



**Manual No. 008**

# ***Business Practices Manual***

## ***Outage Operations***



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## Outage Operations Business Practices Manual

BPM-008-r23

Effective Date: September 1, 2024

### Revision History

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BPM-008-r4	Revised to incorporate Tariff changes clarifying the consequences if a market participant does not comply with a request to reschedule a generator outage. Changes also include a description of study model development process and when to submit breaker outages.	R. Arness	Feb 1, 2011
BPM-008-r3	Revised to reflect Tariff changes incorporating conflicting generation outage coordination.	R. Arness	May, 1, 2010
BPM-008-r2	Revised to reflect the Open Access Transmission, Energy and Operating Reserve Markets Tariff for MISO, Inc. (Tariff) relating to outage submission timing requirements. Revised Critical/Non-Critical Facilities to a facility class system. Revised to reflect changes due to replacement of the AREVA outage scheduler system with CROW system. Revised for Controlled Document numbering change.	R. Arness	Dec, 30 2009



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TP-BPM-001	Converts this previously referred to Manual No 008 to new BPM template to include miscellaneous format, grammatical, and clarification changes. Updated Attachment C.	R. Arness	FEB-20-2008
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## 1 Introduction

This introduction to the Midcontinent Independent System Operator, Inc. (MISO) *Business Practices Manual (BPM)* for Outage Operations Business Practices Manual includes basic information about this BPM and the other MISO BPMs. The first section (Section 1.1) of this Introduction provides information about MISO BPMs. The second section (Section 1.2) is an introduction to this BPM. The third section (Section 1.3) identifies other documents, in addition to the BPMs, which can be used by the reader as references when reading this BPM.

### 1.1 Purpose of MISO Business Practices Manuals

The BPMs developed by MISO provide background information, guidelines, business rules, and processes established by MISO for the operation and administration of MISO's markets, provision of transmission reliability services, and compliance with MISO's settlements, billing, and accounting requirements. A complete list of MISO BPMs is available for reference through MISO's website. All definitions in this document are as provided in MISO's Tariff, the NERC Glossary of Terms Used in Reliability Standards, or are as defined by this document.

### 1.2 Purpose of this Business Practices Manual

This *Outage Operations BPM* describes the roles and responsibilities of MISO, its Transmission Owners, Transmission Operators and Tariff Customers (hereinafter also collectively referred to as "members"), and all other non-MISO members within MISO's Reliability Coordinator Area that serve as Transmission Operators or Generator Operators, to coordinate and respond to planned and unplanned transmission and generation outages.<sup>1</sup>

MISO prepares and maintains this *Outage Operations BPM* as it relates to the reliable operation of MISO's region of authority. This BPM conforms and complies with the Agreement of Transmission Owners to Organize MISO (Transmission Owners Agreement), Federal Energy Regulatory Commission (FERC) Order 2000, MISO's Open Access Transmission, Energy and Operating Reserve Markets Tariff ("Tariff"), North American Electric Reliability Corporation (NERC) -- also known as the Electric Reliability Organization (ERO) -- Mandatory Reliability Standards, and the applicable Regional Entity reliability principles, guidelines, and standards, and is designed to facilitate administration of reliable and efficient Energy and Operating Reserve Markets.

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<sup>1</sup> For purposes of this BPM, the term Transmission Outage shall mean not only outages of elements of the Transmission System, but also outages of any Transmission facilities within MISO's Reliability Coordinator Area for which coordination and planning are required under the NERC Reliability Standards.





This BPM benefits readers who want answers to the following questions:

- What are my responsibilities and obligations as a Transmission Owner or Operator to report planned and unplanned transmission facility outages?
- What are my responsibilities and obligations as a Generator Owner or Generator Operator to report planned and unplanned generation facility outages?
- What are MISO's responsibilities and obligations to process my requests for planned and unplanned outages?

## 1.3 Controlling Document Requirements

The following is a summary of requirements related to this BPM found in key documents.

### 1.3.1 FERC Order 2000

FERC Order 2000 comments on Transmission and Generation Maintenance Approval [Section III.D.4 Short-Term Reliability (Characteristic 4)], as follows:

#### **Transmission Maintenance Approval**

"We conclude that, when the RTO operates transmission facilities owned by other entities, the RTO must have authority to approve and disapprove all requests for scheduled outages of transmission facilities to ensure that the outages can be accommodated within established reliability standards. Control over transmission maintenance is a necessary RTO function because outages of transmission facilities affect the overall transfer capability of the grid. If a facility is removed from service for any reason, the power flows on all regional facilities are affected. These shifting power flows may cause other facilities to become overloaded and, consequently, adversely affect system reliability.

The RTO is expected to base its approval on a determination of whether the proposed maintenance of transmission facilities can be accommodated within established state, regional and national reliability standards. The RTO's regional perspective will allow it to coordinate individual maintenance schedules with other RTOs as well as with expected seasonal system demand variations. Since the RTO will have access to extensive information, it will be able to make more accurate assessments of the reliability effect of proposed maintenance schedules than individual, sub-regional transmission owners.

If the RTO is a transmission company that owns and operates transmission facilities, these assessments will be an internal company matter. However, if there are several transmission owners in the RTO region, the RTO will need to review transmission requests



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made by the various transmission owners. In this latter case, we expect the RTO to: receive requests for authorization of preferred maintenance outage schedules; review and test these schedules against reliability criteria; approve specific requests for scheduled outages; require changes to maintenance schedules when they fail to meet reliability standards; and update and publish maintenance schedules as needed.

We conclude that, if the RTO requires a transmission owner to reschedule planned maintenance, the transmission owners should be compensated for any costs created by the required rescheduling only if the previously scheduled outage had already been approved by the RTO.

We encourage the RTO to establish performance standards for transmission facilities under its direct or contractual control. Such standards could take the form of targets for planned and unplanned outages. The rationale for this requirement is that two transmission owners should not receive equal compensation if one owner operates a reliable transmission facility while the other operates an unreliable facility. For RTOs that are transcos, we will require that such quality standards be made explicit in any rate proposal.

### **Generation Maintenance Approval**

We conclude that the RTO is not required to have authority over proposed generation maintenance schedules. However, we acknowledge that there are reliability advantages to the RTO having this authority, and we would accept RTO proposals where the participants choose to grant the RTO such authority. In our order approving the MISO, we observed that "the dividing line between transmission control and generation control is not always clear because both sets of functions are ultimately required for reliable operation of the overall system." Because of this close connection between generation and maintenance of system reliability, it is essential for generator owners and operators to provide the RTO with advance knowledge of planned generation outage schedules so that the RTO can incorporate this information into its reliability studies and operations plan. However, although a generator may be required to submit its maintenance schedule to an RTO, the RTO should be prohibited from sharing that information with any other market participants, or affiliates of market participants."

FERC Order 2000, Transmission and Generation Maintenance Approval, Section III.D.4 Short-Term Reliability (Characteristic 4).



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### 1.3.2 Agreement of Transmission Owners to Organize MISO

#### Appendix E, Framework for Operational Responsibilities

The TOA's Appendix E, Section 1.A.8 states: "MISO shall approve the scheduling of maintenance of all transmission facilities making up the Transmission System and shall coordinate with generation owners, as appropriate, the scheduling of maintenance on generation facilities as set forth in Section VII of this Appendix E".

### 1.3.3 NERC Reliability Standards

The NERC Reliability Standards require coordination between a Reliability Coordinator, Balancing Area Operator and respective Transmission Operators and Generator Operators with respect to outages that could affect Bulk Electric System reliability.

Specifically, Reliability Standard TOP-003-3 R1 provides: Each Transmission Operator shall maintain a documented specification for the data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. R2 of the same standard provides: Each Balancing Authority shall maintain a documented specification for the data necessary for it to perform its analysis functions and Real-time monitoring.

Reliability Standard IRO-010-2 provides requirements for the RC to have a documented specification for data and information it needs to monitor and assess the operations of its Reliability Coordinator Area.

R1 The Reliability Coordinator shall have a documented specification for data and information to build and maintain models to support Real-time monitoring, Operational Planning Analyses, and Real-time Assessments of its Reliability Coordinator Area to prevent instability, uncontrolled separation, and cascading outages. The specification shall include the following:

R1.1 A list of data and information needed by the Reliability Coordinator to support its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments including non-BES data and external network data, as deemed necessary by the Reliability Coordinator.

R1.2 Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.

R1.3. A periodicity for providing data.

R1.4. The deadline by which the respondent is to provide the indicated data.



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- R2 The Reliability Coordinator shall distribute its data specification to entities that have data required by the Reliability Coordinator's Operational Planning Analyses, Realtime monitoring, and Real-time Assessments.
- R3. Each Reliability Coordinator, Balancing Authority, Generator Owner, Generator Operator, Load-Serving Entity, Transmission Operator, Transmission Owner, and Distribution Provider receiving a data specification in Requirement R2 shall satisfy the obligations of the documented specifications using:
- R3.1 A mutually agreeable format
  - R3.2 A mutually agreeable process for resolving data conflicts
  - R3.3 A mutually agreeable security protocol.

Requirement R6 of Reliability Standard NUC-001-3 provides the requirement for coordination between the Nuclear Plant Generator Operators and the Reliability Coordinators.

- R6 Per the Agreements developed in accordance with this standard, the applicable Transmission Entities and the Nuclear Plant Generator Operator shall coordinate outages and maintenance activities which affect the NPIRs.

Finally, Reliability Standard IRO-017-1 Outage Coordination ensures that outages are properly coordinated in the Operations Planning time horizon and the Near-Term Transmission Planning Horizon. Requirement R1 establishes that the Reliability Coordinator maintain an outage coordination process for generation and transmission outages and Requirement R2 dictates that each Transmission Operator and Balancing Authority shall perform the functions specified in the Reliability Coordinators outage coordination process.

Specific sections of this BPM are marked to identify the minimum requirements to comply with the MISO IRO-017 Outage Coordination Process.

- R1 Each Reliability Coordinator shall develop, implement, and maintain an outage coordination process for generation and Transmission outages within its Reliability Coordinator Area. The outage coordination process shall
- R1.1 Identify applicable roles and reporting responsibilities including:
    - R1.1.1 Development and communication of outage schedules.
    - R1.1.2 Assignment of coordination responsibilities for outage schedules between Transmission Operator(s) and Balancing Authority(s).
  - R1.2 Specify outage submission timing requirements.
  - R1.3 Define the process to evaluate the impact of Transmission and generation outages within its Wide Area.



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R1.4 Define the process to coordinate the resolution of identified outage conflicts with its Transmission Operators and Balancing Authorities, and other Reliability Coordinators.

R2 Each Transmission Operator and Balancing Authority shall perform the functions specified in its Reliability Coordinator's outage coordination process.

## 1.4 References

Other reference information related to this BPM includes:

- Agreement of Transmission Facilities Owners to Organize MISO, Inc. a Delaware Non-Stock Corporation (referred to as ISO Agreement, T.O. Agreement or TOA)
- BPM-018 Voltage and Reactive Power Management
- FERC Order approving Generation Outage Scheduling Provisions (Dec. 23, 2009 & March 18, 2010)
- MISO/PJM JOA for Generation & Transmission Outages (Feb. 2, 2004)
- Operating Protocol for Existing Generators – FERC Filing (Mar. 22, 2004)
- CROW User Guide
- RTO-OP-051 Notification of Automatic Voltage Regulator Status Procedure
- SO-P-NOP-00-411 Outage Operations
- Tariff of MISO
- MISO defines what is a valid single contingency in its SOL/IROL Methodology

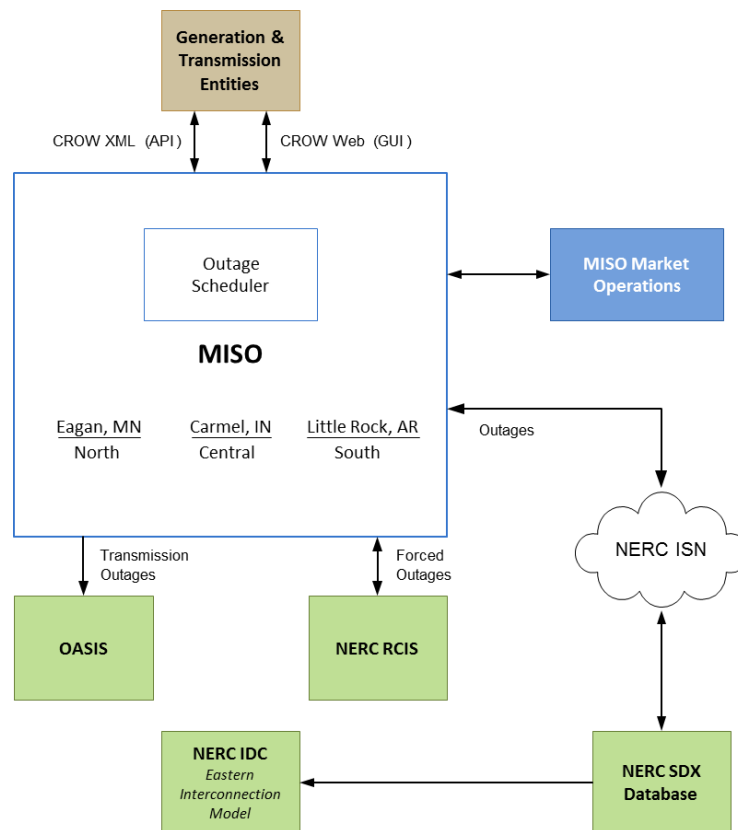
## 2 Outage Operations Overview

MISO is responsible for approving the scheduling of maintenance on all transmission facilities making up the Transmission System and for coordinating with Generator Owners, as appropriate, to schedule maintenance on generation facilities.

MISO performs regional transmission and generation outage coordination in order to identify proposed transmission and generation outages that would create unacceptable system conditions and works with the facility owners to create remedial steps to be taken in anticipation of such proposed outages. This is accomplished while minimizing any inconvenience resulting from the involvement of an additional party in the outage review process.

This BPM describes MISO's transmission and generation outage coordination process, which includes outage scheduling, outage analysis, and outage reporting. Exhibit 2-1 presents an overview of the outage operations process.

**Exhibit 2-1: Outage Operations Overview**



## Exhibit 2-2: Major distinctions between Generator and Transmission Outages

Facilities Required and MISO Approval Authority	Generation Facility Outages	Transmission Facility Outages
Facilities Required to Report Outages to MISO	Generators with capacities 10 MW and higher	<ul style="list-style-type: none"> <li>Facilities 100kV and above</li> <li>Facilities under 100 kV, if in MISO node/breaker model</li> </ul>
MISO Outage Schedule Approval Authority (planned and opportunity outage priorities)	(NO), however planned outages must be submitted for MISO analyses and coordination	<ul style="list-style-type: none"> <li>(YES) if functional control of the facility is transferred to MISO</li> </ul>
MISO Outage Schedule Change Authority	(YES), if required for system security and reliability reasons	(YES), if required for system security and reliability reasons

### Facilities Requiring Outage Reporting and MISO Approval Authority

## Exhibit 2-3: Reporting Requirements by Outage Type

Type	Generation Facility Outages	Transmission Facility Outages
Planned Outage Schedules	<ul style="list-style-type: none"> <li>Minimum Rolling 24 months (36 months for nuclear Generation Resource facilities)</li> <li>Updated daily</li> </ul>	<ul style="list-style-type: none"> <li>Minimum Rolling 12month period</li> <li>Updated daily</li> </ul>
Urgent Outages	<ul style="list-style-type: none"> <li>Notify MISO immediately upon discovery of an outage need.</li> </ul>	<ul style="list-style-type: none"> <li>Notify MISO immediately upon discovery of an outage need.</li> </ul>
Emergency Outages	<ul style="list-style-type: none"> <li>Notify MISO immediately prior to the outage</li> <li>Approval is not required</li> </ul>	<ul style="list-style-type: none"> <li>Notify MISO immediately prior to the outage</li> <li>Approval is not required</li> </ul>
Forced Outages	Notify MISO as soon as possible after the occurrence of the outage	Notify MISO as soon as possible after the occurrence of the outage



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## 3 MISO Operational Responsibilities

MISO has the operational responsibility for coordinating generation and Transmission Outages:

- Within MISO's Reliability Coordinator Area
- With neighboring Reliability Coordinators (RCs)

### 3.1 Internal Coordination and Communications

MISO Carmel, Little Rock, and Eagan Operations Engineering staff coordinates the analysis and approval of all outage schedules. Each location's Operations Engineer staff area of responsibility is aligned with the location's RC region of responsibility.

