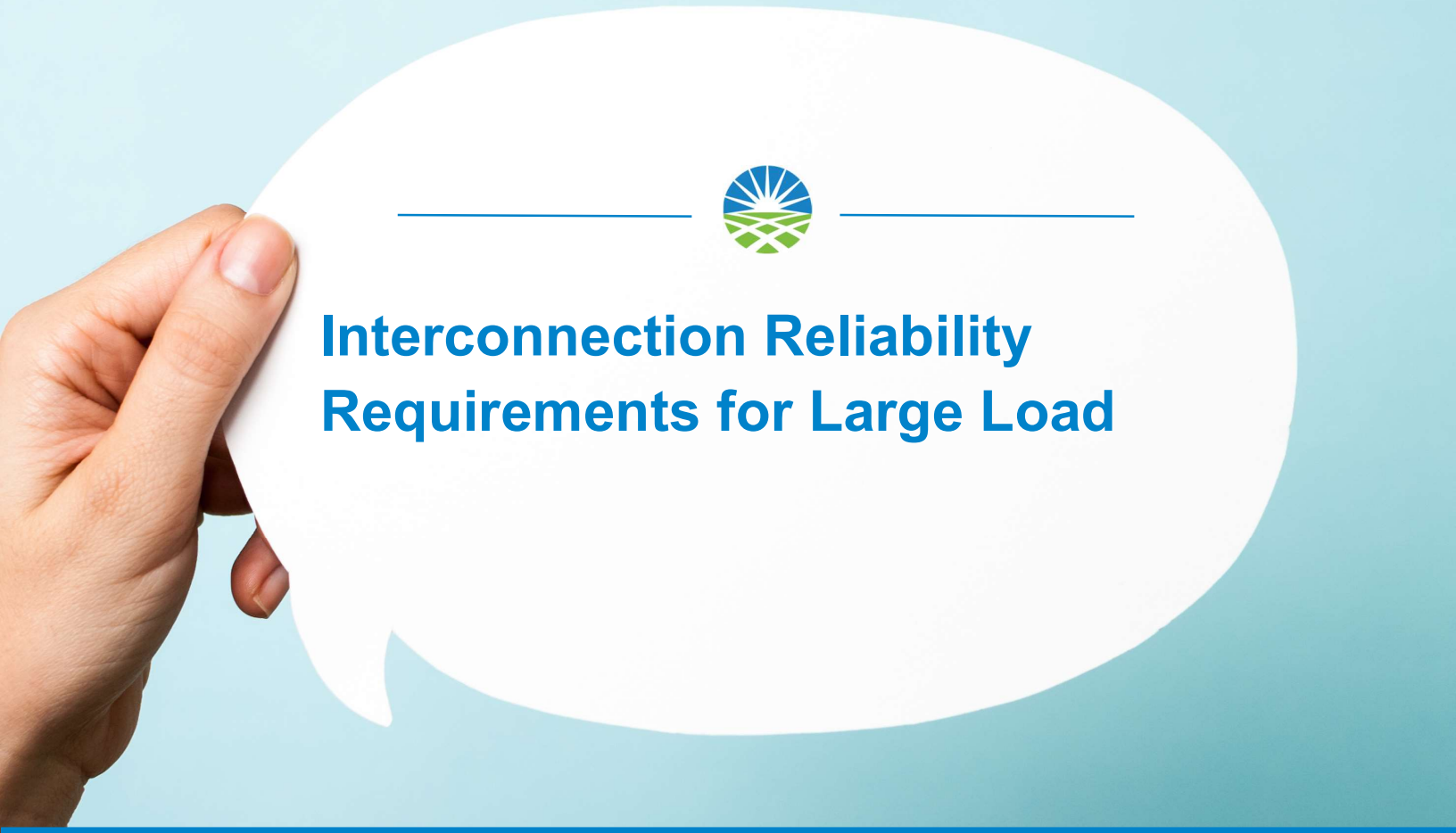

Interconnection Reliability Requirements for Large Load

June 2026

Highlights

- Establishes clear, consistent reliability interconnection requirements for rapidly growing Large Loads.
- Improves system visibility and operational readiness through data, modeling, and telemetry requirements
- Enhances grid stability with ramp, ride-through, and dynamic performance requirements.
- Aligns with emerging NERC guidance to support safe, resilient large-load integration across the footprint.

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Executive Summary

MISO is experiencing rapid growth in large transmission-connected loads, including data centers, artificial intelligence computing facilities, cloud computing infrastructure, supercomputing facilities, cryptocurrency mining operations, and other electronically controlled or computational loads. Many of these facilities represent large concentrations of demand and may exhibit operating characteristics that differ from traditional industrial load, including rapid changes in power consumption, power-electronic interfaces, fast control response, and increased sensitivity to grid disturbances.

Recent whitepapers and Alerts published by the North American Electric Reliability Corporation (NERC) Large Loads Task Force and Large Loads Working Group identifies emerging large loads as an increasing reliability consideration for the Bulk Electric System. NERC guidance highlights that traditional planning and operational assumptions developed for conventional load may not fully capture the behavior or reliability impacts of emerging large loads, particularly as load facilities become larger, more dynamic, and increasingly interconnected with power-electronic equipment and behind-the-meter resources.

As large load growth accelerates across the MISO footprint (Figure 1), additional reliability considerations may be necessary to support transmission planning, operational preparedness, disturbance performance, and system stability. Large loads may materially affect planning assumptions, load forecasting, balancing, outage coordination, voltage and frequency performance, and system dynamics. In certain conditions, rapid changes in load behavior or sudden loss of load during disturbances may contribute to degraded system performance, increased operational uncertainty, or reduced system stability margins.

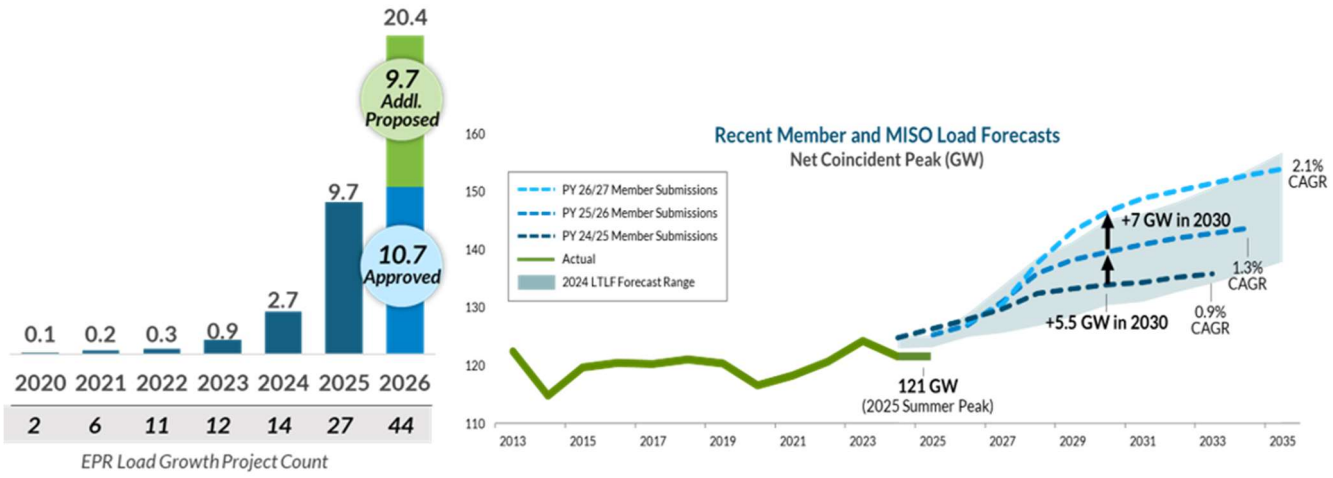

Figure 1: EPR and Load Project Growth Projection

This whitepaper complements MISO's Large Load Interconnection Tariff by describing a reliability-based framework to support the interconnection and operation of Large Loads within the MISO footprint. The objective is to establish scalable, technically justified, and risk-informed expectations that improve visibility into large load behavior, support planning and operational readiness, and preserve reliable operation of the Transmission System and Bulk Electric System. The proposed framework is intended to complement existing MISO planning, interconnection, and operational processes and align, to the extent practical, with emerging NERC guidance and industry practices.

