Transmission System Emergency

SO-P-EOP-00-004 Rev: 13

ROLE			ROLE	
BAO			SM	☑
UCD-IRAC			RC	☑
UCD-UDS			G&I	☑
RE	☑		MISO Mgmt	☑

Rev History	Reason for Issue	Revised By	Issue Date	Effective Date
13	Annual Review. Completed Compliance Review. Updated NERC References. Operating Procedure Owner approval on file.	Dan Pacilio/ Becca Skalko/ Bill Puller	05/18/2023	06/01/2023
12	Annual Review. Minor edit to Section 4.1. Completed Requirement Owner Review. Operating Procedure Owner approval on file.	Josh Netherton/ Jacob Krouse/ Ken Delp/ Bill Puller	05/18/2022	06/01/2022

1.0 Purpose

Provide instructions for mitigating operating emergencies on the Transmission System that have the potential to exceed or have exceeded an Interconnection Reliability Operating Limit (IROL).

2.0 Precautions and Limitations

1. MISO will restrict communications of sensitive information related to reliability to MPs and to the public in order to protect the integrity of the Bulk Electric System (BES). [□]
2. When a Transmission System Emergency (TSE) occurs within the MISO Reliability Coordinator (RC) Area, immediate and appropriate action shall be taken by the MISO RC and associated Transmission Operators (TOPs), Local Balancing Authorities (LBAs), Balancing Authorities (BAs), or Generation Operators (GOPs) in order to address the condition. [□]
3. TOPs may determine further action is needed to mitigate loading on facilities that are **NOT** IROLs and may take or direct mitigating actions including load shedding in coordination with MISO to provide the mitigation. [□]
4. This procedure does **NOT** limit TOPs' authority and responsibility, per North American Electric Reliability Corporation (NERC) Standards and contractual obligations, to take action to mitigate System Operating Limits (SOLs) in coordination with MISO. [□]
5. Mitigation of a TSE may result in a capacity or energy emergency which will be managed through SO-P-EOP-00-002 MISO Market Capacity Emergency or SO-P-EOP-00-002-A Non-Market Footprint and Sub-Area Capacity Emergency as appropriate. [□]
6. Resolution of a TSE Event needs to be less than 30 minutes or T_V for a defined IROL Flowgate or Interface and temporary IROLs. Where T_V is defined as the amount of time less than 30 minutes that the IROL condition must be relieved to avoid system collapse or cascading outages. T_V for all temporary IROLs determined through this procedure is 30 minutes. All Operating Instructions issued are expected to be implemented without delay. [□]

7. During a TSE Event, MISO RC shall **NOT** rely on Transmission Loading Relief (TLR) Levels 1-5 or Unit Dispatch System (UDS) Binding. [□]
   A. UDS binding or TLR may be implemented simultaneously with emergency actions in order to release emergency actions in a timely manner.
8. During rapidly changing conditions where an unexpected TSE condition briefly exists then clears (prior to declaration of a TSE), it is **NOT** the intent of this procedure to post an after-the-fact message on MISO's communication tools. These after-the-fact messages would be a distraction and inappropriate during conditions where an unexpected TSE condition briefly exists then quickly clears. [□]

3.0 Entry Conditions

1. **IDENTIFY** a Transmission System condition that has the potential to exceed or has exceeded a pre-defined or temporary IROL per SO-RA-NOP-01 Methodology for Identification and Implementation of SOLs and IROLs Plan. [□]

4.0 Instructions

4.1 Temporary IROL Verification

RC/ RE

Note [□]

If the cascade analysis study can **NOT** be completed within 15 minutes, or the case will **NOT** solve due to legitimate reasons determined using good engineering judgment, then the Reliability Engineer (RE) and RC should treat the constraint as a temporary IROL.