MISO Carmel engineering staff evaluates outage schedules submitted by MISO Owners and Operators within the MISO Central Region. MISO Little Rock engineering staff evaluates outage schedules submitted by MISO Owners and Operators within the MISO South Region, and MISO Eagan engineering staff evaluates outage schedules submitted by MISO Owners and Operators within the MISO North region.

Each MISO Operations Engineering group evaluates the outages assigned to their work group and communicates the results of their analysis to the other work group, as necessary, for review and comment prior to approving the outage schedules.

### 3.2 Outage Reporting

MISO Carmel, Little Rock, and Eagan Operations Engineering staff coordinates the analysis and approval of all outage schedules.

Each MISO regional group evaluates the outages assigned to their work group as described in section 3.1 above and communicates the results of their analysis to the other work group, as necessary, for review and comment prior to approving the outage schedules.

### 3.3 Coordination with Other Reliability Authorities

MISO coordinates transmission and generator outages with other RCs. Outage schedules are normally exchanged with other RCs via the NERC System Data Exchange System (SDX). Communication with other RCs is normally done through MISO's Operations Engineering group to provide other RCs a single point of contact. Every reasonable effort is made to work with other RCs to reschedule conflicting outages of both parties in order to ensure that regional system reliability is maintained for outages scheduled both within and outside MISO's Reliability Coordinator Area.



## 4 Generation Outage Coordination

This section describes the generation outage coordination process that is administered by MISO. The requirements of this Section do not apply to Demand Response Resources – Type I (DRRs – Type I), Demand Response Resources – Type II (DRRs – Type II) or External Asynchronous Resources (EARs).

### 4.1 Generation Outage Schedule Submittal Requirements

Generator Owners or Generator Operators must submit their planned maintenance outage schedules for all generation facilities 10 MW and above to MISO for a minimum rolling 24 months period (36 months for nuclear Generator Resources) and updated daily. The outage schedules are reviewed and coordinated per Section 4.3 of this BPM. Planned outage requests submitted with less than a 24 months (36 months for nuclear Generator Resources) notice shall be considered late and not timely submitted.

Wind Generator Resources are requested to submit outage schedules for generation facilities less than 10MW. These outage schedules are utilized to improve wind resource forecast accuracy.

If the GO or GOP expects to physically replace the energy needed as a result of the scheduled outage, then the GO or GOP should provide this information with the outage request for the purposes of engineering studies. Typically, this would only be for firm energy schedules from external resources or the intention to make internal-to-MISO resources “must run”. If the GO/GOP intends to allow normal market commitment and dispatch to replace the energy that would have been provided by the outaged unit, no such information need accompany the outage request.

**Examples –** Brown Unit 3 is a MISO unit. The GO/GOP for Brown has a contract with favorable terms from Entergy such that the replacement of energy will be more economical than the resulting MISO market dispatch. The Entergy replacement will come from Arkansas 12. The GO/GOP should indicate on the outage request that 200 MW of replacement energy will flow from Arkansas 12 for all hours that Brown 1 is unavailable.

Gardner 5 is a MISO unit. The GO/GOP for Gardner also owns Planter 2. Planter 2 is a unit in MISO’s market that normally gets economic commitment and dispatch instructions, i.e. it is not run for a particular reliability reason. However, during the outage of Gardner 5, the GO/GOP intends to “must run” Planter 2 to replace the



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energy from Gardner 5. The fact that Planter 2 is changing normal operations should be conveyed with the outage request by stating that Planter 2 will be must run during the outage.

Reliable 1 is a MISO unit. When the GO/GOP requests an outage for this unit, it will not take any actions to affect dispatch or interchange. The GO/GOP is assuming that MISO's market will commit and dispatch resources based on the economically available units during the outage of Reliable 1. No information needs to accompany the outage request.

GO or GOPs of non-market generation within MISO's reliability footprint should provide information on how they intend to physically replace the energy needed as a result of the scheduled outage. (Similar to Brown and Gardner unit examples above for market generation).

All active outages (Proposed, Submitted, Study, Pre-Approved, Approved, and Implemented status) appearing in the OS are used in MISO's Available Flowgate Capability (AFC) calculation process and posted to the NERC SDX for use in congestion management and regional AFC calculations.

Generation outages must be submitted according to one of the following associated outage Priority and Equipment Request types:

Generation Outage Priorities:

- **Planned** – Equipment is known to be operable with little risk of a forced outage.
  - As required for preventive maintenance, for troubleshooting, or repairs that are not viewed as urgent work.
  - Equipment capacity is upgraded, additional equipment is added, or equipment is replaced due to obsolescence. This category includes periodic overhauls of generation equipment.
- **Urgent** – Equipment is known to be operable yet carries an increased risk of a forced outage or equipment loss. The equipment remains in service until maintenance crews are ready to perform the work.
- **Emergency** – Equipment is to be removed from service by the Operator as soon as possible because of safety concerns or increased risk to grid security.
- **Forced** – Equipment is relayed out of service.

#### Generation Equipment Request Types:

- **Out of Service** – Equipment is out of service.
- **Deration** – Units that are online and available but with limited total output.
- **Economy** – Units that are offline for economic reasons but available if needed (See section 4.5).

The availability of Generation Resources is also determined in the Reliability Assessment Commitment (RAC) by looking at the status of the unit in OS. In normal operating conditions, if a Generation Resource is listed in OS with an Equipment Request Type of "Out of Service" the unit will be considered unavailable in the RAC analysis. Generation Resources listed in OS with an Equipment Request Type of "Deration" would be considered in the RAC analysis.

The Generator Owners or Generator Operators are also required to submit an Automatic Voltage Regulator (AVR) status report if the voltage regulation or supplementary excitation control of an on-line generator is not available. This information must be conveyed to MISO's RC or Operations Engineer (OE) and must include the unit and the anticipated duration of the AVR unavailability. Reactive reporting for reduced unit AVR capability must also be communicated to MISO's RC or OE shift staff.

It is the sole responsibility of the Generator Owner/Operator or appointed designee to submit and maintain outage schedules in MISO's outage schedule system. MISO will not submit or maintain outage schedules on the Generator Owner's or Generator Operator's behalf unless technical reasons prevent the Generator Owner or Generator Operator from doing so itself. It is the Generator Owner or Generator Operator's responsibility to validate accuracy of all data submitted, by them or on their behalf, in the outage scheduler.

### 4.1.1 Generation Outage Exemption Requirements

Capacity Resources accredited pursuant to Schedule 53 are at risk of adjustments to Seasonal Accredited Capacity (SAC) unless certain exemptions are obtained. Full Generator Planned Outages and full Proposed Generator Planned Outages shall be eligible for Tier 1 and Tier 2 planned outage exemptions as set forth in Tariff Schedule 53 (SAC Exemption(s)). The SAC Exemptions are based on (a) the timeliness of the outage request, known as the Time Requirement Exemption (TRE); and (b) the Maintenance Margin for the duration of the outage, known as the Maintenance Margin Exemption (MME).

Time Requirement Exemption (TRE) will be provided if the Generator Owner or Generator Operator schedules its first Generator Planned Outage 120 days or more in advance of the outage start date and 120 days or more beyond the end date of any previously scheduled outages for the unit.

Maintenance Margin Exemption (MME) will be provided if the Maintenance Margin in the subregion containing the generator unit is greater than or equal to 0 MW for the duration of the outage at the time of submission, after subtracting the outage capacity unavailable from the request.

A Request for TRE can be made, to be provided at the Transmission Provider's discretion, when (a) an outage is extended in CROW; AND (b) the request is made greater than 120 days in advance of the start date of the outage.

When Generator Owner or Generator Operator reschedules its Generator Planned Outage at the Transmission Provider's request for weather, forced outage, or other reliability concerns, as set forth in Section 4.3, the TRE and MME may be provided at the discretion of the Transmission Provider without regard to how many days in advance the outage was submitted or whether there was projected to be adequate Maintenance Margin for the duration of the outage.

Generator outages resulting from operating limitations provided by the Transmission Provider or Transmission Operator, such as thermal, voltage, or stability limits, should be coordinated per Operating Procedure SO-P-NOP-00-497 and Section 5.7 of this BPM. Exemptions provided against adjustments to Seasonable Accredited Capacity (SAC) are set forth in Tariff Schedule 53.

Generator Owner or Generator Operator may request a review of the CROW Time Requirement Exemption (TRE) and/or Maintenance Margin Exemption (MME) within fourteen (14) calendar days following the actual end date of the outage associated with the exemption(s) ("Exemption Review Request Period").

- The request must be submitted through the MISO Help Center. Only requests submitted via the MISO Help Center will be considered. Submission instructions can be found in the Knowledge Article "How to Submit an Outage Exemption Review":

<https://help.misoenergy.org/knowledgebase/article/KA-01502/en-us>

- The request must contain sufficient data and the reason review is requested.
- The MISO Operations Planning team will review all requests submitted through the MISO Help Center during the Exemption Review Request Period and update the exemption status, as required, based on the outcome of the review. MISO may issue a decision on the request for review during or after the Exemption Review Request Period.
- Once the Exemption Review Request Period ends, no further requests for review will be accepted.



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- All exemptions will be considered final upon expiration of the Exemption Review Request Period, if no request for review is submitted during that period through the MISO Help Center, or upon MISO issuing a decision based on a properly submitted request for review.

### 4.2 Jointly-Owned Generating Units

Jointly-Owned Units (JOUs) must be reported appropriately to ensure that the generation outage is accurately represented in the AFC calculation and security planning process. In MISO's model, JOUs that are operated using pseudo-ties are represented as multiple units based on the ownership share of each Owner/Operator while JOUs operated using interchange schedules are modeled as a single unit in the operating Balancing Authority Area. Owner/Operators within MISO's reliability footprint must report all shares of the JOU. Outage schedules for JOU shares with Owners/Operators outside MISO's Market Footprint are obtained from the NERC SDX interface.

### 4.3 Coordination of Generation Outages

MISO coordinates and assesses the impact of all generator outage schedules in MISO's Reliability Coordinator Area. These generation outage schedules are included in all Transmission Outage request studies and in the security studies performed on a regular basis by MISO.

MISO coordinates with the Generator Owners or Generator Operators to recommend a schedule that maintains system security and minimizes adverse impacts in the available transmission capacity levels and adheres to agreed nuclear plant interface requirements. This is in accordance with reliability standards and the normal operation requirements.

MISO reviews all existing submitted generation maintenance schedules for generation facilities 10 MW and above. The review of the submitted generator planned outage schedule will include analysis of transmission system reliability and any other relevant material effects. MISO will work to respond to timely submitted generator planned outage schedules within two (2) weeks, but in no case longer than three (3) months per MISO's Tariff. MISO will also perform a reliability analysis six (6) months prior to the start date of the outage, provided the outage or change request was submitted timely per section 4.1 and 4.8.2, respectively. MISO will respond to all other submitted outage schedules within three (3) months or as soon as practicable.

During each study of a unit outage, MISO reviews any Energy replacement information that is included in the outage submittal. If no information is provided, MISO will assume a representative market area dispatch as appropriate.



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If a conflict is found between planned generation schedules, MISO will request re-scheduling consistent with Good Utility Practice if study results indicate a documented reasonable expectation of an Emergency, or a documented reasonable expectation of any of the following circumstances that compromise the reliability of the Transmission System, as determined by MISO: (a) the inability to maintain voltage required by nuclear Generation Resources, or to meet any other Nuclear Plant Interface Requirement, as that term is defined by NERC, including the provision of off-site power supply; (b) the inability to maintain the transmission system within system operating limits using normal (non-emergency) operating procedures or restore the transmission system to normal operating conditions following a single contingency with the use of normal (non-emergency) operating procedures; or (c) the potential for credible contingencies to significantly affect transmission system reliability of metropolitan areas.

MISO reviews the schedules and suggests possible alternate times for all the Generator Owner(s) or Generator Operator(s) to re-schedule the outage in order to maintain network security. If neither Generator Owner nor Generator Operator reschedules on a voluntary basis, then the outage



schedule that was requested last is the first one considered for rescheduling when a conflict arises. Prior to rescheduling an outage, MISO will: (1) attempt to minimize the economic consequences of rescheduling (except for opportunity costs); (2) consider physical feasibility; and (3) coordinate with the affected Generator Owners or Generator Operators.

If generation outage schedules cannot be moved or changed because doing so would contravene applicable laws, regulations, judicial orders, or where rescheduling is not feasible (voided warranty or equipment damage) MISO will consider the use of existing Operating Guides or the development of new Operating Guides to allow the conflicting outage schedules to continue. MISO, in conjunction with the associated Transmission Operators and Balancing Authority Operators, will coordinate the Operating Guides. MISO will, through the appropriate code of conduct policies, notify the affected Generator Owners or Generator Operators and Transmission and Balancing Authority Operators that an Operating Guide will be necessary to eliminate projected reliability concerns on the system. Operating Guides to mitigate conflicts between two generator outages that cannot be rescheduled may include Emergency redispatch of generation and Load Shedding provisions.

If an Operating Guide cannot be developed to address the generator conflicts, as a last resort, MISO will review the existing Transmission Outage schedules and attempt to identify any Transmission Outage requests that contribute to the problem. If any are found, the contributing Transmission Outage request may be targeted for cancellation or revocation to ensure the system is in a reliable state for the duration of the generation outage schedule per Section 5 of this BPM.

### 4.4 Generation Outage Analysis

MISO utilizes network applications to analyze a planned generating unit maintenance schedule to determine its effects on Available Flowgate Capability(AFC), Ancillary Services, the security of MISO's Reliability Coordinator Area, and any other relevant matters. Analysis includes power flow, contingency analysis, and stability analysis, as necessary, to identify:

- Capability for Balancing Authority Area to Balancing Authority Area transfers
- System Capacity and Conditions
- Violation of pre and post-contingent thermal limits
- Violation of pre and post-contingent voltage limits
- Violation of pre-determined stability limits

If outage analysis indicates unacceptable system conditions, MISO works with the Generator Owner in advance of such proposed maintenance to coordinate the schedule per Section 4.3 of





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this BPM. This includes the use of existing Operating Guides, the development of new Operating Guides, and the potential rescheduling of generation and/or approved Transmission Outages.

### **4.4.1 Maintenance Margin**

MISO will assess the impact of a generator outage request against the maintenance margin criterion for the same time period. Maintenance margin is the maximum megawatt of generation that can be taken out of service for planned maintenance for a given time period without impacting supply adequacy for MISO's Balancing Authority Area including MISO sub-regions.

Maintenance margin is a proactive measure that may provide an early window of opportunity for MISO and Generator Operators to resolve a potential risk to supply adequacy. If a generator outage request results in the maintenance margin being exceeded (or if the maintenance margin has already been exceeded), MISO will notify the affected Generator Operator(s) and recommend alternative schedules that lessen the impact on maintenance margin. Additional details regarding the maintenance margin calculation are in Attachment F of this BPM.