The framework consists of four categories of reliability requirements:

Data, Modeling, Telemetry, Forecasting, and Outage Coordination Requirements

Establish expectations for facility information, electrical models, real-time telemetry, monitoring, short-term and long-term forecasting, outage coordination, and other operational visibility necessary to support planning studies, operational assessments, commissioning, model validation, post-event analysis, and accurate representation of Large Loads behavior and system impacts.

Ramp Requirements

Establish expectations for managing rapid changes in load behavior that may materially affect balancing, operational reliability, reserve deployment, or outage coordination.

Ride-Through Requirements

Establish minimum disturbance performance expectations during voltage and frequency disturbances to reduce the risk of unnecessary disconnection or sudden loss of demand during credible system events.

Stability Assessment Requirements

Establish expectations for evaluating reliability impacts associated with large load integration, including transient stability, forced oscillations, system strength, and electromagnetic transient interactions where appropriate.

MISO recognizes that not all large loads exhibit the same operational or electrical characteristics and that reliability risks may vary by facility type, operating behavior, and system conditions. Consistent with NERC guidance, the proposed framework is intended to be scalable and risk-informed, allowing requirements to be applied in a manner proportional to demonstrated reliability risk while supporting efficient interconnection and reliable operation of the Transmission System.

Background and Reliability Need

Growth of Emerging Large Loads

MISO is experiencing rapid growth in transmission-connected large loads, including data centers, artificial intelligence computing facilities, cloud computing infrastructure, supercomputing facilities, cryptocurrency mining operations, and other electronically controlled or computational loads. Many of these facilities represent large concentrations of demand and may exhibit operational and electrical characteristics that differ from traditional industrial load.

Historically, transmission planning and operations have relied on assumptions that load behavior is relatively predictable, geographically diverse, and sufficiently represented through historical demand profiles, weather-based forecasting, and conventional planning assumptions. Traditional industrial facilities generally exhibit slower-changing operating behavior and are represented through established planning and operational practices.

Emerging large loads may exhibit characteristics that differ materially from conventional demand, including:

- High concentrations of demand at a single location or campus;
- Rapid changes in real and reactive power consumption;
- Fast-acting controls and power-electronic interfaces;

- Increased interaction with uninterruptible power supply systems, inverter-based devices, and co-located resources;
- Sensitivity to voltage, frequency, and transient disturbances; and
- Operating behavior that may not be fully represented using traditional forecasting and planning assumptions.

As the size and concentration of these facilities increase, additional visibility into load behavior and system interactions may be necessary to support reliable operation of the Transmission System.

Reliability Considerations

Emerging large loads may introduce reliability considerations that are not fully captured through traditional planning and operational approaches. Large load behavior can materially affect transmission planning assumptions, operational balancing, outage coordination, voltage and frequency performance, and system dynamics.

Rapid changes in load behavior, sudden loss of demand, or dynamic interactions between power-electronic equipment and the transmission system may affect system performance during both normal operations and contingency conditions. In certain conditions, these behaviors may contribute to increased operational uncertainty, reduced stability margins, oscillatory behavior, degraded post-disturbance recovery, or increased stress on transmission facilities and balancing resources.

These considerations do not imply that all large loads create the same reliability risk. Reliability impacts may vary depending on facility type, operating characteristics, electrical design, system strength, and local transmission conditions. Accordingly, a scalable and risk-informed approach is necessary to ensure reliability requirements remain proportional to demonstrated system risk.

NERC Guidance and Industry Direction

The North American Electric Reliability Corporation (NERC), through the Large Loads Task Force and Large Loads Working Group, has identified emerging large loads as an increasing reliability consideration for the Bulk Power System. NERC publications identify several characteristics that distinguish emerging large loads from conventional demand, including concentrated power consumption, fast control response, uncertainty in operating profiles, power-electronic interfaces, and sensitivity to grid disturbances.

NERC's 2026 assessment of emerging large load reliability gaps concluded that existing planning practices, interconnection processes, operational procedures, and Reliability Standards may not fully address risks associated with emerging large loads. The assessment identified areas for improvement related to facility visibility, dynamic modeling, telemetry, forecasting, disturbance performance expectations, operational coordination, and post-event performance validation.

NERC's reliability guidance further recommends scalable and risk-informed mitigation approaches focused on improving observability, planning assumptions, operational preparedness, disturbance performance, and system modeling to preserve reliable operation of the Bulk Power System as emerging large load growth accelerates.

MISO Reliability Need

Within the MISO footprint, large load growth is increasingly occurring through transmission planning, Expedited Project Review (EPR), and other interconnection-related processes. Existing MISO planning and operational processes provide a strong foundation for evaluating reliability impacts; however, additional consistency and reliability expectations may be necessary to improve visibility into facility behavior, strengthen planning and

operational assumptions, support system preparedness, and preserve reliable system performance as large load penetration increases.

Accordingly, this whitepaper proposes a reliability-based framework for Large Loads that complements existing MISO planning, interconnection, and operational processes. The framework is intended to improve visibility into large load characteristics and behavior, support reliable planning and operational decision-making, and establish scalable and technically justified expectations proportional to demonstrated reliability risk.

The proposed framework focuses on four categories of reliability requirements:

- **Data, Modeling, Telemetry, Forecasting, and Outage Coordination Requirements** to establish expectations for facility data, modeling, real-time telemetry, short-term and long-term forecasting, outage coordination, and other information necessary to support accurate representation of Large Loads behavior and system impacts in planning and operations;;
- **Ramp Requirements** to manage rapid changes in load behavior that may affect operational reliability;
- **Ride-through Requirements** to establish disturbance performance expectations during voltage and frequency events; and
- **Stability Assessment Requirements** to evaluate dynamic and stability impacts associated with large load integration.

Scope and Applicability

Scope of the Whitepaper

This whitepaper establishes a reliability-based framework for evaluating and integrating Large Loads within the MISO footprint. The framework is intended to support reliable planning, interconnection, commissioning, and operation of transmission-connected large loads that may materially affect the Transmission System or Bulk Electric System due to their size, operating behavior, electrical characteristics, or dynamic performance.

The whitepaper focuses on reliability considerations associated with emerging large loads and proposes a consistent framework for evaluating facility characteristics, operational behavior, disturbance performance, telemetry, system visibility, and stability impacts during planning and operational timeframes.