1. WHEN Real Time Contingency Analysis (RTCA) indicates a post contingent loading in excess of 125% of Emergency thermal rating or projects post contingent voltages less than their applicable Emergency voltage rating, THEN **PERFORM** cascade analysis as follows: [□]
   A. **LOAD** real time State Estimator (SE) case into Powerflow. [□]
   B. **TRIP** single Contingency as indicated in RTCA. [□]
   C. **TRIP** the highest loaded facility or lowest voltage bus. [□]
   D. **RUN** Powerflow study. [□]
   E. **SAVE** results. [□]

F. **REPEAT** Section 4.1 Step 1.C. and Section 4.1 Step 1.D. until **NO** facilities exceed 125% of their Emergency thermal rating and **NO** bus voltages are outside their emergency voltage range. [□]

Note [□]

Studies showing 1000 MW or more of load loss will be considered temporary IROLs only until further studies can be performed to disprove or validate the condition and determine an operating limit. T_V for a temporary IROL starts once the condition has been identified, or after the 15 minute evaluation period has been exhausted.

G. IF 1000 MW or more of load is lost, THEN **IDENTIFY** the constraint as a temporary IROL. [□]

H. IF less than 1000 MW of load is lost, THEN **TERMINATE** TSE per Section 4.3 TSE Termination Actions. [□]

4.2 TSE Event Actions

RC **Note** [□]

If consensus can **NOT** be reached on real-time conditions with impacted TOPs or neighboring RCs when jointly monitored facilities are involved, then the most conservative values will be used.

1. **NOTIFY** Shift Manager (SM). [□]

RC 2. **CONFIRM** a TSE exists as follows: [□]

A. **CONFIRM** real-time values are accurate. [□]

B. **CONFIRM** SE and RTCA solutions are reasonable. [□]

C. **CONFIRM** ratings associated with these values are correct and the availability of short-term emergency ratings/capability. [□]

RC 3. **DECLARE** TSE as follows: [□]

RC A. **DEFINE** start time (time condition is met) of TSE. [□]

RC B. **NOTIFY** SM of impacted parties. [□]

SM C. **SEND** TSE Declaration via MISO Communication System (MCS) including the following: [□]

- Affected BAs, LBAs, and TOPs
- Operator Log
- Email Notifications per SO-I-NOP-00-448 Event Communications Matrix
  - *RT Ops Notification email
  - MISO Management

SM D. **SEND** TSE Declaration summary information via Reliability Coordinator Information System (RCIS). [□]

SM E. **NOTIFY** MISO management to analyze staffing needs. [□]

Mgmt (1.) **ANALYZE** severity of event, anticipated duration of the event, and staff availability in order to call in additional MISO personnel and management. [□]

Mgmt (2.) **PROVIDE** support and assist the SM in analyzing system conditions or coordinating control room activities until additional MISO personnel and management are brought in to provide assistance. [□]

RC **Note** [□]

- For any Emergency Operating Instruction issued in response to exceeding an IROL, the expected implementation time must be less than 30 minutes or the T_V for the defined IROL.
- Emergency Operating Instructions will be issued per SO-P-NOP-00-431 Communications Protocol For Operating Instructions.

4. **IMPLEMENT** any of the following to relieve TSE: [□]

RC A. IF an Operating Guide exists for the given condition, THEN **ISSUE** Emergency Operating Instruction per applicable Operating Guide. [□]

RC B. **ISSUE** Emergency Operating Instruction for emergency re-dispatch of generation resources per SO-I-NOP-00-443 Manual and Emergency Redispatch within the market area or other generation within the RC area, including starting generation designated as Emergency Only (AME) and using emergency dispatch ranges per SO-I-EOP-00-001 Utilizing Emergency Ranges and Emergency and VOLL Pricing. [□]

RC C. **ISSUE** Emergency Operating Instruction for reconfiguration of the transmission system. [□]

Note [□]

Expected implementation time for Emergency Demand Response (EDR)/ Load Modifying Resources (LMRs) will vary depending on the situation.

D. IF EDR resources are available, THEN **PERFORM** the following: [□]

RC/ G&I (1.) **CONTACT** TOP/Market Participant (MP) to determine location and availability of EDRs and offered MW. [□]

SM

Note

Start time will be for a specific resource and MW amount, at a time the resource is available, respecting the total time to start of the resource.

(2.) **ISSUE** a start via Market Ops Suite. [□]

E. IF LMRs are available, THEN **PERFORM** the following: [□]

RC/ G&I

Note [□]

- MCS is currently **NOT** configured to deploy LMR for TSEs.
- All LMR starts for TSEs must be issued verbally.