## **4.5 Units Off for Economic Dispatch (Non-MISO Market Units)**

Base load generating units that are off for economic reasons must be reported to the OS. MISO network applications treat these units as offline, but available for dispatch if needed. The requirements for reporting economy outages are listed below:

- Outage must be entered as an economy Equipment Request Type as soon as the condition is identified.
- The planned start and estimated end times must be entered.
- The requestor notes must indicate that the unit is offline but available.
- The recall time must indicate the time needed to bring the unit online.

## **4.6 Generation Derates**

Generator Owners or Generator Operators shall submit a derate outage for all generation facilities when its available output is reduced below the machine's capability. Individual outages for each machine must be submitted unless modeled otherwise in MISO's Energy Management System (EMS). Derate planned outages, even if approved in the outage scheduling system, are subject to the forced outage rate adjustments in Section 4.1.

Regarding intermittent resources (including wind generation), derate information is not required on individual wind turbines but determined on the total capability at the point of injection into the transmission system or CP node. Derates or entire plant outages are not required if the wind, etc. is not blowing but required when the resource or portion of is unavailable.





A derate threshold may be applied to determine if a reduction qualifies for outage submission, or any reduction below the Module E must offer requirement must be submitted, whichever is most restrictive.

Derate Threshold – If a machine's seasonal capability is reduced: (greater than or equal to 10% and greater than 5MW) or (greater than or equal to 50MW) a derate outage submission is required. Submission of incremental hourly changes is not necessary, largest hourly reduction per operating day may be submitted.

Example(s):

- 15MW Unit reduced by 20% = 3MW, < 5MW No Submission required
- 100MW Unit reduced by 10% = 10MW, > 5MW & =10% Submission Required
- 1000MW Unit reduced by 7% = 70MW, > 50MW => Submission Required

A scheduled derate outage due to planned maintenance/system upgrade activities shall be submitted in line with planned outage scheduled requirements as stated in section 4.1. Unplanned derates (Emergency/Urgent) shall be submitted as soon as the derate is identified. Forced events that result in generation derates shall be submitted per requirements stated in section 4.7.

### 4.7 Forced Generation Outages

MISO coordinates with the Generator Owners or Generator Operators to implement schedules for unplanned generation maintenance due to a forced outage. Generator Owners or Generator Operators must contact MISO's shift Operations Engineer or MISO's RC to report any equipment limitation, including derates and forced equipment outages. This report must be made as soon as possible after the occurrence of the outage and within 30 minutes of the outage. Reported information must include the cause of the outage and the expected return to service time (if known). The Generator Owner or Generator Operator must develop an associated schedule for the outage and submit the schedule as a forced outage to MISO's OS. This must include an estimated end time and must be updated periodically, as necessary. The outage schedule submission must be made as soon as possible after the occurrence of the outage and within 30 minutes of the event.



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### 4.8 Generation Outage Rescheduling

MISO works with Generator Owners or Generator Operators to reschedule conflicting generator outages for security and reliability reasons within the scope of its authority and per Section 4.3 of this BPM.

#### 4.8.1 Changes by MISO

Generator Owners or Generator Operators are compensated for eligible costs associated with rescheduling a generation outage due to system Emergency conditions or those emergency conditions that are described in Section 4.3 above in accordance with MISO's Tariff.

Provided that the planned outage request was timely submitted, MISO may request re-scheduling, after coordination with impacted parties as outlined in Section 4.3 above, consistent with Good Utility Practice if study results indicate a documented reasonable expectation of an Emergency, or a documented reasonable expectation of any of the circumstances specified in Section 4.3 (a)-(c) that compromise the reliability of the transmission system. No rescheduling of such approved outage requests will be initiated by MISO within twelve (12) months of a generator planned outage (twenty-four (24) months for a nuclear Generation Resource) except when the above circumstances are due to the following unexpected conditions: (1) severe weather; or (2) unplanned (urgent, emergency, or forced) outages.

MISO may request rescheduling previously accepted outage requests that were not timely submitted, when there is a documented reasonable expectation of an Emergency or a documented reasonable expectation of any of the circumstances specified in Section 4.3 (a)-(c) that compromise the reliability of the transmission system.

Rescheduled planned outages are eligible for compensation pursuant to Attachment BB of the Tariff provided the outage request was timely submitted or the request was not timely submitted and the request had been accepted.

Request for cost recovery due to a rescheduled outage should be submitted to MISO's Manager of Transmission Settlements. Documentation that provides justification of the expense, including proof of payment in the amount sought for recovery, should be provided at the time of the request.

If a request by MISO to reschedule a generator outage request is refused by the Generator Owner or Generator Operator, and the outage request provides less than one year advance notice, has not yet been approved, and the proposed outage causes a scheduling conflict as noted above

and in Section 4.3, MISO will change the outage request priority in the outage scheduling system to Forced. The Forced outage shall be included in the Seasonal Accredited Capacity value for such Generation Resources under Resource Adequacy Requirements (RAR) and Module C (Section 38.2.5.g.vii) of the Tariff.

#### **4.8.2 Changes by Generator Owner or Generator Operator**

Generator Owners or Generator Operators may choose to modify a previously timely submitted planned outage at any time up until twelve (12) months prior to the time of the previously scheduled outage for non-nuclear Generation Resources and twenty-four (24) months prior to the outage for nuclear Generation Resources.

New requests are required to extend an outage already in progress (Implemented status in the OS) and in accordance with Section 4.1 timing requirements. The new request should only cover the additional time needed beyond the outage currently in process. Previously granted SAC Exemption(s) will remain for a submitted outage if the duration of the outage is shortened and the submitted change request's start and end dates remain within 20% of the originally scheduled outage window. If the duration of the outage is increased or the outage is moved to a new time frame, SAC Exemption(s) will be re-evaluated using the change request date as priority for the outage. SAC Exemption(s) may remain if there is a reduction in the capacity of the outage (resulting in an increase in the MW available to the Transmission Provider from the resource). Such requests will be analyzed and accepted if the change does not result in a system Emergency condition or those emergency conditions that are described in Section 4.3 above. The date the outage change request is received will reset or establish a new outage request queue position.

Example 1: Outage #12345 is currently scheduled to last 20 days. SAC Exemption(s) previously granted will remain for the outage if the requestor ends the outage early by 4 days. (The outage has been shortened and the end date is 20% shorter than the originally scheduled window.)

Example 2: Outage #67890 is currently scheduled to last 20 days. SAC Exemption(s) previously granted will be re-evaluated using change request date as priority for the outage if the requestor extends the outage by 4 days. (The duration of the outage has been increased.)

Generation outages are evaluated by operating day. Therefore, changes to a start or end time that do not change the operating day do not require a change request and should be completed in OS by implementing and completing the outage ticket with the actual time.

Any change request for an outage that was not originally timely submitted will be processed and responded to as soon as practicable. Again, such requests will be analyzed and accepted if the change does not result in a system Emergency condition or those emergency conditions that are



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described in Section 4.3 above. The date the outage change request is received will reset or establish a new outage request queue position.

Changes requested prior to the start of an approved outage require additional review by MISO. The Generator Owner or Generator Operator can change the outage using one of the following methods:

- Submit additional request(s) for the time period(s) outside of the original outage window (the original outage window will stand as previously approved in this case) or,
- Cancel the original request and submit a new request for the revised outage period or,
- Submit a change request via the outage scheduling system.

Changes requested after the start of an approved outage: once an outage has been implemented, situations may arise that require additional time to complete the maintenance. When this occurs, the Generator Owner or Generator Operator must notify MISO as soon as possible to inform MISO that additional time may be required. This notification can be accomplished by submitting a new Generation outage request in the OS. As part of this communication, the Generator Owner or Generator Operator must provide MISO with the reason(s) for the potential delay and an estimate of the additional time that may be required, beyond the previously approved completion time, to complete the maintenance.

MISO determines if the desired extension will have an adverse impact on system reliability and/or will cause other approved planned requests to be revoked due to new reliability issues. MISO provides the results of its review to the Generator Owner or Generator Operator to further coordinate the outage extension.

MISO outage change request response time: (Note: Any outage change request submitted using the CROW outage scheduling system must first be accepted by MISO prior to that change being incorporated in MISO's reliability or market functions/DART. Prior to accepting any outage change request, time must be provided to conduct a reliability assessment/study. The Generator Owner or Generator Operator is responsible for timely submission of outage requests/changes and allowance for outage submission processing times.)

- Outage change requests submitted for outages applicable to that day - MISO will respond as soon as practical, normally within 4 hours of submitting the request. If under extenuating circumstances, the Generator Owner or Generator Operator may contact/call the Regional Operating Engineer to determine if the request evaluation can be expedited.
- Outage change requests submitted for outages applicable to the next day - MISO will respond as soon as practical, normally within 12 hours or midnight day prior



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(whichever comes first). If under extenuating circumstances, the Generator Owner or Generator Operator may contact/call the FRES Engineer and request expedited processing of the change request.

- Outage change request submitted two or more business days in advance of the start date – MISO will respond as soon as practical, and within the time period allowed for study of a new outage request. If under extenuating circumstances, the Generator Owner or Generator Operator may contact/call the Outage Coordination Engineer and request expedited processing of the change request.

### **4.9 Nuclear Facilities**

Generator Owners or Generator Operators with nuclear Generation Resource facilities are required to submit nuclear Generator Planning Outage schedules for a minimum rolling 3 year period.

MISO has responsibility for honoring Nuclear Plant Operating Agreement (NPOA) or any other applicable procedures or protocols that are mutually agreed upon.

This is in accordance with NERC Reliability Standard NUC-001 to address mutually agreed upon Nuclear Plant Interface Requirements (NPIRs). The NPIRs establish the operating criteria necessary to maintain adequate offsite power to the nuclear generating facility.

Transmission lines and/or transmission circuit breakers associated with nuclear generating facilities require coordination of outages and maintenance activities which affect the NPIRs.

### **4.10 Blackstart Facilities**

Blackstart unit outage submissions will be reviewed in accordance with the planned outage restriction requirements set forth in the Blackstart Service Business Practice Manual (BPM-022). If the minimum requirement for blackstart facility availability is not met, Generator Owners or Generator Operators may be requested to reschedule planned outages of Blackstart units.

Transmission Operators will be notified and advised to revise their Transmission Operators System Restoration Plan as necessary.

### **4.11 Generation Outages as Result of Fuel Supply Availability**

Generator Owners or Generator Operators shall submit outage schedules for events when specified generation facilities are unavailable to operate due to fuel supply availability. Derate outages must also be submitted for unit output restrictions due to fuel supply limitations, quality conditions and fuel conservation.



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Generation resources operating on any of the following fuel types are required to submit outage schedules for fuel availability events: Coal, Natural Gas, Diesel, Oil or Water. Dual fuel resources are also required to submit outage schedules, if one of the facility's fuel sources is listed, unless the facility is fully operable on the alternate fuel source. Generation Resources registered as Intermittent Resource are excluded from this requirement.

Fuel supply related outages are to be submitted in accordance with Planned, Urgent, Emergency or Forced outage Priorities as applicable to the event. The Derate Threshold defined in section 4.6 may be applied to fuel supply related outages to determine if a derate outage submission is required.

Specific outage submission Cause and Subcase codes should be utilized when reporting outages related to Fuel Supply Availability events.<sup>2</sup>

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<sup>2</sup> Reference Attachment D for guidance with outage cause code selection.



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## 5 Transmission Outage Coordination

This section describes the transmission outage coordination process that is administered by MISO.

### 5.1 Transmission Outage Schedule Submittal Requirements

All Transmission Operators must submit their long-term planned maintenance outage schedules for transmission facilities 100 kV and above or under MISO functional control (including but not limited to transmission lines, transformers, breakers<sup>3</sup>, reactive devices, etc.) to MISO for a minimum of a rolling one year period. These plans must be submitted to MISO as planned outages and updated as schedules or scope changes are identified.

Tie-line facility outage reporting: MISO Transmission Operators opening joint owned/operated facilities in support of a neighboring non-MISO entity must also report the tie-line facility outage to MISO. Tie-line facilities between MISO Transmission Operators only need to be reported by one entity.

In order to facilitate better representation of the system topology; Transmission Operators should also submit outage schedules for networked non-transferred facilities (facilities less than 100 kV), subject to Agency Agreement (Appendix G of the TOA), if such facilities are modeled in MISO's node-breaker Network Model. (Class IV)

#### 5.1.1 Transmission Outage Request Time Table

Outage requests on Transmission facilities must be submitted to MISO's OS per the following time table:

- Outage Class I:
  - To be considered a timely submission, submission must be before the first day of the month prior to the month containing the start date of the outage.
  - At least 14 Calendar Days in advance of the planned start date.
- Outage Class II – At least 7 Calendar Days in advance of the planned start date.
- Outage Class III – At least 48 hours in advance of the planned start date.
- Outage Class IV – By 1400 hours EST the day prior to the outage.

Note: The above referenced time table does not apply to outage request submitted with the priority type of, Opportunity, Urgent, Emergency or Forced.

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<sup>3</sup> Reference Attachment C for examples/clarification for submitting breaker outages.



Transmission facilities are assigned to an outage Class as defined in Section 5.3. If an outage request contains two facilities, one of which is Facility Class I and the other Facility Class II, then the outage request will be treated as Outage Class I.

These outages will be evaluated by MISO staff to determine if the outage request would create unreliable system conditions. The request will be scheduled for study with a response time determined by the lead-time of the outage request.

All active outage records (Proposed, Submitted, Study Pre-Approved, Approved or Implemented status) appearing in the OS are used in MISO's AFC calculation process and are posted to the NERC SDX for use in congestion management and regional AFC applications. All MISO transmission outages are immediately available on MISO's OASIS site.

### 5.1.2 Transmission Outage Priorities and Equipment Request Types

Transmission Outages must be submitted with one of the following outage Priorities and associated Equipment Request Types:

Transmission Outage Priorities:

- **Planned** – Equipment is known to be operable with little risk of leading to a forced outage.
  - As required for preventive maintenance, troubleshooting, or repairs that are not viewed as urgent work.
  - Due to needed system improvements such as capacity upgrades, the installation of additional facilities, or the replacement of equipment due to obsolescence.
- **Opportunity** – Equipment is known to be operable with little risk of leading to a forced outage; however, the time line for submission of Planned outage priority has passed. See section 5.1.3 for further details.
- **Discretionary** – Equipment is removed from service for operational reasons such as voltage control, constraint mitigation as identified in an operating procedure, etc.
- **Urgent** – Equipment is known to be operable, yet carries an increased risk of a forced outage or equipment loss. The equipment remains in service until maintenance crews are ready to perform the work.
- **Emergency** – Equipment is to be removed from service by Operator as soon as possible because of safety concerns or increased risk to grid security.
- **Forced** – Equipment is relayed out of service.



Transmission Outage Equipment Request Types:

- **Out of Service** – Equipment is out of service.
- **Normally Open** – Equipment is normally out of service and is identified as normally open in the Network Model. Normally Open request type is used to close (place in service) a normally open facility.
- **Informational** – Used for outage events that are not covered by one of the other Outage Equipment Requests Types. Not an out of service event.
- **Hot Line Work (HLW)** – Work is being performed on live or energized equipment.
- **General System Protection** – Work is being performed on protection systems while the protected transmission facilities remain in service. Requestor shall specifically identify protection systems out of service and any modification to operation or behavior of system contingencies. See section 5.1.5 for further details.

Transmission Operators must make efforts to plan and schedule outages of transmission facilities for periods when the likelihood of adverse system impacts is minimized. For example, non-urgent and non-emergency work (i.e., normal maintenance, construction) would not normally be planned and scheduled by the Transmission Operators during Peak periods. However, in the event that scheduled outages are needed during peak system conditions, MISO's evaluation of these requests may be subject to study at elevated Load levels and varying "flow" pattern considerations.

Transmission Outage schedules submitted to MISO's OS less than 14 days prior to the commencement of the outage will not be deemed to be planned outages. MISO will do its best to analyze and respond to Transmission Outage schedules submitted to MISO with less than the lead times specified above.