The recommendations contained in this whitepaper are intended to complement existing MISO planning, interconnection, operational, and reliability processes, including the MISO Transmission Expansion Plan (MTEP), Expedited Project Review (EPR), transmission planning studies, operational assessments, commissioning activities, and applicable North American Electric Reliability Corporation (NERC) Reliability Standards. The proposed framework is intended to establish scalable and risk-informed expectations and does not replace existing Transmission Owner, Local Balancing Authority, or reliability obligations.

Applicability of Requirements

The applicable requirements in this whitepaper apply to Large Loads as defined by MISO tariff provisions and associated Business Practice Manuals.

Large Loads associated with data centers, artificial intelligence computing facilities, cloud computing, supercomputing centers, cryptocurrency mining operations, and other electronically controlled or computational

uses may be subject to all requirements described in this whitepaper due to their operating characteristics, power-electronic interfaces, dynamic behavior, and potential reliability impacts.

Large Loads associated with other facility types may be subject to selected requirements where MISO determines that facility operating characteristics, electrical design, load behavior, system conditions, or demonstrated reliability risk warrant additional reliability expectations. Examples may include facilities exhibiting rapid changes in demand, dynamic disturbance sensitivity, power-electronic interfaces, or other characteristics that may materially affect reliable system performance.

MISO recognizes that not all large loads present the same reliability risks. Accordingly, requirements are intended to be scalable and risk-informed and may be applied in a manner proportional to demonstrated reliability need, system conditions, and facility characteristics.

Requirement Applicability Overview

The proposed framework consists of four categories of reliability requirements intended to address planning, operational, disturbance performance, and system stability considerations associated with Large Loads.

Requirement Category	General Applicability
Data, Modeling, Telemetry, Forecasting, and Outage Coordination Requirements	Generally applicable to Large Loads subject to MISO reliability requirements to support planning and operational studies, electrical modeling, telemetry, forecasting, commissioning, outage coordination, operational visibility, and accurate representation of Large Loads behavior and system impacts. Certain requirements (e.g., PERC1-equivalent modeling, EMT models, and PMU capability) may apply specifically to the Computational Load portion of a Large Load, as defined by NERC.
Ramp Requirements	Applicable to the Computational Load portion of Large Loads whose owner, operator, controller, end-user, or hosting entity meets applicable NERC registration criteria for a Computational Load Entity, regardless of registration status, where rapid changes in load behavior may materially affect system operations or reliability.
Ride-Through Requirements	Applicable to the Computational Load portion of Large Loads whose owner, operator, controller, end-user, or hosting entity meets applicable NERC registration criteria for a Computational Load Entity, regardless of registration status, where disturbance performance may materially affect reliability.
Stability Assessment Requirements	Applicable based on demonstrated reliability need, system characteristics, planning requirements, screening results, or facility operating behavior.

The applicability of individual requirements, study expectations, implementation details, exemptions, and compliance approaches may be further defined in applicable tariff provisions and Business Practice Manuals.

Roles and Responsibilities

Reliable integration of Large Loads requires coordination among MISO, Transmission Owners, Load Serving Entities, Large Load Customers, Local Balancing Authorities, Transmission Operators, and other applicable reliability entities. Responsibilities associated with large load interconnection, planning, operations, telemetry, and disturbance performance may vary depending on facility characteristics, system conditions, and applicable tariff or operational requirements.

The responsibilities described below provide a high-level overview of expected roles associated with the proposed Large Load reliability framework. Additional implementation details, study expectations, and compliance obligations may be further defined in applicable tariff provisions, Business Practice Manuals, operating agreements, and reliability requirements.

Entity	General Responsibilities
MISO	Establish reliability frameworks, review reliability impacts associated with Large Loads, coordinate planning and operational assessments, establish applicable reliability requirements, perform screening where applicable, review study results, and support reliable operation of the Transmission System.
Transmission Owner (TO)	Coordinate interconnection activities, provide local transmission planning input, perform or support applicable studies consistent with local planning criteria, coordinate telemetry and interconnection facilities, and support commissioning and operational readiness activities.
Load Serving Entity (LSE)	Coordinate load service arrangements, support planning and operational coordination as applicable, and facilitate information exchange associated with Large Load service obligations.
Large Load Customer (LLC)	Provide facility information, electrical characteristics, models, telemetry, forecasts, operational data, and other information necessary to support planning, interconnection, commissioning, operations, and reliability assessments; coordinate operational requirements and maintain compliance with applicable reliability expectations.
Local Balancing Authority (LBA) / Balancing Authority (BA)	Coordinate operational reliability activities associated with balancing, outage coordination, operational communications, and reliability preparedness as applicable.
Transmission Operator (TOP)	Support reliable operation of the transmission system through operational coordination, outage management, system awareness, disturbance response, and implementation of applicable operating procedures.

Responsibilities associated with individual requirement categories may vary. For example, data and modeling requirements may primarily involve information submission and validation by the Large Load Customer, while

stability assessments may require coordination among MISO, Transmission Owners, and other applicable entities depending on study scope, local planning criteria, and system conditions.

MISO recognizes that reliability responsibilities may differ depending on facility configuration, applicable service arrangements, system conditions, and demonstrated reliability risk. Accordingly, implementation details and associated responsibilities may be tailored through applicable tariff provisions, Business Practice Manuals, operating agreements, and planning or operational processes.

Definitions

The following definitions are provided to support consistent interpretation of the reliability framework described in this whitepaper. These definitions are directly adopted from the proposed MISO Large Load Tariff provisions developed to support Large Load interconnection, registration, planning, operational, and reliability requirements. The definitions are included here for readability and consistency and are intended to align with applicable MISO tariff provisions and associated Business Practice Manuals.

Large Loads

The Load associated with any facility or aggregation of facilities located at a single site behind one or more Point(s) of Withdrawal from the Transmission System that is owned, operated, or controlled by: (a) a single entity or (b) group of entities that will coordinate with respect to the profile of the Load, and that:

(1) results for the first time after September 1, 2026, in any new Load, or any modification, expansion, or addition to existing Load, at a single site and resulting in an aggregate Demand equal to or greater than 50 MW behind one or more Points of Withdrawal from the Transmission System; or
(2) for Load that already exceeds 50 MW of Demand as of September 1, 2026, any increase in the Demand of such Load by 25 MW or more above the value documented as of September 1, 2026, at a single site behind one or more Points of Withdrawal from the Transmission System.

A Large Loads may have one or more Points of Withdrawal from the Transmission System and includes all Large Load Equipment. Additional details regarding configurations that constitute a single site and degree of coordination in Load Demand profile that constitute an aggregation for purposes of this definition may be specified by the Transmission Provider in the Business Practices Manual for Large Load.

Large Load Customer

A Tariff Customer that seeks Transmission Service on behalf of, or in order to provide Energy to, a Large Loads. Large Load Customers include Load Serving Entities procuring new or additional Network Integration Transmission Service to serve a Large Loads.

Large Load Equipment

Any of the facilities, devices, or equipment that constitutes a part of a Large Load, or are used to interconnect the Large Loads to the Transmission System.

Point of Withdrawal

The point where a non-transmission facility used to withdraw Energy from the Transmission System to serve a Large Loads connects to the Transmission System.