(1.) **CONTACT** TOP/MP to determine availability and impact of LMRs and offered MW. [□]

RC (2.) WHEN LMR availability is confirmed, THEN **REQUEST** Resource come online as soon as possible and until further notice to support a TSE. [□]

RC F. **COORDINATE** with TOP to curtail other non-firm interruptible Loads that could relieve the TSE in an appropriate time. [□]

RC 5. **ISSUE** Emergency Operating Instruction for TOP to shed firm load rather than risk an uncontrolled failure of components or cascading outages of the Interconnection. [□]

A. IF time permits a targeted calculation, THEN **INSTRUCT** firm load shed per Attachment 1 — Targeted Load Shed Method. [□]

B. IF time does **NOT** permit a targeted calculation, THEN **INSTRUCT** firm load shed as follows: [□]

(1.) **DETERMINE** location and magnitude of required load shed using operator discretion and judgment. [□]

(2.) **INSTRUCT** firm load shed based on previous step. [□]

(3.) **NOTIFY** SM of location and magnitude of firm load shed. [□]

RC

Note [□]

Actions that are expected to take longer than 30 minutes or the T_V for a defined IROL Flowgate or Interface may still be directed in order to rescind other, more severe actions, as quickly as possible.

6. **EVALUATE** actions taken. [□]

RC 7. IF additional actions are necessary to mitigate TSE, THEN **ISSUE** additional actions to resolve the condition. [□]

RC 8. **UPDATE** load shed Operating Instructions as conditions warrant. [□]

RC 9. **COORDINATE** with SM on any necessary notifications per SO-P-NOP-04 MISO Event Reporting Operating Plan. [□]

SM/ RC/ G&I — 10. **LOG** actions per SO-I-NOP-00-496 MCS Operator Logging and Shift Turnover Checklist. [□]

4.3 TSE Termination Actions

RC

Note [□]

TSE declaration should **NOT** be immediately canceled upon clearing the IROL to ensure system conditions are stable.

1. WHEN IROL has been cleared and flows are consistently below the IROL, THEN **RELEASE** all actions as deemed appropriate, placing a priority on restoration of load per Attachment 1 — Targeted Load Shed Method. [□]

SM — 2. **ISSUE** stop via Market Ops Suite. [□]

RC — 3. **NOTIFY** TOP the LMR is going to be released. [□]

G&I — 4. **NOTIFY** MP of stop and to release the LMR. [□]

RC — 5. WHEN all actions implemented by the RC to address the emergency condition have ended and only normal procedures are being utilized, THEN **TERMINATE** TSE Declaration as follows: [□]

SM — A. **SEND** TSE Termination Declaration via MCS including: [□]

- Affected BAs, LBAs, and TOPs
- Operator Log
- Email Notifications per SO-I-NOP-00-448 Event Communications Matrix
  - *RT Ops Notification email [□]
  - MISO Management [□]

SM — B. **SEND** TSE Termination Declaration summary information via RCIS. [□]

SM — 6. **SEND** email to *Transmission Settlements and *Market Dispute with the following: [□]

- Start time of the resource (when the resource came online/ reduced load).
- Stop time of the resource (when the RC released the resource).
- Resource name.
- Total MW the resource provided.
- To apply a Revenue Sufficiency Guarantee (RSG) exemption for the entities responding to LMR, EDR, or firm load shed due to a TSE.

SM/ RC/ G&I

7. **LOG** actions per SO-I-NOP-00-496 MCS Operator Logging and Shift Turnover Checklist. [□]