### 5.1.3 Opportunity Outages

MISO shall coordinate with Transmission Operators to implement schedules for transmission outages submitted with less than the lead times set forth in Section 5.1. Such requests are considered "late submitted," not a normal outage request process, and treated as an exception.

The requestor shall include sufficient notation in the request to assist MISO in determining the significance of the opportunity. Sufficient notation in the outage scheduler "Requestor Notes" comment field should include description or explanation for the opportunity and alternatives.

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Opportunity outages will be considered and characterized as a system condition opportunity or a scheduling opportunity.

- System condition opportunities are characterized as an opportunity to take a facility out-of-service due to an unexpected change in system conditions/topology that would otherwise or normally not allow the outage to proceed without significant reliability risk or efficient market operation. Examples include:
  - An outage or dispatch change of a generating unit resulting in an opportunity outage on one of the transmission outlets to the plant
  - Unanticipated change in an existing outage stop or start times Equipment return to service earlier than anticipated allowing subsequent outages to proceed
  - An unexpected transmission or generation outage occurs resulting in an opportunity outage on a transmission element.
  - Un-expected load forecast changes that allow difficult to schedule outages to proceed

Scheduling opportunities are characterized as opportunity due to resource availability. Examples include:

- Crew/Parts/Tools availability, resources become available due to scheduling openings.
- Re-submission of outages left in Proposed status too long, MP must approve and submit the outage or it is automatically withdrawn by the system. (If the planned outage submission time frame is passed).
- Low risk repair that may have potential to escalate, preference to perform maintenance earlier if possible. (Example: adding gas to a breaker)
- General late submission, not on time for planned status.

Evaluation and approval of system condition opportunity outage requests will ensure system reliability is maintained and include factors such as adequate time to process, need for operating guide, market dispatch, external coordination and significance of the opportunity.

MISO staff will analyze scheduling opportunity outage requests as time permits without sacrificing studies required for the outage submittals that were submitted per the specified request time. Requirement of an operating guide, market dispatch or external coordination may be considered as cause for denial of an opportunity outage.

#### **5.1.4 Local Load Serving Transmission Facilities**

Local Load serving transmission facilities are non-Class 1 or Class II facilities that have little or no-impact on the regional operation of the grid and mainly serve local Load. Prior outage of these facilities, (scheduled maintenance outages), typically result in “N-1” conditions that will drop Load in a Local Balancing Authority Area and will not result in cascading Load Shedding or cascading system outages. The Transmission Operators must submit to MISO, facilities that fall under this category in their Local Balancing Authority Area and are in MISO’s Network Model or under the functional control of MISO per MISO’s Transmission Owners Agreement and/or individual agreements that place the facilities under MISO’s functional control. MISO and the Transmission Operator will review the submitted facilities to determine whether they fall under the local Load serving qualification.

#### **5.1.5 Systems Protection Work**

Transmission Operators must submit outage schedules to MISO for planned and unplanned events pertaining to status of all Protection and Control Systems; that the Transmission Operator owns or operates, when an identical redundant system (primary/secondary) is not in place and one of the following criteria is met:

1. Transmission and Generation Protection systems: Expected mode of fault clearing when system protection is out of service or modified and would result in additional or multiple facilities taken out of service for a single event (N-1 contingencies are altered)
2. Status change from normal mode of operation for any of the following protection systems:
  - a. Special Protection System (SPS) and/or Remedial Action Scheme (RAS)
  - b. Under Voltage Load Shedding (UVLS)
  - c. Under Frequency Load Shedding (UFLS)
3. Transmission Operator can submit outage schedules of other protection and control system changes as may be deemed necessary to maintain system reliability

Outages pertaining to Protection and Control Systems and meeting the above criteria must be submitted to MISO as soon as the outage requirements are determined but no less than 48 hours in advance of the outage for Planned events. Emergency and Forced outage events must be submitted in line with requirements in the Emergency and Forced outage sections of this BPM (sections 5.10 and 5.11 respectively)

Protection System Outage Analysis and Responsibilities

Applicability: Protection system outages, planned and unplanned, when the facilities protected by the subject protection systems is presently and intended to remain in service.

The outages are to be classified as follows:

Overtripping – Protection System will still protect its intended transmission or generation assets, however believed to potentially operate for faults on other facilities or conditions not designed to operate for.

- Transmission Operator to determine and provide identification of facilities faults or conditions the Protection system may operate for beyond the designed operation conditions (modified and/or additional N-1 contingencies must be provided).
- MISO and the Transmission operator will jointly determine mitigating actions as necessary.

Delayed or Failure to Trip – Protection System outages or failures that result in a condition of delayed clearing or failure to clear subsequent fault.

- Transmission Operator to determine stability impacts.
- If determined, Transmission Operator will communicate impact limits to MISO and to any specifically reliability impacted generation facility operator/owner.
- MISO and the Transmission operator will jointly determine mitigating actions as necessary.

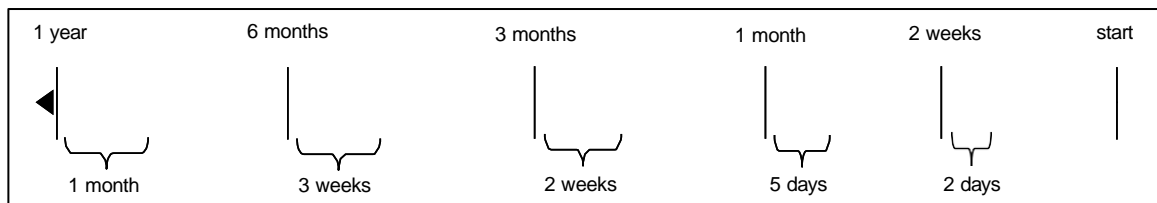
## 5.2 Outage Request Response Times

MISO analyzes and responds to Transmission Outage requests submitted to MISO's Outage Scheduler within a period of time determined by the lead-time of the request. As shown in Exhibit 5-1, the response time is longer for those outages that are planned far in advance. The response times are:

- Two Business Days for outages that have been submitted within two weeks of the start date.
- Five Business Days for outages submitted between two weeks and one month in advance of the start date.
- Two weeks for outages submitted between one month and three months in advance of the start date.
- Three weeks for outages submitted between three months and six months in advance of the start date.

- One month for outages submitted six months or more in advance of the start date.

## Exhibit 5-1: Timeline for MISO's Response to Outage Request



This staggered approach expedites the study of outages that require immediate attention while addressing the need to provide adequate notice for requests that must be planned well in advance of the start date additional time is needed to study the transmission maintenance requests and/or prepare special operating procedures, MISO contacts the Transmission Operator within the response window to indicate additional study time is needed or that an Operating Guide is required.

MISO outage change request response time: (Note: Any outage change request submitted using the CROW outage scheduling system must first be accepted by MISO prior to that change being incorporated in MISO's reliability or market functions/DART. Prior to accepting any outage change request, time must be provided to conduct a reliability assessment/study. The Transmission Operator is responsible for timely submission of outage requests/changes and allowance for outage submission processing times.)

- Outage change requests submitted for outages applicable to that day - MISO will respond as soon as practical, normally within 4 hour of submitting the request. If under extenuating circumstances, the Transmission Operator may contact/call the Regional Operating Engineer to determine if the request evaluation can be expedited.
- Outage change requests submitted for outages applicable to the next day - MISO will respond as soon as practical, normally within 12 hours or midnight day prior (whichever comes first). If under extenuating circumstances, the Transmission Operator may contact/call the FRES Engineer and request expedited processing of the change request.
- Outage change request submitted two or more business days in advance of the start date – MISO will respond as soon as practical, and within the time period allowed for study of a new outage request. If under extenuating circumstances, the Transmission Operator may contact/call the Outage Coordination Engineer and request expedited processing of the change request.

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## 5.3 Transmission Outage Approval

MISO's approval is required for all planned Transmission facility outages for which MISO has functional control. For the purpose of outage reporting, Transmission facilities are categorized into Outage Facility Classes.

### 5.3.1 Outage Facility Classes

The criteria for each class of facilities are set forth in Section 5.3.2. For purposes of this BPM, Class I Facilities, Class II Facilities, and Class III Facilities are those Transmission facilities that satisfy the requisite criteria set forth below, and that also are either: a) a Member's transferred facility or b) a facility for which MISO provides Reliability Coordinator services. A Class IV Facility is any Transmission facility over which MISO does not have functional control pursuant to the Transmission Owners Agreement, and which is not subject to MISO's Reliability Coordinator authority. The status of such facilities is communicated to Transmission Providers and Operators for information purposes.

### 5.3.2 Criteria for Classification of Facilities

**Class I:** A facility is designated as Class I if it has a reliability or market impact on transmission system operations; specifically if one or more of the following conditions exist<sup>1</sup>. The listed conditions shall be applied to system intact configuration when determining facility class.

**A. Facility outage:**

- a. Is predicted to cause the implementation of:
  - i. MISO Congestion Management Procedures; i.e. binding constraints in real-time or in day-ahead processes
  - ii. Market Flow Relief Procedures, i.e. TLR procedures
- b. Requires:
  - i. Unit commitment via the Reliability Assessment and Commitment (RAC) process
  - ii. An associated mitigation procedure
- c. Impacts a Nuclear Plant's Interface Requirement

**B. Facility is:**

- a. A tie point > 100kV between MISO's RC footprint and an external party
- b. Greater than 300kV<sup>2</sup> (Excluding non-networked serving local load)

C. Facility is listed in; or included in the definition of:

- a. An outage coordination agreement or process with an external MISO party, e.g., IESO, MAPP, SPP, TVA, etc.
- b. A Coordinated Flowgate or Reciprocally Coordinated Flowgate in MISO's RC footprint:
  - i. Facility is the monitored element of a PTDF;
  - ii. Facility is the contingent element of an OTDF; or
  - iii. Facility affects TTC or AFC on the flowgate
- c. An Interconnection Reliability Operating Limit (IROL)

<sup>1</sup> 69kV facilities are not considered Class I, unless specific circumstance necessitates additional time required to coordinate an outage.

<sup>2</sup> Transformer voltage class is determined based on the secondary winding voltage. Exception; a three-winding transformer voltage class is determined based on the secondary or center tap voltage, whichever has the highest voltage.

Class II: A facility is designated as Class II if it has been identified as not having a reliability or market impact on transmission system operations and specifically if one or more of the following conditions exist.

- A. All 69kV facilities unless determined otherwise
- B. Facility is > 100kV (Excluding non-networked serving and/or local load) and does not qualify under any of the Class I criteria

Class III: A facility is designated as Class III if it has been identified as not having reliability or market impact on transmission system operations and specifically one or more of the following conditions exist.

- A. Facility is identified as non-networked serving and/or local load
- B. Facility does not qualify under any of the Class I or Class II criteria and MISO has functional control

Class IV: A facility is designated as Class IV if all of the following conditions exist.

- A. Is a facility for which functional control has not been transferred to MISO per the Transmission Owners Agreement and is a facility within the RC footprint that is not subject to MISO's Reliability Coordinator authority
- B. Facility does not qualify under any of the Class I, Class II or Class III criteria.

MISO may reclassify a facility if studies support the change and the reclassification is coordinated with the appropriate Transmission Operator.





MISO works with the Transmission Operators to develop the Facility Class list. The list is reviewed periodically, typically as part of the outage submission/approval process. However a formal review may be requested by MISO or Transmission Operators at any time to ensure that the list is complete and accurate. The Outage Facility Class list is made available to the Transmission Operator via the Reliability Coordination web page on MISO's extranet site. MISO staff may add facilities to the Outage Facility Class list if studies reveal that the facility's scheduled outage may have an adverse impact on reliability or is in conflict with other outage requests. MISO staff will notify the Transmission Operator that a facility that was previously listed has had its Class modified.

MISO may need to operate the Transmission facilities within its Reliability Coordinator Area in a conservative manner at times to maintain reliability. Examples include periods of extreme adverse weather, high system Loads, and elevated homeland security levels that include threats to the electric system infrastructure. MISO has the authority to deny or reschedule planned Transmission Outages and return transmission facilities to service during these conditions. MISO contacts the equipment owner if cancellation or rescheduling of an outage request is needed per Section 5.12 of this BPM.

## 5.4 Transmission Outage Analysis and Models

Study priority is based on the request type and date and time of the submittal. MISO recognizes the advantages of prioritizing by outage type and gives preference to the more critical outages. The request date and time further determines the order of the requests in the queue. Section 5.9 of this BPM discusses the priority of requests and conflict resolution based on the outage types.

MISO MOD process is the basis for development of (off-line) bus-branch operational planning models. MISO's Energy Management System (EMS) is utilized for (on-line) nodal operation planning models. These operations planning models are the primary models used for outage analysis. To ensure accurate representation of the system topology across bus-branch and nodal models, Transmission Operators should submit all equipment required to accurately model an outage. Equipment required for bus-branch models includes open-ended lines or transformers that would be out of service, while nodal models require all switches and breakers that would be out of service, as per Attachment C.





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General differences between the base MISO Series MTEP planning models and the operational planning models include:

- System topology is adjusted based on pending MOD projects and equipment in-service dates
- Operational Ratings (MISO EMS ratings set) Summer/Winter Ratings seasons used
- System Load and applicable outages based on NERC SDX data
- System Interchange and Generation Dispatch is adjusted based on historic operation levels/market patterns

MISO utilizes planning and study network applications to analyze planned transmission outage requests. Analysis includes power flow, contingency analysis, and stability analysis, as necessary, to identify:

- Violation of pre and post-contingent thermal limits
- Violation of pre and post-contingent voltage limits
- Violation of pre-determined stability limits

In General, if outage analysis indicates next-contingency system conditions would be acceptable (i.e., no overloads beyond emergency ratings, excessive or inadequate system voltages, loss of system stability, etc.), MISO approves the request and notifies the requestor. The requestor is notified of the approval by a status change within MISO's OS.

Under certain limited conditions, outage approval may be subject to additional review and analysis to ensure regional security. Multiple contingencies (N-2) or the second next contingency (N-1-1) may be considered during the outage approval analysis. This analysis will be made in conjunction with the Transmission Operator and reliability coordinator assessment of risk. Analysis of such conditions will be limited to extreme conditions or previously identified scenarios involving cascading events, loss of significant load/generation, nuclear power plant operations, or IROL interfaces.

Outage evaluation may also include analysis at elevated Load levels and/or additional sensitivity analysis (e.g., increased transfers to stress interfaces or wind impact analysis) to account for forecast uncertainty.

If outage analysis indicates unacceptable system conditions, MISO works with the requestor to develop remedial steps to be taken in advance of such proposed outage. This includes scheduling the outage based on alternate start and end times submitted by the equipment owner, the use of existing Operating Guides, or the development of new Operating Guides. Operating Guides



prepared by Transmission Operators must be submitted to MISO staff utilizing the official MISO Operating Guide Template (see Attachment A of this BPM) and in accordance with the schedule in Section 5.5 of this BPM, but no later than 3 Business Days prior to the start date of the planned outage. This allows sufficient time for MISO staff to verify that the steps in the Operating Guide are adequate and do not adversely affect adjacent areas. If no remedial steps are possible, MISO normally denies the request and provides an acceptable timeframe in which the maintenance can be performed – recognizing the priority of scheduling transmission outage work to maintain transmission system reliability.

MISO also performs steady state voltage analysis and voltage stability analysis on certain identified reactive elements. These are elements associated with known voltage problems in MISO's Reliability Authority Area and the voltage analysis is done in conjunction with the normal thermal assessment of the outage request. The elements are identified and listed in Transmission Facility Outage Class list.

### **5.5 MISO Reliability Coordinator Outage Notification Process**

MISO RC, through its Outage Notification Process, will verify that planned outage switching is coordinated the day of the planned outage. The purpose of the Outage Notification Process is to confirm the switching events planned for the day are taking place and to provide for a final assessment of planned outages under current system conditions. The notification process is described in the Outage Operations procedure: SO-P-NOP-00-411.