Service Commencement Date

The date the Transmission Provider or ITC begins to provide service pursuant to the terms of an executed Service Agreement, or the date the Transmission Provider or ITC begins to provide service in accordance with Section 15.3 or Section 29.1 under MISO Tariff.

Telemetry and PMU Requirements

Reliability Objective

The objective of telemetry requirements is to ensure that MISO and Transmission Owners maintain continuous, high-resolution visibility into Large Load behavior through accurate SCADA/ICCP data and time-synchronized phasor measurements. Because emerging large loads can change real and reactive power rapidly and exhibit power-electronic-driven dynamic responses during disturbances, enhanced telemetry and PMU live streaming (or better) enable operators to identify abnormal voltage, frequency, or oscillatory conditions early, validate and refine modeling assumptions, support balancing and contingency analysis, and respond effectively before issues propagate across the Bulk Electric System. Reliable, real-time telemetry strengthens MISO's ability to manage system stability, operational uncertainty, and disturbance performance under both normal and stressed conditions, ensuring that large loads integrate safely and predictably into the grid.

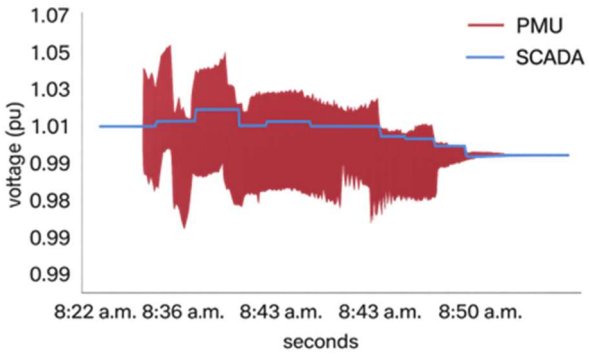

Figure 2: Differences between SCADA and PMU

Considerations to support the telemetry reliability objective include:

- Sampling Rate and Data Quality: High-resolution sampling (e.g., PMU-level >60 samples per second) is necessary to capture fast voltage, frequency, and real/reactive power changes characteristic of power-electronic large loads.
- SCADA/ICCP Update Frequency: SCADA telemetry should provide sufficiently frequent updates (typically 2–4 seconds or faster) to support operational situational awareness and real-time reliability assessments.
- Phasor Measurement Unit (PMU) Integration: PMUs, or better phasor-quality devices, should be installed at the Transmission Owner side of the Point of Withdrawal to capture time-synchronized voltage/current phasors and event signatures that SCADA cannot detect.
- Digital Fault Recorder (DFR) or High-Speed Recording: Access to high-speed oscillography (DFR, event recorders) enhances disturbance analysis, post-event model validation, and assessment of protection interactions

- Location of Telemetry Measurement Devices: Telemetry equipment should be installed at Point of Withdrawal.
- Communications Infrastructure & Latency: Sufficient bandwidth, redundant communication paths, and low latency data streaming are essential for ensuring real-time visibility, especially for PMU data that should remain tightly time-aligned.
- Time Synchronization Requirements: PMUs, DFRs, and related devices should maintain GPS-quality time synchronization to support system-wide correlation of events and dynamic monitoring.
- Cybersecurity and Data Integrity: Telemetry and PMU data should comply with NERC CIP expectations for secure communications, integrity checks, and protection from data corruption or unauthorized access.
- Model Validation Integration: Telemetry should support continuous model validation workflows, ensuring that planning and EMS models accurately reflect operational behavior and remain aligned with NERC MOD standards
- Event Detection and Alarming Configuration: Alarms for abnormal voltage, frequency, oscillations, loss of communication, and PMU quality metrics should be configured to ensure rapid operator response.
- Compatibility with MISO Telemetry Specifications: All telemetry should align with MISO's ICCP, PMU streaming, and EMS data validation requirements as documented in relevant BPMs and LLWG guidance.

Applicable Requirements

A Large Load Customer should provide real-time telemetry for all Large Load Equipment, including Computational Load and non-Computational Loads, either directly, through the applicable Transmission Owner or Load Serving Entity, or another Transmission Provider-approved communication path, in the form and manner described in the Business Practices Manual for Large Load. Individual metering should be provided for Large Load Equipment and generation resources meeting thresholds described in the Business Practices Manual for Large Load. Telemetry should be provided via ICCP, where applicable, and should satisfy Transmission Provider update requirements described in the Business Practices Manual for Large Load.

A Large Load Customer should use commercially reasonable efforts to maintain telemetry availability and accuracy for the Large Load and should promptly correct erroneous data, bad mappings, and ICCP modeling issues. Disturbance monitoring and event recording capability should be provided sufficiently to support post-event analysis, model validation, and reliability assessment.

For the Computational Loads, as defined by NERC, phasor measurement recording and communications equipment should be installed prior to the Service Commencement Date and should be capable of gathering phasor measurements as described in the Business Practices Manual for Large Load. To the extent similar-quality equipment is added or already exists, such as relays or digital fault recorders capable of collecting synchronized data at a rate comparable to a Phasor Measurement Unit (PMU), such equipment may be used to satisfy this capability if located on the Transmission Owner side of the Point of Withdrawal.

Phasor measurement capability for Computational Load should be installed on the Transmission Owner side of the Point of Withdrawal and become part of the Transmission Owner interconnection facilities. Phasor measurements should be streamed in IEEE C37.118 or equivalent format and provided to the Transmission Provider.

Data and Modeling Requirements

Reliability Objective

The objective of data and modeling requirements is to ensure sufficient visibility into the characteristics, operating behavior, and electrical performance of large loads necessary to support reliable planning, interconnection, commissioning, operations, and post-event analysis. As emerging large loads increasingly exhibit dynamic operating characteristics, power-electronic interfaces, and concentrated demand, additional facility information, telemetry, and modeling detail may be necessary to evaluate reliability impacts under both normal and contingency conditions. Data and modeling requirements are intended to support reliable operation of the Transmission System by improving the accuracy of planning assumptions, strengthening operational awareness, supporting disturbance analysis and model validation, and enabling more consistent evaluation of system performance associated with Large Load integration. These requirements provide a framework for obtaining facility information, electrical models, telemetry, monitoring data, and operational visibility necessary to support planning studies, operational assessments, commissioning activities, and reliability evaluations.

Consistent with emerging industry practices and North American Electric Reliability Corporation (NERC) guidance, data and modeling expectations are intended to be scalable and risk-informed and may vary based on facility characteristics, operating behavior, system conditions, and demonstrated reliability need.

Applicable Requirements

Basic Facility Data

A Large Load Customer shall be responsible for providing the Transmission Provider with basic information, one-line diagrams, and a description of the electrical characteristics of the Large Load for all Large Load Equipment, in the format and consistent with the timelines specified in the Business Practice Manual for Large Load. Any changes to the characteristics of a Large Load and/or Large Load Equipment, including any changes to the modeling details for the Large Load, shall be provided to the Transmission Provider in a timely manner, consistent with the Business Practices Manual for Large Load. Such changes may include, but are not limited to, Load MW amounts, firm and non-firm MW amounts, any dispatchable Load MWs, power factor, metering, telemetry, and breaker configuration, as further set forth in the Business Practices Manual for Large Load.

