of Interregional Market Efficiency Projects (IMEPs), at the October 20, 2017 IPSAC. No IMEP proposals were recommended from the study for board approval.