### **5.6 Operating Procedures Specific to Outages**

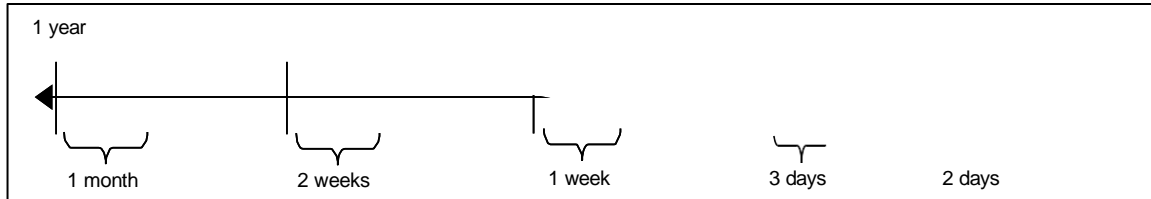
In some cases, an outage may result in unacceptable system conditions. Therefore, MISO recognizes the need for procedures to avoid jeopardizing the integrity of the system while continuing to allow maintenance and system improvements to proceed. An outage request analysis that identifies conditions that impact system security would require the submittal of an Operating Guide by the Transmission Operator making the request or development of a Transmission Notification (T-Note) by MISO. Outage approval is dependent upon receipt or creation, and verification, of the Operating Guide or T-Note.

#### **5.6.1 Operating Guides**

Requestors are required to work with MISO staff to develop and/or provide a specific Operating Guide for the maintenance outage. The parties involved in the mitigation must review and agree to operate the system per the Operating Guide if the anticipated conditions arise. MISO staff and the requesting utility will have an equivalent amount of time to develop the Operating Guide as the original response time allotted to the outage request as shown in Exhibit 5-2, but it must be

finalized no fewer than three days prior to the outage in order for MISO to review the steps and verify the results of the implementation of the Operating Guide.

## Exhibit 5-2: Timeline to Provide Operating Guide to MISO



If an Operating Guide is not provided in the appropriate amount of time, the outage will be denied and the requestor must make a new request for a later date. MISO will analyze and respond to the Operating Guide by the close of the next Business Day. It may be necessary to develop an Operating Guide due to results of MISO's next day or seven day studies. If this occurs, Operating Guides will be developed as soon as possible. Emergency Operating Guides are developed as quickly as possible to mitigate system conditions that arise from unplanned outages or other unanticipated conditions.

The Operating Guide is a detailed plan of action that will be implemented in the event of an Emergency condition. At a minimum, the details of the Operating Guide (see Attachment A of this BPM) must include:

- Specific event and conditions triggering the implementation of the Operating Guide, including the effective dates of the guide
- Expected availability of the Guide
- Steps necessary to carry out the plan and expected response time
- Anticipated relief resulting from implementing the Guide and based upon the system state.

Standing Operating Guides will be considered for use during a planned outage if the Guide contains sufficient details as specified in this policy and the requestor and/or reviewer verifies the effectiveness of the Guide in addressing the specific outage request during the anticipated system conditions of the outage timeframe.

Operating Guides for outages that cause flowgate overloading may be used in determining the System Operating Limit (SOL) that will be used for initiating NERC TLR action. Only switching actions that can occur promptly will be considered for adjustment of SOL. Redispatch options will only be considered if implemented in pre-contingency conditions. If a short-term Emergency rating



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(less than 2 hours) has been submitted by the owner of the overloaded equipment, it may be used in the adjusted SOL.

When system conditions necessitate a change in the Operating Guide once an outage has begun, a new Operating Guide will be requested. Any revision to the Operating Guide must be submitted in writing and must represent operating conditions of the current system state. If no revision has been submitted, MISO will continue to operate the system under the present Operating Guide and address NERC TLR issues accordingly.

MISO posts Operating Guides that are presently in effect on the Reliability Authority/ Reliability Coordination web page found on MISO's extranet site.

### **5.6.2 T-Notes**

T-Notes are a short form of an Operating Guide. When an outage results in unfavorable conditions that can be resolved using the market congestion management procedures a T-Note may be used in place of an Operating Guide. T-Notes may also be developed to convey known outage conditions that may restrict system access/performance that doesn't otherwise require an Operating Guide. T-Notes are developed by MISO's outage coordination engineer in coordination with the Transmission Operator.

Time requirements for development and review T-Notes are the same as for Operating Guides. T-Notes are contained within the OS as part of the outage schedule details.

## **5.7 Market Impacts**

Transmission outage impact mitigation steps can include MISO's market redispatch, TLR, switching options, and operating guides. Redispatch of non-MISO market generator resources is not typically an option unless provided for under a joint operating agreement and coordinated otherwise. Exhibit 5-3 shows allowable actions for each outage type. During the outage evaluation process, this information is used to determine if an outage should be approved. Once an outage has started, then any acceptable action to relieve loading is permitted.

Transmission outages that result in operating limitations imposed on Generation Resources due to thermal, voltage, or stability limits should be coordinated, per Operating Procedure SO-P-NOP-00-497, between Transmission Operator and Generation Owner/Operator to reduce market impacts and scheduled to coincide with a Generator Planned Outage when possible.



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### Exhibit 5-3: Allowable Actions versus Outage Types

Outage Priority	Action	Permission
Planned	Outage Load	Not Permitted
	Gen Outlet Reduction	Not permitted unless agreed to by impacted Generator – should be scheduled around Generator outage
	Non-firm TLR	Permitted, AFCs to be adjusted prior to outage to avoid use of NERC TLR
	Firm TLR	Permitted in accordance with Section 5.8 of this BPM
	Redispatch	Permitted
Opportunity	Outage Load	Not permitted
	Gen Outlet Reduction	Not permitted
	Non-firm TLR	Not permitted
	Firm TLR	Not permitted
	Redispatch	Not permitted
Discretionary	Outage Load	Not permitted
	Gen Outlet Reduction	Permitted
	Non-firm TLR	Permitted
	Firm TLR	Not Permitted
	Redispatch	Permitted
Urgent	Outage Load	Not permitted
	Gen Outlet Reduction	Permitted, with attempt to schedule around Generator outage
	Non-firm TLR	Permitted
	Firm TLR	Permitted in accordance with Section 5.8 of this BPM
	Redispatch	Permitted
Forced/Emergency	All	Any approved process that will mitigate loading will be allowed during this type of outage

**Definitions:**

- **Firm TLR** – Equipment outage requires NERC TLR Level 5 to avoid violation of operating criteria.
- **Gen Outlet Reduction** – Equipment outage leads to requiring Generator output limitation to prevent violation of operating criteria. This outage type only applies to generation with a scheduled commitment.
- **Non-firm TLR** – Equipment outage requires activation of NERC TLR Level 3 to prevent violation of operating criteria.
- **Outage Load** – Equipment outages that directly result in loss of service to end use Load, excluding radially served Load. Load transfers must be noted in the request record.
- **Redispatch** – Action to avoid NERC TLR 4/5 with costs paid for by requestor for maintenance and construction outages. This outage type can include implementation of reliability redispatch for urgent outages.

## 5.8 Approval with Over-Subscription of Firm Service

Outage coordination studies typically do not attempt to distinguish between the firm and non-firm impacts that are subject to curtailment in the event of NERC TLR, but may indicate that a potential contingency overloading condition is to be expected with the facility outage. In most cases the outage should be rescheduled if a mitigation plan cannot adequately address the expected overloads. MISO uses available processes and tools (outage coordination studies, AFC calculations, etc.) to assess the potential for firm curtailment if oversubscription of firm service is suspected. For certain Class 1 Transmission Facility outages that cannot be rescheduled to avoid curtailment of firm transactions, a mechanism is available to permit the outage to occur with the potential for oversubscription of firm service when specific conditions are met. These conditions include:

- The requested outage must involve a Class 1 Transmission Facility as defined in Section 5.3 of this BPM.
- A planned outage request must be submitted at least six months in advance of the planned start date to verify that there is no other window of opportunity to minimize impact on firm service (e.g. concurrent with Generator outages).
- The outage cannot be rescheduled for a later date because of the risk associated with a delay in the work.
- The outage coordination study must show that there is significant overloading (greater than 5%) on defined flowgates for the forecasted conditions and an Operating Guide

must be submitted to specify any system reconfiguration or redispatch options available to avoid or minimize firm curtailment.

- To be eligible for approval with potential impacts on firm service, the studied outage must not be concurrent with another unrelated facility outage that causes additional impacts including negative effects on system adequacy. If the studied outage conflicts with an outage submitted by the same requesting company, the conflicting outage must be voluntarily cancelled, or the relevant facility returned to service without compensation. If another requestor has submitted the conflicting outage, priority will be based on the conflict resolution guidelines indicated in the table in Section 5.9 of this BPM.
- The outage must be performed in the shortest possible outage window, including overtime work if necessary, to minimize the amount of firm curtailment.
- The outage is subject to recall in order to avoid unnecessary firm curtailment in the event of forced outages or unexpected delay. The minimum recall time must be reported with the original outage request and updated as necessary.
- The Operating Guide must comply with the terms discussed in Section 5.6 of this BPM in order to be eligible for approval with potential impacts on firm service. The Operating Guide must clearly indicate the reason and adequately justify the risk of firm service curtailment and must state that the outage is pre-approved for over-subscription of firm service.

If all conditions are met, then the outage request may be approved with over-subscription of firm service as a potential risk. When the potential for firm curtailment exists due to an outage request, MISO coordinates with adjacent RCs.

## 5.9 Outage Conflicts

The outage Priority is used to determine the priority of the request and to resolve conflicts between outages. In the approval process, the outages are prioritized by type and preference is given to those outages that are considered urgent or Emergency in order to avoid conflicts. When two approved outage schedules are found to jeopardize grid security due to actual system conditions, it may be necessary to cancel a request in order to eliminate the conflict. Exhibit 5-4 addresses the treatment of conflicting outages in the approval process and in the revocation of outages that are already in progress.

When a conflict occurs, the requestors will be contacted to assist in eliminating the conflict. This assistance could include the cancellation and/or rescheduling of the outage or the development of an Operating Guide.



## Exhibit 5-4: Conflicting Outages versus Resolution

Conflicting Outages		Assumptions
A	B	
Planned	Planned	First come, first served
Planned	Urgent	Delay Planned regardless of which is first
Planned	Forced	Delay Planned regardless of which is first
Discretionary	Planned	Delay Discretionary regardless of which is first
Discretionary	Urgent	Delay Discretionary regardless of which is first
Discretionary	Forced	Delay Discretionary regardless of which is first
Urgent	Urgent	Determine which outage should be delayed based on operating risks
Urgent	Planned	If N-1 Load is in jeopardy, delay Planned construction
		If Gen Outlet is compromised, delay Planned construction
		If loading can be mitigated with Non-firm TLR issuance, permit both outages
		If Firm TLR necessary, delay construction, unless construction outage is permitted with possible over-subscription of firm service allowance under Section 5.8 of this BPM
Urgent	Forced	Determine risk for delay of urgent outage

Planned construction is determined by cause code selected in the outage submittal.

### 5.10 Emergency Outages

For emergency transmission maintenance, when conditions endanger the safety of employees or the public, or may result in damage to electrical facilities or private property, the Transmission Operators must notify MISO as soon as possible. Approval by MISO for emergency maintenance is not required; however, an outage schedule for the emergency maintenance must be submitted to MISO as soon as possible.

### 5.11 Forced Outages

MISO coordinates with the Transmission Operators to implement schedules for unplanned transmission maintenance due to a forced outage. Approval by MISO for unplanned maintenance due to forced outages is not required. Transmission Operators must contact MISO's RC or shift Operations Engineer to report forced equipment outages as soon as possible after the occurrence



of the outage. Reported information must include the cause of the outage and the expected return to service time (if known). MISO and the Transmission Operator must develop an associated maintenance schedule for the outage and update the schedule periodically, as necessary. The Transmission Operator must develop an associated schedule for the outage and submit the schedule as a forced outage into MISO's OS. This must include an estimated end time and must be updated periodically, as necessary.

## **5.12 Outage Rescheduling**

Once a planned request has been approved and scheduled, the Transmission Operator can proceed to perform the maintenance per the approved schedule request. The Transmission Operator should plan the outage appropriately and strive to perform the maintenance during the approved maintenance outage window. However, adjustments to start and/or completion times may be necessary due to various reasons as described below. (Note, any change to an outage start/end time or cancellation of an outage that will occur the next day should be made prior to 1030 hrs. EPT of the day prior to the scheduled outage start/end date to facilitate reliable and efficient market operations.)

### **5.12.1 Changes by Equipment Owner**

Changes requested prior to the start of an approved outage require additional review by MISO.

- MISO approval is needed if the proposed changes will result in a widening of the original outage window. The Transmission Operator can change the outage using one of the following methods:
  - Submit additional request(s) for the time period(s) outside of the original outage window (the original outage window will stand as previously approved in this case) or;
  - Cancel the original maintenance request and submit a new maintenance request for the revised outage period, or
  - Submit a change request via the outage scheduling system.

To reduce the need for the Transmission Operator to resubmit an outage due to the widening of the original outage window, MISO recommends that the Transmission Operator not schedule conflicting outages one after the other. MISO attempts to coordinate these outages to allow a period of time (e.g., 48 hours or more) between such outages. This is done to avoid a potential overlap of conflicting outages because of the possible need to extend the length of a maintenance outage due to unforeseen events.

- If the change results in a shorter timeframe being needed to complete the maintenance, the requesting Transmission Operator only needs to notify MISO. No

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additional approval will be necessary as long as the outage remains within the originally approved timeframe. However, updating the outage information ensures that outages are represented accurately for security analysis and outage coordination. For outages that start late (after the planned start date) or end early (before the planned end date), the equipment owner must promptly contact MISO's shift OE or MISO's RC to report the changes. MISO updates the OS to reflect the new outage times.

Once an outage has been implemented, situations can arise that may require additional time to complete the maintenance. When this occurs, the Transmission Operator must notify MISO as soon as possible to inform MISO that additional time may be required. This notification can be accomplished by submitting a Scheduled Change Request in the OS. As part of this communication, the Transmission Operator must provide MISO with the reason(s) for the potential delay and an estimate of the additional time that may be required, beyond the previously approved completion time, to complete the maintenance.

MISO determines if the desired maintenance extension will have an adverse impact on system reliability and/or will cause other approved planned requests to be revoked due to new reliability issues. MISO provides the results of its analysis to the Transmission Operator. The Transmission Operator has the option to:

- Complete the maintenance beyond the previously approved completion date provided there will be no adverse impact on system security and the Operator is willing to compensate other Operators whose approved planned maintenance is revoked by MISO; or
- Work overtime in order to complete all of the maintenance by the previously approved completion time; or
- Complete as much of the work as possible and return the facility to service by the previously approved completion time and submit a request to complete the remainder of the work at a later date.

Changes due to events outside the control of the Operator or as directed by MISO may still be considered as planned outage events by MISO. Examples of such events can include:

- Unsafe or inhospitable working conditions due to weather as determined by the Transmission Operator
- MISO issued weather alerts and/or conservative operations declaration
- System reliability issues as caused by Forced or emergency outage events



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Changes to outage tickets associated with events outside the control of the Operator may be reported by submitting a change request in the outage scheduling system. If the change results in the outage priority being modified to Opportunity or Urgent, the requestor must include comments in the “reason for change” field of the change request form stating the specific reason the request should qualify to still be considered as planned. If a new outage request is submitted, requestor notes must state the specific reason for consideration as a planned request and reference the outage system identification number (CROW ID#) of the canceled request it replaces. Changes impacting switching times for outages scheduled for the current operating day may also require the Transmission Operator to contact the RC. See the Outage Operations procedure (SO-P-NOP-00-411) for requirements.