A Large Load Customer must coordinate with the Transmission Owner where the Large Load Point of Withdrawal is located pursuant to the Transmission Provider’s load interconnection guidance and applicable NERC standards.

Modeling Data

A Large Load Customer should provide the Transmission Provider with validated and complete electrical models of the large load, as well as detailed Load profiles for modeled Loads. Such model information should include sufficient detail for the Transmission Provider to evaluate system performance under contingency conditions in accordance with currently effective Transmission System Planning Performance Standards.

For the Computational Load portion of a Large Load, as defined by NERC, the Large Load Customer should provide a positive-sequence power system dynamic model capable of representing power-electronic load behavior, including a Power Electronic Reconnecting and Ceasing (PERC1) model, or an equivalent model with comparable capability, consistent with applicable NERC guidance.

For non-Computational Loads, the Large Load Customer should provide appropriate positive-sequence power system dynamic models representative of the expected electrical behavior of such Loads.

Following completion of applicable studies and prior to its Service Commencement Date, final validated models should reflect the as-built configuration and actual operating characteristics of the Large Load and should be maintained and updated as required by the Transmission Provider.

Load Forecasting Requirements

Reliability Objective

Large Loads can change system conditions rapidly, and unlike traditional demand, their behavior cannot be forecasted accurately using historical load patterns, even when modeled with weather and calendar data in MISO's short-term forecasting system.

Applicable Requirements

Short-term Large Load Forecast

The Large Load Customer should provide day(s) ahead and real-time Load Forecasts for a Large Loads directly to the Transmission Provider, to support the Reliability Assessment Commitment (RAC) and Security Constrained Economic Dispatch (SCED) processes, along with other reliability studies. Given the sizable reliability impact a Large Load may have on the Transmission System, the Load Forecasts should be updated to reflect the most current information on the expected Demand, in accordance with the Business Practices Manual for Operations Forecasting.

Ramp Requirements

Reliability Objective

The objective of ramp requirements is to manage rapid changes in large load behavior that may materially affect balancing, operational reliability, reserve deployment, and system performance. As emerging large loads increasingly include fast controls, automated operations, and concentrated demand, rapid increases or decreases in power consumption may introduce operational uncertainty or create challenges for maintaining reliable system conditions.

Ramp requirements are intended to support reliable operation of the Transmission System by improving predictability of load behavior, reducing operational uncertainty associated with sudden changes in demand, and supporting coordination among Large Load Customers, Transmission Owners, Local Balancing Authorities, and MISO during changing operating conditions. These requirements establish expectations for managing load transitions in a manner that supports operational preparedness and reliable system performance.

MISO's Balancing Authority Obligation

- Regulation will be primarily used to balance load changes inside the UDS interval (5 min). Dynamic regulation reserves range from 600 MW – 1,000 MW for system wide.
- No single Large Load consumes more than 15% of MISO's total regulation requirement
- Ramp limit

= 15% x Max(Dynamic regulation reserves)/UDS interval

= 15% x 1,000MW/5min

= 30MW/min

Applicable Requirements

A Large Loads should be subject to up-ramp and down-ramp limits established by the Transmission Provider consistent with the process set forth in the Business Practices Manual for Large Load. The process to establish up-ramp and down-ramp limits for a Large Loads will consider local planning criteria and will include a procedure for the Transmission Provider to authorize or instruct deviations as may be needed to preserve reliability.

Ride-through Requirements

Reliability Objective

The objective of ride-through requirements is to reduce the risk of unnecessary large load disconnection or rapid changes in demand during voltage and frequency disturbances and support predictable disturbance performance during credible system events. As emerging large loads increasingly include power-electronic interfaces, fast controls, and dynamic operating behavior, disturbance response may materially affect system performance, operational reliability, and post-contingency recovery.

Ride-through requirements are intended to support reliable operation of the Transmission System by improving disturbance resilience, reducing operational uncertainty associated with sudden changes in large load demand, and promoting more predictable facility behavior during transmission disturbances. These requirements establish minimum performance expectations for maintaining connection and stable operation during voltage and frequency excursions, while supporting system voltage recovery, frequency performance, and overall system stability.

Consistent with emerging industry practices and North American Electric Reliability Corporation (NERC) guidance, ride-through expectations are intended to establish scalable and reliability-based performance criteria proportional to demonstrated system risk and facility operating characteristics.

Applicable Requirements

General Principles

Ride-through requirements apply at the facility's Point(s) of Withdrawal (PoW(s)) and establish the voltage and frequency conditions under which a Large Loads is expected to remain connected to the Transmission System during disturbances. When system conditions remain within the specified ride-through performance limits, the Large Loads is expected to remain connected and maintain stable operation without unnecessary interruption of service. Protection and control systems should be coordinated to avoid unnecessary tripping, and momentary cessation is not permitted unless explicitly allowed. Following disturbance clearance, the Large Loads is expected to recover toward pre-disturbance operating conditions in a controlled manner consistent with established performance expectations.

Voltage Ride-Through (VRT)

Large Loads should remain connected to the Transmission System and maintain stable operation during voltage disturbances measured at the Point(s) of Withdrawal (PoW(s)) when system voltage remains within the defined no-trip region of the voltage ride-through envelope. Voltage ride-through requirements should establish the magnitude and duration of voltage deviations that a Large Loads should tolerate without unnecessary disconnection from the Transmission System.

When voltage remains within the specified ride-through performance limits, the Large Loads should remain connected and maintain stable operation consistent with established performance expectations. Protection systems and facility controls should be coordinated to avoid unnecessary tripping and support stable operation during and following transmission disturbances.

These requirements should reduce the risk of sudden changes in large load demand during credible system events and support reliable operation of the Transmission System by improving disturbance resilience and predictable system response.

Voltage Ride-Through Envelope

Voltage ride-through performance at the Point(s) of Withdrawal (PoW(s)) should be defined by the minimum voltage magnitude and duration that a Large Loads should tolerate without unnecessary disconnection from the Transmission System. Large Loads should remain connected to the Transmission System when voltage conditions remain within the ride-through envelope shown in Table 1.

Large Load Customers should ensure that the design, protection systems, and operating characteristics of the Large Loads support compliance with applicable ride-through performance expectations and maintain stable operation during and following transmission disturbances.

Table 1. Voltage Ride-Through Requirements at PoW

Root Mean Square Voltage (p .u. of nominal)	Minimum ride-through time (s)
V > 1.20	May ride-through or trip
1.10 < V ≤ 1.20	0.50
0.90 ≤ V ≤ 1.10	Continuous
0.80 ≤ V < 0.90	2.00
0.50 ≤ V < 0.80	0.50
V < 0.50	0.15

Within the voltage-duration limits defined by the ride-through envelope, the Large Loads should remain connected to the Transmission System and maintain stable operation consistent with established performance expectations. Disconnection should not occur unless voltage conditions exceed the ride-through envelope or otherwise permitted under applicable ride-through provisions.

The ride-through envelope establishes the expected no-trip region for Large Loads and is intended to support predictable disturbance performance during credible voltage events and reliable operation of the Transmission System.

The specified durations of the no-trip regions in Table 1 should be cumulative over one or more disturbance events occurring within any 10-second period. Large Loads should be capable of remaining connected during consecutive

voltage disturbance events, including at least three disturbance events occurring within any 10-second period, provided cumulative voltage-duration limits remain within the applicable ride-through envelope.