5.0 Definitions

1. IROL - cascading event with expected load loss where a contingent event would result in loss of 1,000 MW or more of load. This restricts the applicability of the IROL to large area impacts rather than small load areas where load loss is contained.
2. Temporary IROL- when one or more of the following criteria are met for transmission lines 100 kV and higher, transformers with at least two windings of 100 kV and higher, or busses 100 kV and higher, except if it is determined that the condition is **NOT** an IROL violation per criteria in SO-RA-NOP-01:
   A. Steady State Conditions of actual voltage less than 95% or greater than 105% of nominal or other value based on an operating study, Operating Guide, mutual agreement/ understanding between the RC and TOP (Reactive Power imbalance).
   B. Contingency Related Conditions as follows:
      (1.) Actual flow is beyond a voltage stability or angular stability limit as defined in an Operating Guide.
      (2.) Per SO-RA-NOP-01, when studies indicating a post-contingent loading in excess of 125% of Emergency rating and subsequent overloading of facilities causing cascading outages that result in loss of 1000 MW or more of load. Analysis is performed using an iterative study process by assuming facilities loaded above 125% of its Emergency rating will trip following the initiating Contingency.
      (3.) When post-contingent voltage would be less than 90% or greater than 110% as a result of a single contingency unless another post-contingent voltage limit is established based on an operating study, Operating Guide, or mutual agreement/understanding between the RC and TOP (Reactive Power imbalance).
   C. Other Systems Conditions as follows:
      (1.) Any other operating conditions that would jeopardize the reliability of the interconnection as deemed by the RC.
      (2.) Any operating condition where it is reasonable for the RC to expect that conditions will worsen and require declaration of a TSE.

6.0 References

6.1 NERC References

1. IRO-008-2 Reliability Coordinator Operational Analyses and Real-time Assessments
   - R5 [Section 4.2 Step 3.]
   - R6 [Section 4.3 Step 5.]
2. IRO-009-2 Reliability Coordinator Actions to Operate Within IROLs
   - R2 [Section 4.1][Section 4.2]
   - R3 [Section 4.1][Section 4.2]
   - R4 [Section 4.2]

6.2 MISO References

1. SO-I-EOP-00-001 Utilizing Emergency Ranges and Emergency and VOLL Pricing
2. SO-P-EOP-00-002 MISO Market Capacity Emergency
3. SO-P-EOP-00-002-A Non-Market Capacity Emergency
4. SO-I-NOP-00-443 Manual and Emergency Redispatch
5. SO-I-NOP-00-448 Event Communications Matrix
6. SO-I-NOP-00-496 MCS Operator Logging and Shift Turnover Checklist
7. SO-P-NOP-00-431 Communications Protocol For Operating Instructions
8. SO-P-NOP-04 MISO Event Reporting Operating Plan
9. SO-RA-NOP-01 Methodology for Identification and Implementation of SOLs and IROLs Plan

Attachment 1 — Targeted Load Shed Method

1. Targeted Load Shed Method (TLSM) is used to quickly shed the highest impacting loads in a TSE where probable voltage collapse or cascading thermal overloads will result if a critical contingency should occur.
2. MISO RC, in coordination with TOPs, LBAs, and BAs, will identify in which area or zone (affected by probable voltage collapse or cascading thermal overloads) TLSM is to take a place. Each participant with control over transmission facilities must be capable of manually shedding the load as soon as possible per their Load Shedding Plans.
3. TLSM should avoid, if possible, interruption of transmission paths. MISO recognizes that there might be a situation when interruption of transmission paths is unavoidable. In this situation, participants with control over transmission who include such interruptions in Load Shedding Plans must demonstrate from system simulations that transmission interruptions will not degrade interconnected system reliability.
4. In a TSE where Load curtailment becomes imminent, the RC will identify the area susceptible to voltage collapse or cascading thermal overloading and calculate the amount of Load Curtailment by using TLSM. The TLSM identifies the Load that provides the most effective relief to the congested flowgate by implementing Load Shift Factors (LSFs) methodology similarly to generation redispatch that uses the Generation Shift Factors (GSFs) methodology. RC will utilize shift factors provided by CLogger or other appropriate tools. This method's goal is to resolve the emergency condition while minimizing the magnitude of load curtailment. The method is described as follows:

$$(LoadCurtailment) = (ReliefMWRequired)/(ShiftFactor)$$

5. The calculation method is based on the LSFs of Load buses within the defined area or zone susceptible to voltage collapse or cascading thermal overloading. In general, the LSFs may be approximated utilizing representative Load or Generator bus locations within the defined area or zone. Where multiple Load buses are relatively close (electrically) in terms of impacts on the constraint, a single LSF or GSF will be utilized for those buses and load shed proportionally to their individual Loads.