### **5.12.2 Changes Due to New Class 1 Transmission Facility Outage Requests**

In the event a planned Class 1 Transmission Facility maintenance outage request impacts earlier approved outage requests, MISO works with the Transmission Operators who submitted the earlier approved requests to determine if they would be willing to adjust their dates/times. The Equipment Operator requesting the planned Class 1 outage is responsible for paying eligible costs, as described in MISO’s Tariff, incurred as a result of any rescheduled previously approved outage.

### **5.12.3 MISO Changes to an Outage Schedule Due to Security or Reliability Reasons**

MISO has the authority to revoke any previously approved planned transmission maintenance outage if forced Transmission Outages or other circumstances (e.g., unexpected loss of generation, unexpected changes in Load, unexpected delays in transmission maintenance, etc.) compromise the integrity or reliability of the Transmission System or MISO’s Reliability Coordinator Area. MISO notifies the Transmission Operator of the decision to revoke approval of the maintenance as soon as possible after the circumstances arise that create the need for the revocation.

#### **5.12.3.1 Cost Recovery Due to a Rescheduled Outage**

Transmission Operators are compensated for eligible costs associated with an approved outage of a transmission facility that is revoked due to system security and regional reliability reasons according to MISO’s Tariff.

Request for cost recovery due to a rescheduled outage should be submitted to: MISO Manager of Transmission Settlements. Documentation that provides justification of the expense including proof of payment in the amount sought for recovery should be provided at the time of the request.



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### **5.12.4 MISO Changes to an Outage Schedule Due to a Transmission Customer Request for Enhanced Available Flowgate Capability**

When a Transmission Customer requests enhanced AFC, MISO identifies transmission maintenance schedules that limit AFC and then identifies opportunities and the associated costs to reschedule planned maintenance in order to enhance AFC. MISO will reschedule a Transmission Outage that limits AFC if the Transmission Operator is willing to reschedule the transmission maintenance and the Transmission Customer is willing to compensate the Transmission Operator for the eligible costs, as described in MISO's Tariff, incurred as a result of the rescheduled maintenance.

MISO has complete audit rights over costs claimed by the Transmission Operators for costs incurred due to a maintenance rescheduling. If an audit reveals inappropriate charges, MISO retains complete reimbursement rights.

## 6 Outage Scheduling

MISO utilizes an outage scheduling (OS) application to document all transmission and generation outage schedules. The OS application is available for outage submission as soon as known; Transmission and Generator Operators should report outages and updates as soon as possible. Every effort should be made to ensure outage information for the next operating day is reported prior to the close of the Day Ahead Market to ensure availability for the next day security studies.

MISO Transmission and Generator Owners or Operators have access to MISO's outage scheduling system in order to submit outage requests/schedules to MISO. Generator Owners or Generator Operators only have access to the Generation Resources that they own or operate. Transmission Owners and Operators have access to the transmission equipment they own or operate, and limited access to Generation Resources in their footprint and transmission equipment of surrounding areas.

Transmission and Generator Owners and Transmission and Generator Operators must submit their outage requests/schedules to MISO via MISO's OS system. Two methods for submission are available:

- OS Web Interface
- OS XML API Interface

The OS Web Interface accommodates new requests as well as changes to outage requests. Changes can be made to the equipment selected, planned start and planned end while the record is in the proposed state. Any changes to the equipment or planned start/end dates once the record has entered the submitted or any advanced state require the submission of a change request. When the outage is in progress the requestor is responsible for the outage Implementation and Completion. The requester must enter, in a timely manner, the actual start and end times as appropriate and maintain the request information to update the progress of the outage.

- **Actual Start Time:** This is considered the time the facility is disconnected from the bulk electric system or closing in the case of a normally open facility state change, not the time that the field work begins or the time a unit starts ramp down. Applies to generation and transmission outages; generally considered breaker-or-breaker to breaker opening time.
- **Actual End Time:** This is considered the time the facility is re-connected to the bulk electric transmission system or opening in the case of a normally open facility state change, not the time that field work ends or the time when a unit completes ramp and returns to full output level. Applies to generation and transmission outages; generally



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considered breaker or breaker-to-breaker closing time. (Note: If a generator completes an outage but normally does not run or is not expected to run, the Actual End Time represents the time the generator would be available to reconnect to the bulk electric system.)

(Note: The above requirements also apply to establishing the estimated planned outage submittal start and end times.)

The submission, maintenance and implementation of outage records is the responsibility of the Generator Operator and Transmission Operator, not MISO; with exception of the approval process.

## 6.1 Backup Method

In the event neither of the two methods listed above are available for an extended period of time, outage requests/schedules can be communicated to MISO Operations Engineering staff via telephone or email until such a time that functionality is back to normal. Problems accessing MISO's OS via the Web Interface should be reported to the IT Help Desk at 1-888-368-7711.

## 6.2 Outage Scheduler

MISO's OS is the application for defining and maintaining equipment outage requests and schedules in a central repository for access by other applications. The OS is integrated with NERC SDX – posting outages to the NERC SDX and retrieving external outages on an hourly basis. A planned outage report is also developed from the OS database and posted to MISO's OASIS to meet FERC requirements. The planned outage report only contains transmission outage schedules; generation resource outage schedules are not posted. Once an outage has been entered it is available on the report after the next hourly update.

All transmission and generation equipment as modeled in MISO's Energy Management System (EMS) is accessible in the OS and is recorded in a hierarchy. Access to equipment details is based on access rights, which means that Market Participants (MPs) and Operators can create an outage schedule request on all equipment for which they have access rights.

Refer to the "CROW User Guide" for a detailed description of the OS data entry and retrieval process. (Reference: [https://cdn.misoenergy.org/CROW User Guide105027.pdf](https://cdn.misoenergy.org/CROW%20User%20Guide105027.pdf))

Exhibit 6-1 illustrates the workflow from the request for an outage to the outage schedule. The key elements to the process are:

- **Active** – Status is only applicable to external outages from the NERC SDX. Active indicates that the request is present in the SDX process.
- **Approved** – If MISO approves the request after the study has been completed, the status changes to Approved. If an emergency outage is submitted, the status immediately becomes Approved. Approved state indicates that the outage request is ready for implementation.
- **Cancelled** – The Cancelled state indicates the outage has been cancelled by the requestor. Cancelled outages can be reinstated by the MP, provided the planned start of the outage falls within the business rules for lead time submission.
- **Completed** – Outage status once the actual end time has been entered, indicates the outage is no longer in progress.
- **Denied** – An outage request that is in *Study* mode can be *Denied*. If MISO denies the request, the status changes to *Denied*; a denied outage request can be modified and resubmitted. Denied state indicates that the outage request was not approved for implementation.
- **Implemented** – Outage status once the actual start time has been entered, indicates the outage is in progress.
- **Inactive** – Status is only applicable to external outage from the NERC SDX. Inactive indicates that the request is no longer present in the SDX process.
- **Preliminary Approved** – Requests with Preliminary Approved status have the same rights as request with Approved status. Preliminary Approved status is used to designate outage request that were approved based on long lead studies and may need additional analysis closer to the planned start date or finalization of an Operating Guide. Once the restudy is complete or final opguide posted the outage status is changed to Approved.
- **Proposed** – If outage request is saved as Proposed, the outage request remains in the system under full revision control of the MP until it is approved by the MP, thus changing the status to Submitted. If the outage does not receive MP approval within 30 days of the planned start date the outage is automatically Withdrawn. A Proposed outage request qualifies for outage queuing in conflict resolution.
- **Recalled** – An outage that has been implemented can be recalled due to system emergency or conservative operations conditions. Recalled indicates that the outage request had been implemented, but that it was returned without having completed all the necessary work.
- **Revoked** – Once an outage request has been *Approved*, it can be *Revoked* at any time (i.e., before or during the outage).





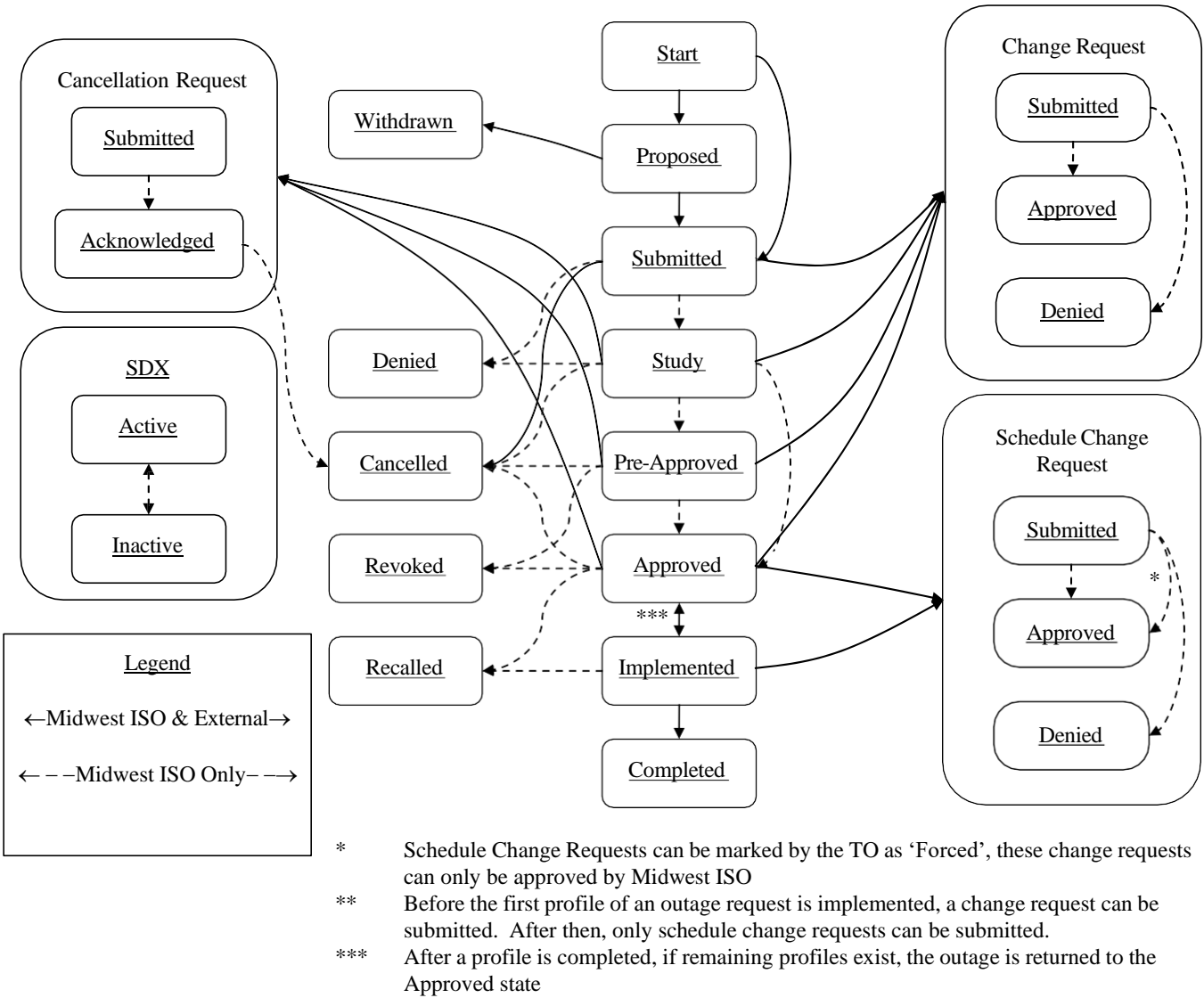
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- **Study** – Once the active study process begins, the Market Operator changes the outage status to study.
  - **Submitted** – MP places the outage request in Submitted status once the MP is confident the outage will proceed or request the acceptance response from the Market Operator.
  - **Withdrawn** – The MP can withdraw an outage request while it is still in Proposed status. Once in Submitted, Study or an approved status the request must be Cancelled.

## Exhibit 6-1: Outage Request Workflow





**Attachment A:**  
**MISO Operating Guide Template**

Reference: Operating Guide Process Template posted on MISO's Reliability Coordinator web page at <https://extranet.misoenergy.org/extranet/reliability-authority/reliability-coordination/operating-guides/#t=10&p=0&s=&sd=>



**Attachment B:**  
**MISO Backup Outage Scheduling Form**

**No Longer Utilized**

## **Attachment C:**

### **Including Circuit Breakers and Switches in an Outage Request**

To ensure proper functionality of MISO systems and coordination of outage data with neighboring entities Transmission Lines, Transformers, Loads and reactive device facilities must be submitted for outage. Additionally, switching devices located in the field must also be included with the outage request. This includes circuit breakers and switches. The inclusion of these devices allows MISO's systems to accurately reflect forecasted operating conditions and perform the necessary analysis to conduct outage operations reliably. Switching devices shall be included in an outage request if they are to be in an abnormal state either out of service for a normally closed device or in-service for a normally open device for the duration of an outage or an outage profile in a non-continuous outage. Switching devices which will not be in an abnormal state, but will be momentarily operated during switching do NOT need to be in the outage request, but they should be detailed in the clearing location field in CROW. Examples of different outage scenarios and equipment that shall be submitted to CROW are detailed below.

#### **Examples Included Below:**

- Ring Bus
- Breaker and a Half Scheme
- Three – Terminal Lines
- Normally Open Breaker

#### **Required Equipment Information:**

Outage requests have two areas where equipment information must be included.

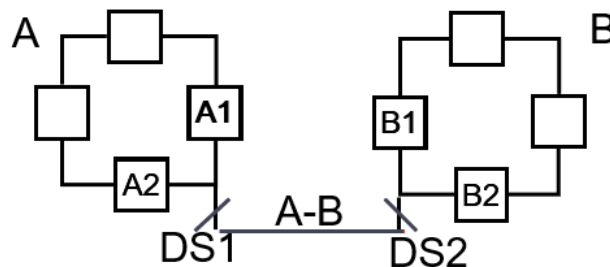
#### **Equipment Requested:**

- Facilities and devices that remain outaged for the duration of the request
- Equipment request type must be selected for each facility or device

#### **Clearing Location:**

- Details devices that will be utilized for clearance boundary and devices which will be operated during switching in the field. Under certain scenarios the clearing location may be left blank, but in other scenarios the equipment which establishes the clearance boundary and remains outaged will be noted in the equipment requested and clearing location along with devices operated during switching.