Performance Requirements During Voltage Disturbances

Large Loads should comply with the following performance requirements while operating within the voltage ride-through envelope:

- Voltage between 0.90 pu and 1.20 pu:
  - The Large Loads should remain connected to the Transmission System and maintain pre-disturbance active power consumption.
  - Temporary reduction of active power should not occur.
  - Protection systems, converter protections, and control logic should not initiate unnecessary tripping, interruption of service, or curtailment.
- Voltage between 0.50 pu and 0.90 pu:
  - The Large Loads should remain connected to the Transmission System within the ride-through envelope.
  - Temporary reduction of active power may occur in proportion to the voltage reduction to support continued operation during the disturbance.
  - Following voltage recovery above 0.90 pu, the Large Loads should restore at least 90% of pre-disturbance active power within one second.
- Voltage below 0.50 pu:
  - The Large Loads should remain connected to the Transmission System within the ride-through envelope.
  - Temporary reduction of active power may occur as necessary to maintain connection and support ride-through performance during the disturbance.
  - Following voltage recovery above 0.90 pu, the Large Loads should restore at least 90% of pre-disturbance active power within one second.

Protection systems, converter protections, and control logic should be coordinated to avoid unnecessary disconnection during voltage disturbances occurring within the ride-through envelope. Control systems should maintain stable operation during and following disturbances and should avoid oscillatory or unstable behavior that could adversely affect reliable operation of the Transmission System.

Transient Overvoltage (TOV) Ride-Through

Large Loads should remain connected to the Transmission System and avoid unnecessary disconnection during short-duration transient overvoltage conditions associated with normal system events, including faults, transmission energization, switching operations, or other credible system disturbances.

Protection systems, converter protections, and facility controls should be coordinated to avoid unnecessary interruption of service resulting from instantaneous or short-duration transient voltage excursions that do not represent sustained abnormal system conditions. These requirements are intended to support predictable disturbance performance and reduce the risk of unnecessary changes in large load demand during credible transmission events.

Phase Jump Ride-Through Requirement

Large Loads should remain connected to the Transmission System and maintain stable operation during instantaneous positive-sequence voltage phase angle changes of up to 25 electrical degrees resulting from non-fault switching events on the Transmission System, provided system voltage remains within the voltage ride-through limits specified in Table 1.

Protection systems, converter protections, and facility controls should be coordinated to avoid unnecessary disconnection or unstable operation resulting from allowable phase angle changes during credible transmission system events.

Volts per Hz (V/Hz) Ride-Through

Large Loads should remain connected to the Transmission System and maintain stable operation during abnormal voltage-frequency conditions, provided the Volts per Hertz (V/Hz) measured at the Point(s) of Withdrawal (PoW(s)) does not exceed 1.10 per unit for more than 45 seconds or exceed 1.18 per unit for more than 2 seconds.

Protection systems, converter protections, and facility controls should be coordinated to avoid unnecessary disconnection during V/Hz excursions within these limits and support stable operation during and following transmission disturbances.

Frequency Ride-Through (FRT)

Large Loads should remain connected to the Transmission System and maintain stable operation during system frequency deviations within the limits specified in Table 2. The ride-through envelope should establish the frequency ranges and associated durations over which a Large Loads should remain connected without unnecessary disconnection.

Large Load Customers should ensure that the design, protection systems, facility controls, and operating characteristics of the Large Loads support compliance with applicable ride-through performance expectations during frequency excursions.

Protection systems and facility controls should be coordinated to avoid unnecessary disconnection during frequency excursions within the defined limits and support predictable disturbance performance and reliable operation of the Transmission System.

Frequency Ride-Through Envelope

Large Loads should remain connected to the Transmission System and maintain stable operation when system frequency remains within the continuous operating range of 58.8–61.2 Hz. For frequency deviations outside this range, Large Loads should remain connected for the minimum durations specified in Table 2. Disconnection may occur when frequency excursions exceed the applicable limits of the ride-through envelope.

The specified durations of the no-trip regions in Table 2 should be cumulative over one or more disturbance events occurring within any 10-minute period.

Table 2. Frequency Ride-Through Requirements at POI

System Frequency (Hz)	Minimum Ride Through Time (Seconds)

f>61.8	May Trip
f>61.2	299
f≤ 61.2 and f≥ 58.8	Continuous
f< 58.8	299
f< 57.0	May trip

Performance During Frequency Excursions

During frequency deviations within the ride-through envelope, Large Loads should:

- Remain connected to the Transmission System; and
- Maintain stable operation consistent with established performance expectations.

Large Loads should maintain pre-disturbance active power consumption while system frequency remains within the continuous operating range of 58.8 Hz to 61.2 Hz.

For frequency excursions outside the continuous operating range but within 57.0 Hz to 58.8 Hz or 61.2 Hz to 61.8 Hz, Large Loads should remain connected and maintain active power consumption within ±10% of pre-disturbance levels while maintaining stable operation.

Rate of Change of Frequency (RoCoF) Ride-Through

Large Loads should remain connected to the Transmission System and maintain stable operation during frequency excursions within the ride-through limits specified in Table 2, provided the absolute Rate of Change of Frequency (RoCoF) measured at the Point(s) of Withdrawal (PoW(s)) does not exceed 5.0 Hz/s.

For purposes of evaluating ride-through performance, RoCoF should be calculated as the average rate of change of multiple calculated system frequency measurements over a time interval greater than or equal to 0.1 second. Consistent with North American Electric Reliability Corporation (NERC) PRC-029 guidance, RoCoF should not be calculated during fault occurrence or fault clearance.

Any RoCoF protection installed should be coordinated with applicable Transmission System reliability requirements and configured to avoid unnecessary disconnection during credible frequency disturbances. Protection settings and control behavior should support ride-through performance during transient system conditions while avoiding inappropriate operation resulting from temporary fault-induced frequency measurement behavior.

Stability Assessment Requirements

Reliability Objective

The objective of stability assessment requirements is to identify and assess potential reliability impacts associated with Large Loads integration that may not be fully represented through conventional steady-state planning assumptions or historical load representations. As emerging large loads increasingly incorporate power-electronic interfaces, fast controls, dynamic operating behavior, and concentrated demand, additional assessment may be

necessary to understand system dynamic performance and stability during disturbances and changing system conditions.

Stability assessment requirements are intended to support reliable operation of the Transmission System by improving visibility into Large Loads dynamic behavior, identifying potential impacts to voltage performance, frequency performance, oscillatory behavior, and overall system stability, and supporting timely mitigation of reliability risks where necessary. These assessments provide a framework for understanding interactions between Large Loads and the Transmission System under planning and operating conditions, including credible contingencies and disturbance events.

Consistent with emerging industry practices and North American Electric Reliability Corporation (NERC) guidance, stability assessment expectations are intended to be scalable and risk-informed and may include transient stability assessment, forced oscillation assessment, system strength screening, electromagnetic transient assessment, sub-synchronous oscillation assessment, and other evaluations as appropriate based on facility characteristics, system conditions, and demonstrated reliability need.

Applicable Requirements

Large Loads should complete a comprehensive planning assessment consistent with applicable MISO Business Practice Manuals, including BPM-020 (Transmission Planning), as supplemented by additional stability assessment requirements described in this whitepaper and further developed through the Business Practice Manual for Large Load.

Assessments should use validated models, appropriate study assumptions, and applicable contingencies and should demonstrate that Large Loads integration does not result in unacceptable system performance or material reliability concerns, as determined through applicable MISO planning processes and Transmission Owner local planning criteria.

Large Load Customers should coordinate with applicable Transmission Owners during development of study assumptions, model validation, and assessment activities and prior to submission of study results to the Transmission Provider through the MISO Transmission Expansion Planning (MTEP) process.

The Transmission Provider should review study submittals and coordinate with Transmission Owners, as appropriate, to evaluate potential reliability impacts associated with Large Loads integration. Where assessments identify system limitations, mitigation measures, or transmission reinforcements necessary to maintain reliable operation of the Transmission System, such upgrades should continue to be developed and reviewed through the MISO Transmission Expansion Planning (MTEP) process consistent with BPM-020.

Transient Stability Assessment

Large Loads may be subject to transient stability assessment consistent with existing MISO transmission planning processes and applicable Transmission Owner local planning criteria, with targeted enhancements to evaluate reliability risks associated with Large Loads integration.

This assessment is intended to build upon — not replace — the existing MISO transmission planning framework described in BPM-020, which evaluates system stability across near-, mid-, and long-term planning horizons using established planning assumptions, North American Electric Reliability Corporation (NERC) transmission planning contingencies, and applicable planning criteria.

To support evaluation of Large Loads integration, targeted enhancements may include:

1. Large Load Dynamic Representation

Explicit representation of Large Loads dynamic behavior within planning models, including ride-through performance, dynamic load characteristics, load composition, and other operating characteristics necessary to assess system response during disturbances.

2. Targeted Large Load Contingency Analysis
   Evaluation of credible large-load-related contingencies, including sudden loss or rapid reduction of large load demand where system conditions or facility characteristics indicate additional assessment is warranted. These assessments may consider impacts to system frequency, voltage performance, angular stability, oscillatory response, and post-contingency system performance.

This assessment is not intended to replace or supersede Transmission Owner local planning criteria, MISO planning assumptions, or existing transmission planning requirements. Rather, it establishes a minimum reliability expectation intended to support consistent evaluation of reliability risks associated with Large Loads integration within existing planning processes.

Where applicable, Transmission Owner local planning criteria, MISO planning assessments, and other study requirements should continue to apply.

Implementation Considerations

The existing MISO transmission planning process described in BPM-020 already evaluates transient and dynamic system performance using established North American Electric Reliability Corporation (NERC) transmission planning contingencies and applicable planning criteria across multiple planning horizons. This framework provides a strong foundation for evaluating reliability impacts associated with changing system conditions and evolving resource characteristics.

Emerging large loads may introduce operational and electrical characteristics not fully represented through conventional static load assumptions. In particular, facilities incorporating power-electronic interfaces, motor-driven equipment, uninterruptible power supply systems, ride-through controls, or rapidly changing operating behavior may exhibit dynamic responses during disturbances that materially affect post-contingency system performance.

Accordingly, targeted enhancements to transient stability assessment may improve visibility into Large Loads behavior during disturbances and strengthen evaluation of system performance under evolving grid conditions. Explicit representation of dynamic load characteristics may improve modeling accuracy, while targeted contingency analysis involving credible loss-of-large-load events may improve understanding of system response to sudden changes in demand.

Implementation may include enhanced transient stability assessment performed by the Large Load Customer using validated models, applicable planning assumptions, and expanded study scope intended to represent Large Loads dynamic behavior and credible large-load-related contingencies. Study enhancements may include detailed representation of ride-through behavior, dynamic load composition, power-electronic response, and targeted loss-of-large-load scenarios, as appropriate based on facility characteristics and system conditions.

Large Load Customers should coordinate with applicable Transmission Owners during development of study assumptions and performance of transient stability assessment and should submit study results to MISO for review through existing transmission planning processes, including the MISO Transmission Expansion Planning (MTEP) process and, where applicable, the Expedited Project Review (EPR) process.

MISO may enhance existing MTEP and EPR planning processes to incorporate targeted transient stability assessment considerations associated with Large Loads integration, including enhanced review of dynamic load representation, disturbance performance, and large-load-related contingency impacts. These enhancements are

intended to supplement — not replace — existing transmission planning requirements and applicable Transmission Owner local planning criteria.

Where applicable, Transmission Owner local planning criteria, MISO planning assessments, and other study requirements should continue to apply.

Forced Oscillation Assessment

Large Loads may be subject to evaluation of potential forced oscillation impacts associated with repetitive changes in real power demand that could adversely affect reliable operation of the Transmission System or connected generating resources.

As a minimum reliability expectation, MISO proposes a guideline whereby repetitive load power variations should generally not exceed a 10 MW change within a five-second sliding window unless otherwise justified through technical evaluation. This guideline is intended to provide a consistent reference for evaluating potential forced oscillation impacts associated with Large Loads operation.

This assessment is not intended to replace or supersede Transmission Owner local planning criteria or detailed sub-synchronous oscillation assessments performed pursuant to Transmission Owner planning practices. Rather, it establishes a minimum reliability expectation to support consistent screening and evaluation of forced oscillation concerns associated with Large Loads. Where applicable, existing Transmission Owner local planning criteria and study requirements should continue to apply.

Large Load Customers may demonstrate compliance with this expectation through one or more of the following approaches:

- Demonstration that Large Loads operating characteristics satisfy the applicable power fluctuation guideline under expected operating conditions;
- Detailed technical assessment demonstrating that facility operation does not adversely affect reliable system performance or connected generating resources; or
- Identification and implementation of mitigation measures necessary to address identified reliability concerns.

Where detailed studies are performed, assessments may consider impacts to synchronous generators, damping performance, sub-synchronous oscillation susceptibility, generator endurance limits, and system-wide oscillatory performance.

Implementation Considerations

North American Electric Reliability Corporation (NERC) guidance on emerging large loads identifies that certain large loads — particularly those incorporating power-electronic interfaces, repetitive operating patterns, or fast control systems — may interact with existing oscillatory modes of the power system. Under certain conditions, these loads may reduce damping of natural system oscillations or contribute to repetitive oscillatory behavior through real power or voltage fluctuations.

Sustained oscillations near existing system modes may increase reliability risks by increasing mechanical stress on synchronous generators, accelerating equipment wear, amplifying network oscillations, or contributing to protection system operations. Accordingly, MISO proposes evaluation of repetitive load power variations as a practical and scalable approach to support early identification and mitigation of potential forced oscillation concerns associated with Large Loads.

To support implementation, MISO reviewed industry practices and screening approaches used by utilities and system operators, including Southern Company (SOCO), ERCOT, American Transmission Company (ATC), AESO, and Long Island Power Authority (LIPA). These practices provide reference thresholds for evaluating acceptable load variability and oscillatory behavior across local, inter-area, and subsynchronous frequency ranges.

Examples of industry approaches include:

- SOCO — Power oscillation screening criteria for inter-area and subsynchronous frequency ranges, including limits on repetitive power variation and volatility bands;
- ERCOT — Screening guidance limiting repetitive load power variation to approximately 10 MW within a five-second sliding window;
- ATC — Local planning criteria evaluating repetitive load changes and detailed PSCAD studies including synchronous generator shaft models;
- AESO — Variability and oscillatory performance thresholds intended to limit rapid power fluctuations and subsynchronous behavior; and
- LIPA — Oscillatory active power limits across local and aggregate frequency bands intended to reduce adverse impacts to system oscillations.