## Ring Bus – Example 1



Outage Description: Outage Line A-B with ring bus A&B remaining closed during the duration of outage

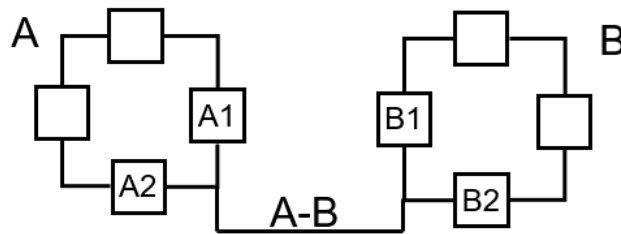
### Equipment Requested

**Required: Line A-B  
and DS1 and DS2**

### Clearing Location

**Breakers A1, A2, B1, and B2 will be opened during switching to allow DS1& DS2 to be opened for clearance point. Breakers will be reclosed after switching.**

## Ring Bus – Example 2



Outage Description: Outage Line A-B with ring bus A&B remaining open during the duration of outage

**Equipment Requested**

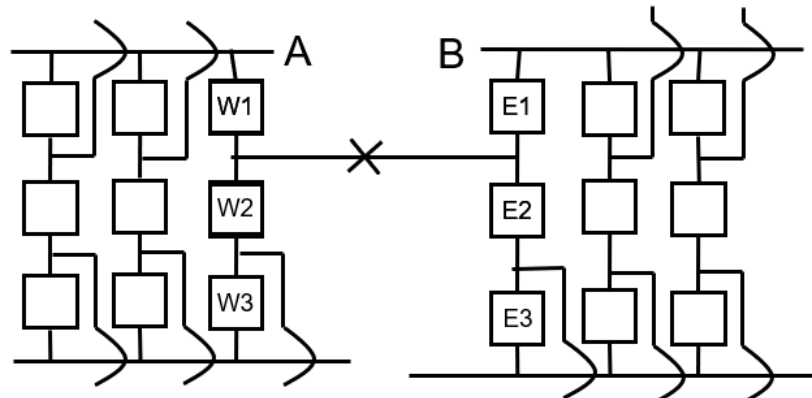
**Required: Line A-B  
& Breakers A1, A2, B1, B2**

**Clearing Location**

**(None)**



## Breaker – and A Half Scheme



Outage Description: Outage Line A-B, breakers remain open for outage duration

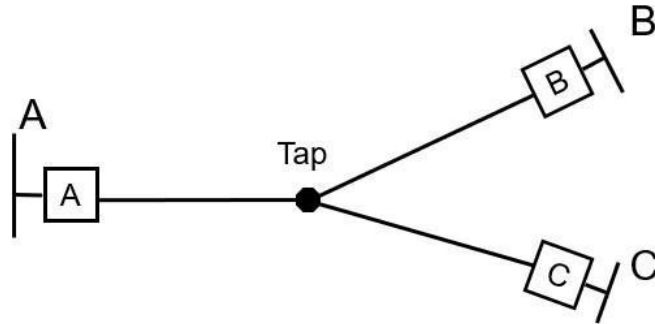
### Equipment Requested

Required: Line A-B  
Breakers W1, W2, E1,E2

### Clearing Location

(None)

## Three-Terminal Line – No Disconnects



Outage Description: Outage line segment A-Tap.

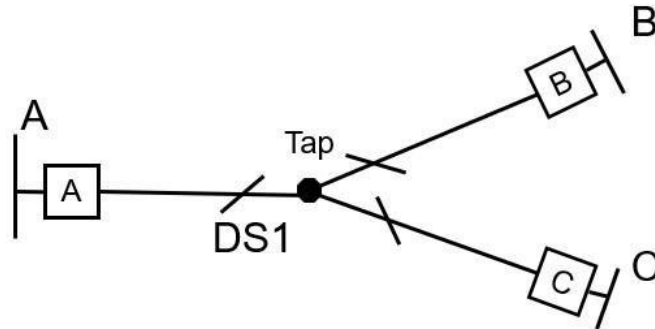
**Equipment Requested**

Line A-B-C or, as more likely in the model, A-Tap, Tap-B & Tap-C and Breakers A, B, and C

**Clearing Location**

(None)

## Three-Terminal Line with Disconnects



Outage Description: Outage line segment A-Tap.

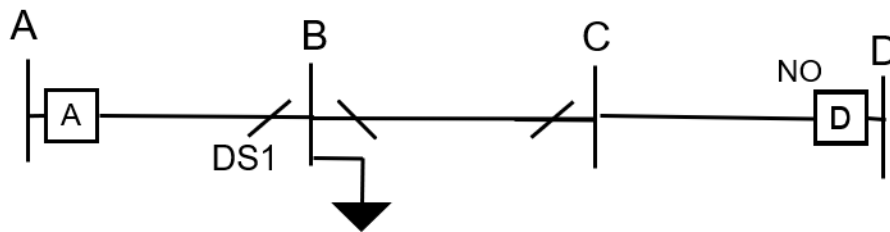
### Equipment Requested

Required: Line A-Tap  
Breaker A & Switch DS1

### Clearing Location

Clear Line A-B-C @ breakers A, B & C and open DS1 to isolate. Path B-C remain in service during outage duration.

## Normally Open Breaker



Outage Description: Outage Line A-B, and feed the load at station B from station D (Note: D is a Normally Open breaker)

### Equipment Requested

**Required: Line A-B & Breaker A and DS1 (OOS)  
Breaker D (InSvcNO)**

### Clearing Location

**Clearing line A-B-C-D @ Breaker A, breaker D will be placed in service once DS1 is open**

## **Attachment D:**

### **Guidance Selecting Appropriate Cause Codes for Outage Submission**

The CROW outage scheduling application contains a set of predefined Cause and Subcause codes for selection when submitting outages.<sup>1</sup> Outage requesters must select one of these predefined cause codes to better describe the nature and/or reason for an outage. Subcause cause codes are optional. In some instances, there may be multiple “Causes” that describe the nature of the requested outage. This Appendix provides guidance for outage requesters to facilitate selection of the most appropriate Cause and Subcause codes for a variety of outage scenarios. To the extent a requester believes more than one Cause or Subcause could apply, they should select the most appropriate code, per the guidance below, and may provide additional information regarding the other Cause(s) or Subcause(s) in the “requestor notes.”

First, consider how the code may best align with the Outage Priority (e.g., Forced, Emergency, Urgent or Planned) and the circumstances driving the outage event.

- For Forced/Emergency/Urgent type outage events, select a code that aligns with the primary event that initiates the outage and not the code that sustains the outage. Example: A circuit trips due to lightning but becomes a sustained outage due to damaged station equipment. In this example it is recommended to submit the outage with Cause code of “Weather/Catastrophe” with Subcause “Lightning” instead of submitting a Cause code of “Equipment Failure” with Subcause “Failed AC Equipment”.
- For planned outage events, select a Cause code that aligns more with the primary sustained event. Maintenance, Repair Facility, Construction, and Inspection are a few of the general choices for sustained planned events.
- Use of the Cause Code “Other” is intended for use only when none of the codes available in the list align with the nature of the outage event. Cause code “Other” is available for transmission outages only. If the Cause “Other” is selected it is important that the outage requester, please also include additional notes in the outage ticket describing the outage Cause. These additional notes can be placed in the “requester notes” field or the “equipment description” field in CROW.

Second, CROW contains a set of predefined Cause codes for selection when submitting outages. A majority of these codes represent general maintenance, construction, inspection activities or

break-fix scenarios relative to specific equipment and in general will likely be utilized a majority of the time. However, there are additional Cause codes that may align better with specific, larger scale system events or events outside an operator's control. These codes should be utilized rather than the more general maintenance/inspection and break/fix Cause codes.

Some of these specific event Cause codes are Nuclear Regulatory Commission Restrictions, Solar Issues, Wind Issues, and Communication Issues. Some additional specific event Cause codes are listed below along with examples of when to use them:

- General Maintenance – General code to be used for annual or routine preventive maintenance of any facility
- Repair Facility – To be used for replacement or mending facilities suffering from damage or failure. Used specifically for repairs that cannot be delayed until a normal maintenance cycle
- Unknown – To be used when the outage cause code is unknown at the time of outage submission. Cause code can be updated by stakeholders and/or by MISO operations once a more appropriate cause is identified
- Fuel Transportation/Supply Issues <sup>2, 3</sup> - When a generation unit is unavailable to operate due solely to fuel supply availability, the Fuel Transportation/Supply Issue Cause codes should be utilized. Some examples include:
  - A natural gas unit is unable to obtain gas as a result of a pipeline outage or lack of available supply.
  - Operator makes a decision to not acquire fuel, thus rendering the unit inoperable.
  - Unit is operating at a reduced output or offering as unavailable to the MISO market to preserve fuel supplies.
- Fuel Quality<sup>3</sup> – Current fuel source available (or operator selected fuel source) does not meet unit design standards for full output capability. Some examples include:
  - Changes in natural gas supply availability - Low heat content gas supply
  - Stored fuel supply is compromised or of reduced quality - wet or frozen coal
  - Operator is employing economic based fuel blending practice - Coal blending
- Weather and Catastrophe related events – Some examples include:
  - Generation units known to be incapable of starting due to weather or temperature conditions should report outages using the Weather/Catastrophe Cause codes when the conditions are predicted or occur. Some examples include:
    - Wind turbine icing issues
    - Gas and Wind units lacking cold weather start/run packages

- Transmission and/or Generation facilities that are removed from service (planned or unplanned) due to major weather driven events.
  - Facilities removed from service due to predicted approaching storm conditions – Hurricane or Flood warnings.
  - Forced outages on facilities due to known or perceived catastrophe events like flooding, tornado or hurricane.
- Transmission System Limitation<sup>2, 3</sup> – This option is available for use in circumstances where transmission events limit a generation unit's output or render the unit unable to operate due to conditions on the transmission system.
- EPA Regulation<sup>2</sup> - Generation unit is specifically scheduled out of service to perform EPA mandated upgrades. If EPA work is being performed as part of annual maintenance, the more general Maintenance Repair Facility Cause is appropriate.
- Geomagnetic Disturbance – Generation or Transmission facility is removed from service (planned or unplanned), or unit output is reduced as a result of solar events.

<sup>1</sup> For a complete list of Cause and Subcause codes available in CROW please see the CROW User Guide.

<sup>2</sup> It is a common practice for generation units to coordinate several of the events listed above to correspond with or take advantage of needed downtime for maintenance and/or upgrades. In these situations where the event is scheduled to correspond with a maintenance outage event, reporting the outage as a maintenance event is acceptable and may even be more appropriate if the maintenance is considered the primary driver of the overall outage schedule. Some examples include:

- Coordination of natural gas supply line outages with an outage for needed repairs
- Installing EPA mandated upgrades during routine seasonal maintenance schedules

<sup>3</sup> Similarly, if a unit is currently under a scheduled derate outage condition, a separate outage submission is not necessary for the additional events further derating the unit, nor is it necessary to update the outage Cause to pertain to the additional derate Cause. For example:

A Unit is currently derated by 50MW due to a cooling issue. A new derate condition arises as a result of a change in the fuel supply quality and thus further derates the unit by an additional 35MW. The original cooling issue derate schedule may be updated to reflect the new overall derate condition of 85MW for both the cooling and fuel quality events. The existing cooling issue Cause code need not be updated to fuel quality.



## **Attachment E:**

### **Outage Coordination Practice Document**

#### **1. Disclaimer**

This document provides the data specification required by NERC reliability standard IRO-017 and to support relevant MISO Business Practices Manuals (“BPMs”), business processes, and technical specifications. This document is intended to facilitate, not change, MISO business processes. In addition, this document does not limit the scope of data requirements specified in MISO BPMs and technical specifications, in support of Open Access Transmission, Energy and Operating Reserve Markets Tariff (Tariff) of the Midcontinent Independent System Operator, Inc. (MISO), and the services provided under the Tariff.

#### **2. Introduction**

##### **2.1. Purpose:**

The purpose of this document is to provide a specification for data and information as required by North American Electric Reliability Corporation (NERC) Reliability Standard IRO-017 and support of MISO Business Practices Manuals (BPMs) and technical specifications.

##### **2.2. Scope:**

This document provides the entire specification necessary to ensure that outages are properly coordinated in the Operations Planning time horizon as specified in requirement one of NERC standard IRO-017.

Not all of the requirements set forth in BPM-008 are deemed necessary for inclusion in the MISO Outage Coordination Process pursuant to NERC standard IRO-017. Many of the requirements of BPM-008 are specific to best practices for coordination with the MISO market protocols and not necessarily specific to maintaining system reliability. This document establishes MISOs expectation of minimum reliability requirements as outlined in the MISO BPM-008 for complying with NERC IRO-017 by the entities that have a reliability relationship with MISO.

When specific data items mentioned or referenced within this specification are required to be provided by a functional entity to MISO pursuant to another NERC reliability standard, this document does not create an independent, separate requirement of the functional entity to provide those data items, but is intended to facilitate compliance with the such other applicable NERC reliability requirements

## 3. Responsibilities

### 3.1. MISO

Pursuant to IRO-017, R1, MISO, as a Reliability Coordinator must have an implemented outage coordination process for generation and transmission outages within its Reliability Coordinator Area.

### 3.2. Entities that have reliability relationship with MISO

Pursuant to IRO-017 (R1.1.2) the outage coordination process included assignment of coordination responsibilities for outage schedules between Transmission Operator(s) and Balancing Authority(s).

*Per MISO RTO-SPEC-006 MISO reliability Data Specification for NERC standard IRO-010; MISO places responsibility for Generation Outage Data submission on the GO/GOPs within its Reliability Authority Area and not upon the BA/LBA as defined in NERC standard IRO-017. This Outage data relationship is further established under the MISO Tariff.*

### 3.3. Outage Coordination Process

The following identified sections, sub-sections of the Outage Operations BPM-008 are considered by MISO to be its Outage Coordination Process as subject to NERC Standard IRO-017

BPM-008 Section/Sub-sections	Applicable to (or Exclusion from) IRO-017	Relevant IRO-017 Requirement
1.0 Introduction	Section 1 and all section 1 sub-sections are excluded	None
2.0 Outage Operations Overview	Section 2 and all section 2 sub-sections are excluded	None
3.0 MISO Operational Responsibilities	Section 3 and all section 3 sub-sections are excluded	None
4.0 Generation Outage Coordination	The opening (and only) paragraph in the section header is excluded, see relevant section 4 sub-section listings below for applicability and/or execution	None



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4.1 Generation Outage Coordination	Entire section is applicable, with exception of requirement to provide replacement energy information.	R1.1 Identify roles and reporting responsibilities  R1.1.1 Develop and communicate schedules  R1.2 Timing requirements
4.2 Jointly-Owned Units	Entire section is applicable	R1.1 Identify roles and reporting responsibilities
4.3 Coordination of Generation Outages	Entire section is applicable	R1.3 Define process to evaluate  R1.4 Conflict resolution
4.4 Generation Outage Analysis	Entire Section is applicable	R1.3 Define process to evaluate  R1.4 Conflict resolution
4.4.1 Maintenance Margin	Excluded	None
4.5 Units Off for Economic Dispatch	Entire section is applicable	R1.1 Identify roles and reporting responsibilities
4.6 Generation Derates	Entire section is applicable, with exception of Derate Threshold example	R1.1 Identify roles and reporting responsibilities
4.7 Forced Generation Outages	Excluded	None
4.8 Generation Outage Rescheduling	Entire section is applicable	R1.4 Conflict resolution
4.8.1	Excluded	None
4.8.2	Excluded	None
4.9 Nuclear Facilities	First two paragraphs are applicable; the remaining two paragraphs of this subsection are excluded.	R1.1 Identify roles and reporting responsibilities  R1.1.1 Develop and communicate schedules  R1.2 Timing requirements  R1.3 Define process to evaluate

4.10 Blackstart Facilities	Entire Section is applicable	R1.3 Define process to evaluate R1.4 Conflict resolution
4.11 Generation Outages as Result of Fuel Supply Availability	Entire Section is applicable	R1.1 Identify roles and reporting responsibilities R1.1.1 Develop and communicate schedules
5.0 Transmission Outage Coordination	The opening and only paragraph in the section header is excluded, see relevant section 5 sub-section listings below for applicability and/or execution	None
5.1 Transmission Outage Coordination	Entire section is applicable with the exception of the third paragraph (submission of non-transferred facility outages)	R1.1 Identify roles and reporting responsibilities R1.1.1 Develop and communicate schedules R1.2 Timing requirements
5.1.1 Transmission Outage Request Time Table	Entire section is applicable with the exception of; "To be considered a timely submission, submission must before the first day of the month prior to the month containing the start date of the outage"	R1.2 Timing requirements
5.1.2 Transmission Outage Priorities and Equipment Request Time	Entire section is applicable with the exception of the last two paragraphs	R1.1 Identify roles and reporting responsibilities R1.1.1 Develop and communicate schedules R1.2 Timing requirements
5.1.3 Opportunity Outages	Entire section is applicable	R1.2 Timing requirements R1.3 Define process to evaluate
5.1.4 Local Load Serving Transmission Facilities	Entire section is applicable	R1.1 Identify roles and reporting responsibilities

		R1.1.1 Develop and communicate schedules R1.3 Define process to evaluate
5.1.5 Systems Protection Work	Entire section is applicable	R1.1 Identify roles and reporting responsibilities R1.1.1 Develop and communicate schedules R1.3 Define process to evaluate
5.2 Outage Request Response Time	Entire section is applicable	R1.1 Identify roles and reporting responsibilities
5.3 Transmission Outage Approval	Entire section is applicable	R1.3 Define process to evaluate
5.3.1 Outage Facility Classes	Entire section is applicable	R1.3 Define process to evaluate
5.3.2 Criteria for Classification	Excluded	None
5.4 Transmission Outage Analysis & Models	Entire section is applicable except for the last two paragraphs on op-guides	R1.3 Define process to evaluate
5.5 MISO Reliability Coordinator Outage Notification Process	Not applicable	None
5.6 Operating Procedure Specific to Outages	Excluded	None
5.6.1 Operating Guides	Excluded	None
5.6.2 T-Notes	Excluded	None
5.7 Market Impacts	Excluded	None
5.8 Approval with over-subscription of Firm Service	Excluded	None
5.9 Outage Conflicts	Entire section is applicable	R1.4 Conflict Resolution
5.10 Emergency Outages	Excluded	None



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5.11 Forced Outages	Excluded	None
5.12 Outage Rescheduling	Entire section is applicable except for the statement; "Note, any change to an outage start/end time or cancellation of an outage that will occur the next day should be made prior to 1100 hrs. EST of the day prior to the scheduled outage start/end date to facilitate reliable and efficient market operations."	R1.1 Identify roles and reporting responsibilities R1.4 Conflict resolution
5.12.1 Changes by Equipment Owner	Excluded	R1.1 Identify roles and reporting responsibilities R1.4 Conflict resolution
5.12.2 Changes due to new Class 1 submittal	Entire section is applicable	R1.4 Conflict resolution
5.12.3 MISO changes due to security or reliability reasons	Entire section is applicable	R1.4 Conflict resolution
5.12.3.1 Cost Recovery Due to a Rescheduled Outage	Excluded	None
5.12.4 Changes due to TO's request for enhanced AFC	Excluded	None
6.0 Outage Scheduling	The following portions for section 6.0 are applicable:	As noted below
	First paragraph, first two sentences are applicable: "MISO utilizes an outage scheduling (OS) application to document all transmission and generation outage schedules. The OS application is available for outage submission as soon as known; Transmission and Generator Operators should report outages and updates as soon as possible."	R1.1 Identify roles and reporting responsibilities R1.1.1 Develop and communicate schedules
	Third paragraph in its entirety: "Transmission and Generator Owners and Transmission and Generator Operators must submit their outage requests/schedules to MISO via	R1.1.1 Develop and communicate schedules



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	<p>MISO's OS system. Two methods for submission are available:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> OS Web Interface</li> <li><input type="checkbox"/> OS XML API Interface"</li> </ul>	
	<p>Last Paragraph in its entirety: "The submission, maintenance and implementation of outage records is the responsibility of the Generator Operator and Transmission Operator, not MISO; with exception of the approval process."</p>	<p>R1.1 Identify roles and reporting responsibilities</p> <p>R1.1.1 Develop and communicate schedules</p>
6.1 Backup Method	Excluded	None
6.2 Outage Scheduler	Excluded	None
Attachment A: MISO Operating Guide Template	Excluded	None
Attachment B: MISO Backup Outage Scheduling Form	Excluded	None
Attachment C: Including Circuit Breakers and Switches in an Outage Request	Excluded	None
Attachment D: Guidance for Selecting Appropriate Cause Codes for Outage Submission	Excluded	None
Attachment E: Outage Coordination Practice Document	Entire section is applicable	<p>R1 Each Reliability Coordinator shall develop, implement, and maintain an outage coordination process for generation and Transmission outages</p>



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		within its Reliability Coordinator Area.
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## **Attachment F: Maintenance Margin**

### **1.0 Purpose of Maintenance Margin:**

Every generator, as an interconnection customer of MISO's transmission system, agrees to coordinate outage of their equipment and is required to submit planned maintenance schedules for MISO's evaluation and review under Section 38.2.5.g of Module C of the Tariff. Excluding any generator from the Maintenance Margin could allow an outage to be scheduled and implemented without identifying potential conflicts and thereby put supply adequacy at risk. The purpose of Maintenance Margin is to project supply adequacy in advance of the operating day. MISO, in coordination with its Stakeholders, has developed a process to assess the impact of planned generation outages and ensure there is enough generation capacity and energy available to reliably serve load. Maintenance Margin is also a tool to provide transparency to stakeholders when adequate margin is expected to effectively coordinate planned outages.

Maintenance Margin is an enhancement to MISO's existing processes and analysis to evaluate the impacts of a generator outage request. Inclusion of the Maintenance Margin criterion in the existing outage process is a proactive measure that may provide an early window of opportunity for MISO and the generation owners to resolve a potential shortage thereby avoiding load shed and/or delayed outage timeframes.

### **2.0 Granularity of the Maintenance Margin Calculation**

MISO will apply the Maintenance Margin methodology on both a system-wide and sub-regional basis (i.e., the North, Central, and South sub-regions). The Maintenance Margin will be calculated for each day and provides MISO engineers the ability to compare individual generator outage schedules to identify potential outage schedule conflicts.

MISO will apply the Maintenance Margin criteria to all generation resources available to be committed by MISO for normal operations.

### **3.0 Maintenance Margin Tool and input components:**

The Maintenance Limit is a calculated value that represents the maximum megawatt of generation that can be taken out of service for maintenance for a given time period while maintaining reliability and supply adequacy. Maintenance Limit is calculated by the MISO Resource Adequacy team as follows:

Maintenance Limit = Installed Capacity – (Reserve Requirement – Import Capability)

Where:

Installed Capacity is the megawatt amount of generation expected to be available for the time period.

Reserve Requirement is the megawatt amount of generation required to be in service and available plus an allowance for unplanned events (e.g. planning reserve margin and operating reserves).

Import Capability is the megawatt amount of energy that can reliably transferred to MISO or sub-region.

Maintenance Margin is the difference between the Maintenance Limit and the Non-Forced Generation Outages and derates for a given time period.

Maintenance Margin = Maintenance Limit – Non-Forced Out of Service Generator Outages<sup>4</sup> and Derates

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<sup>4</sup> Out of Service Generator Outages use the associated Generator Verification Test Capacity value when available, if not available the Pmax of the unit listed in the OS

### 3.1 Detailed Description of Maintenance Margin Input Data

The subsections below describe in greater detail for each component of the Maintenance Limit calculation.

#### 3.1.1 Installed Capacity

Establishing a Maintenance Margin first requires quantifying the megawatts of Installed Capacity available within each sub-region and for MISO system-wide. MISO does not have the authority to direct the output of Behind-the-Meter generators or Emergency only resources under normal operations; therefore, Maintenance Margin will only be based on generators registered in the MISO Commercial Model that are available to be committed for normal operations. For this consideration, generators within MISO can be classified into two categories based upon their operating characteristics: 1) Non- Intermittent Resources and 2) Intermittent Resources.

MISO has an existing process used in its Planning Reserve Margin study to determine Installed Capacity for each generator within MISO that is applied for the Summer season. However, some resources have different operating characteristics during different periods of the year. In order to best assess the capability for each generator, MISO will establish capacity for each generator on a seasonal basis by applying the process used in the Planning Reserve Margin study for different seasons.

##### Non-Intermittent Resources

The capacity values used for non-intermittent resources (e.g. coal, gas, nuclear) are taken from MISO's PowerGADS. As a part of MISO's Resource Adequacy process, the capability of each unit is assessed each planning year by submitting an appropriate summer capacity into PowerGADS. This is called the Generator Verification Test Capacity (GVTC) wherein generators in the Commercial Model test the capability of their units every year to determine maximum capability. MISO will use the values collected from this process combined with the Net Dependable Capacity (NDC) in PowerGADS and apply it to the Maintenance Margin calculation for each season. The NDC values will be used to establish a monthly capacity profile for each generator by scaling the summer GVTC according to the monthly NDC profile. It is possible that a unit is in the Commercial Model but does not have a GVTC value. This can occur in instances where a unit is new and has yet to submit a test due to the timing of when the data is gathered. In these cases, the capacity value in the Commercial Model will be held constant for all months. Certain generators (e.g. Combustion Turbines) may have capability that varies with ambient temperature, but whose fuel supply is controllable. MISO's PowerGADS software captures generator capacity for weather dependent resources in the monthly NDC.

##### Intermittent Resources

Intermittent Resources include resources (e.g., wind, Run-of-River hydro, and biomass) whose fuel supply or availability is forecast driven and determines the output of the generator. MISO's Planning Resource Auction has existing processes that establish generation capacity for these different resource types.

##### Wind Resources (Including Dispatchable Intermittent Resources)

MISO performs an Effective Load Carrying Capability (ELCC) study each year for the summer season to determine the capacity for wind resources for the Planning Reserve Margin study. Each wind generating CPNode is assigned capacity based on its historical output from MISO's top eight peak load days each year. If a unit does not have sufficient historical data, then it will receive the MISO-wide wind capacity credit, which will be multiplied by the Registered Maximum Capacity value in the Commercial Model to determine a capacity value.

### **Solar Resources**

Existing solar units use operational credit outlined in BPM-011 (section 4.2.3.4.1). New solar units without operational data will be assigned 50% capacity credit, which will be multiplied by the Registered Maximum Capacity value.

### **Other Intermittent Resources**

All other Intermittent Generation and Dispatchable Intermittent Resources will have their seasonal capacity value determined based on the 3 year historical average summer output of the resource from 1500-1700 EST using the same process as the Planning Reserve Margin study. Non-wind powered Intermittent Generation and Dispatchable Intermittent Resources that are new, upgraded or returning from extended outages shall submit all operating data for the upcoming summer with a minimum of 30 consecutive days, in order to have their new or upgraded capacity registered with MISO and used in the Maintenance Margin analysis.

### **Treatment of Load Modifying Resources (LMRs)**

It is necessary to not plan too much generation to be offline to avoid planning into an Emergency. Considering this, the Maintenance Margin calculation excludes Load Modifying Resources from being included in the Installed Capacity calculation because LMRs have an obligation to be available during an Emergency. This would include Behind-the-Meter Generators (BTMG), Demand Response, and Energy Efficiency Resources.

### **Accounting for Suspension or Retirement of Generation**

MISO has an existing process wherein a Generation Resource owner must submit a request to retire or temporarily suspend service via submittal of an Attachment Y form. Upon receipt of an Attachment Y request for suspension, MISO creates a generation outage request for the particular generator with a start date equal to the requested suspension date from the Generation Resource owner. Attachment Y retirement tickets are not created until approval. MISO will incorporate this information into its Maintenance Margin calculation by decrementing the Installed Capacity for each sub-region by the effective capacity of the unit requested to retire or suspend. Consistent with the outage request, MISO will use the effective date included by the requestor. Any capacity already accounted for as a planned outage in CROW will not be deducted from the available capacity for each sub-region to prevent a double counting of the energy on outage. After MISO's study process is complete for an Attachment Y request, MISO may designate the resource as a System Support Resource (SSR) if reliability studies indicate a need for that unit. If the unit is designated as an SSR, it will be included in the Installed Capacity category for Maintenance Margin until it is retired. MISO also has an existing process wherein generators can request a feasibility study regarding the effect a retirement or suspension would have on reliability by submitting an Attachment Y-2 request form. Since the Y-2 form is non-binding and exploratory, these generators will remain in the Installed Capacity category.

### **Accounting for New Generation in Interconnection Queue**

MISO maintains a Generation Interconnection queue and study process to evaluate and approve requests for new generation within MISO. The Generation Interconnection Queue process is complete upon the signature of an Interconnection Agreement between MISO and the generation resource owner. Each Interconnection Agreement includes an estimated in service date as of the signing. Additionally, MISO has an established process that tracks the construction of each resource and monitors the expected in service date. The in service dates of each generator are updated as needed within MISO processes. Generator interconnection requests that have signed Interconnection Agreements with MISO will be included in the Installed Capacity category. As expected in service dates change, they will be updated within the calculation. Wind generators will be assigned the ELCC.

### Accounting for Firm Transmission Service Exports

Generators within MISO also have the ability to serve as Capacity Resources for other Balancing Authorities as well as the right to sell energy to other BAs. It is important to account for Firm export Reservations to other BAs to prevent a scenario where a generator or group of generators is relied upon to provide capacity for multiple BAs. In this scenario, the BA that is the sink of a Firm export transaction has the first rights to the resource. Therefore, MISO will decrement the total capacity of long term Firm export transactions from the total monthly Installed Capacity number to avoid a “double dipping” scenario.

### 3.1.2 Reserve Requirement

#### Load Forecast

A Maintenance Margin will be calculated for each operating day in order to measure supply adequacy risk. MISO’s LOLE study models 30 unique hourly load shapes based on historic weather. These 30 load shapes are scaled to the monthly LSE load forecasts submitted to MISO per Module E-1. The Maintenance Margin will use the average daily peak load values of the 30 load shapes from the LOLE study for beyond 30days. MISO Mid-Term Load Forecast (MTLF) will be used for day 0 to 30 of the Maintenance Margin.

#### Establishing Reserve Requirement for Maintenance Margin

The Reserve Requirement in the annual Resource Adequacy construct is traditionally driven by peak demand during summer months. This reserve requirement, calculated on a basis of 0.1 day/year LOLE criteria, ensures uncertainty in demand forecasts coupled with generation forced outages can be balanced by excess generation to meet demand. The summer PRM is set when all capacity has been used to meet demand before shedding firm load. This requirement is calculated within the annual LOLE study to set the upcoming Planning Year’s reserve requirement for LSEs. In the context of Maintenance Margin, MISO will apply this same requirement applicable to each LSE for summer months June, July and August.

For Non-summer months, MISO will calculate and apply a Reserve Requirement in the following manner:

1. Apply seasonal EFORD rates into LOLE model
2. Determine PRM% for each non-summer month by adding planned outages until a target LOLE of 0.01 days/year (practically zero) is achieved
3. The average PRM% of non-summer months from step 2 will be applied to the daily peak values for all non-summer months for a season in Maintenance Margin
4. For 0 to 30days PRM% will be reduced to account for the more accurate demand forecast MTLF. Historic MTLF data will be reviewed annually to determine the level of reduction to PRM%.

#### Operating Reserve requirement

Every day, the MISO energy and operating reserves markets clears enough generation to meet forecasted load and operating reserves. When evaluating generator maintenance requests, enough generation should be available to cover these operating reserves. Reliance on Operating Reserves to accommodate planned maintenance outages before shedding firm load poses a risk to reliability. Today, the MISO BA clears approximately 2,400 MW of Operating Reserves each operating day. Operating reserves are also defined in MISO’s emergency procedures wherein MISO could utilize this 2,400 MW during emergencies. MISO’s methodology will allocate the 2,400 MW requirements in a *pro rata* manner across all subregions according to their weighted average load forecast.



### **3.1.3 Import Capability**

A MISO system-wide import limit of 5,000 MW has been established based on historical import values. Sub-regional import values will be based on historical import values and regionally defined limits similar to the MISO system wide import value methodology.

### **4.0 Maintenance Margin Reports:**

MISO outage coordination team will create MISO system wide and sub-regional based Maintenance Margin reports. MISO outage coordination will be posting MISO system wide and sub-regional based maintenance margin reports for up to three years twice a week, Tuesday and Thursday, at the following public OASIS location:

[https://www.oasis.oati.com/woa/docs/MISO/MISODOCS/Maintenance\\_Margin.html](https://www.oasis.oati.com/woa/docs/MISO/MISODOCS/Maintenance_Margin.html)