The proposed 10 MW within a five-second sliding window guideline reflects an initial reliability reference informed by industry practices and is intended to support a scalable, risk-informed approach for evaluating forced oscillation concerns associated with Large Loads. MISO may perform additional studies to evaluate footprint-specific impacts of emerging large loads on rotor-angle stability, generator stress, oscillatory performance, and overall system reliability to further inform future expectations or mitigation approaches.

System Strength Screening and EMT Study

Large Loads may be subject to system strength screening and, where screening results indicate additional assessment is needed, electromagnetic transient (EMT) assessment to evaluate potential reliability concerns associated with weak system conditions, power-electronic interactions, and dynamic behavior that may not be fully represented through conventional positive-sequence dynamic simulation methods.

This assessment focuses on identifying reliability concerns associated with weak grid conditions and related electromagnetic transient interactions involving Large Loads and the Transmission System. Examples may include control interactions, fast voltage response, inverter behavior, or other power-electronic performance characteristics requiring detailed time-domain assessment.

This assessment is intended to supplement — not replace — Transmission Owner local planning criteria governing system strength evaluation or determination of when EMT studies are warranted. Rather, it establishes a consistent reliability enhancement intended to improve screening consistency across the MISO footprint while preserving existing Transmission Owner planning practices.

Where both MISO and applicable Transmission Owner screening criteria are used to determine the need for detailed assessment, the more restrictive screening outcome should apply.

Implementation Considerations

Implementation may include:

- MISO-conducted system strength screening to identify weak system conditions or elevated reliability concerns and determine whether additional EMT assessment may be necessary;

- Performance of electromagnetic transient studies by the Large Load Customer where MISO screening results, applicable Transmission Owner local planning criteria, or other study requirements indicate additional assessment is needed; or
- Demonstration through technical analysis by the Large Load Customer that Large Loads operation does not present material reliability concerns requiring further EMT assessment.
- MISO system strength screening is intended to supplement — not replace — applicable Transmission Owner local planning criteria governing EMT study requirements. Transmission Owners may continue to apply local planning criteria to determine the need for EMT assessment, and where both MISO and Transmission Owner screening criteria apply, the more restrictive screening outcome should govern.

Large Load Customers should support EMT assessment, where applicable, through validated models, study assumptions, and technical analysis sufficient to demonstrate acceptable system performance and identify mitigation measures where necessary.

Sub-Synchronous Oscillation Screening and Study

Large Loads may be subject to sub-synchronous oscillation (SSO) screening and, where applicable Transmission Owner local planning criteria or system conditions indicate additional assessment is needed, detailed SSO assessment.

This assessment focuses on topology-related or equipment-related conditions that may introduce elevated SSO risk and is intended to identify potential interactions between Large Loads and nearby transmission or generation facilities. The need for assessment may be determined based on facility characteristics, electrical topology, local system conditions, and applicable Transmission Owner planning practices.

Examples of conditions that may indicate additional assessment is needed include proximity to:

- Series-compensated transmission facilities;
- High-voltage direct current (HVDC) transmission facilities;
- Large power-electronic devices, including inverter-based resources and static reactive power devices;
- Large electric arc furnaces or other rapidly varying industrial facilities; or
- Large steam, gas, hydroelectric, or other synchronous turbine-generators susceptible to torsional interaction.

This assessment is intended to supplement — not replace — Transmission Owner local planning criteria or existing SSO study practices. Rather, it establishes a minimum reliability expectation to support identification and evaluation of topology-related SSO concerns associated with Large Loads interconnection and operation. Existing Transmission Owner screening criteria and study requirements should continue to apply, where applicable.

Where SSO screening or detailed studies are performed, study results may be coordinated with MISO to support broader transmission planning and reliability evaluation.

Implementation Considerations

Series-compensated transmission facilities and other power-electronic or dynamic system components may increase the risk of sub-synchronous oscillation when interacting with large, dynamic loads. Large Loads — particularly those incorporating power-electronic interfaces or rapidly varying demand — may interact with oscillatory behavior of nearby transmission networks or generating resources. Under certain conditions, these

interactions may reduce damping, excite electrical oscillations, or contribute to torsional interactions affecting nearby synchronous generators.

Unlike system strength screening and electromagnetic transient assessment, which primarily focus on weak grid conditions and control interactions, SSO assessment is intended to address topology-related reliability concerns arising from transmission configuration, nearby equipment, or electrical interactions not necessarily associated with weak system conditions.

Evaluation of these concerns may require detailed technical assessment, including electromagnetic transient modeling of Large Loads, nearby transmission facilities, and affected generating resources to identify resonance conditions, oscillatory interactions, and potential mitigation measures.

Within the MISO footprint, series-compensated transmission facilities are limited, and Transmission Owners maintain established screening and study procedures to determine when SSO assessment is needed. MISO intends to continue relying on applicable Transmission Owner local planning criteria to identify and evaluate SSO concerns associated with Large Loads interconnection while coordinating study outcomes, as appropriate, to support reliable operation of the Transmission System.

References

[1]. "Characteristics and Risks of Emerging Large Loads" – NERC Large Loads Task Force White Paper (July 2025)
[2]. "Assessment of Gaps in Existing Practices… for Emerging Large Loads" – NERC LLTF White Paper (March 2026)
[3]. Alert: Large Load Interconnection, Study, Commissioning, and Operations – NERC alert addressing unexpected load reductions and emerging reliability risks (Jan 2026)
[4]. "Large Load Interconnection Performance Requirements" – ESIG Large Loads Task Force report (Feb 2026)
[5]. "Large Load Disturbance Events" – ESIG report documenting ride-through failures and load-driven oscillations (Mar 2026)
[6]. "Large Load Modeling for Dynamic Studies: Current Practices and Recommendations" – ESIG modeling report (2026 update)
[7]. "Forecasting for Large Loads: Current Practices and Recommendations" – ESIG forecasting report (Dec 2025)

Appendices

Mapping to tariff/BPM

Requirement	MISO BPM	NERC Standard*
Basic Facility Data	Network: BPM-010 Commercial: BPM-010 Transmission Planning: BPM-020	MOD-032-1 (Data collection & reporting for planning cases)

Modeling Data Package	Transmission Planning: BPM-020 Planning Modeling Manual	MOD-032-1 (Data collection & reporting for planning cases) MOD-033-3 (Model validation; steady state & dynamic) MOD-026-2 (Verification of dynamic models across all applicable facilities) IRO/RTO Spec
Telemetry/Metering	BPM-031/005 BPM-010	RTO Spec
Long-term forecast	BPM-011	
Short-term Forecast	BPM-025	
Outage Coordination	BPM-008	
Ramp	BPM-020	
Stability	BPM-020	
Ride-Through		

Stakeholder Engagement

[1]. 20260225 PAC Item 05 Large Load Interconnection Requirements.pdf
[2]. 20260422 PAC Item 07 Large Load Definition (PAC-2024-1).pdf
[3]. 20260527 PAC Item 10 Large Load Definition.pdf
[4]. Large Load Working Group (LLWG)