



Large Load Interconnection Reliability Requirements (LLWG)

Update on 6/26

- Added Slide 4 – FERC Show Cause Order for Large Load Definition
- Slide 8
 - Computational Load definition update
 - Large Load definition update

Large Load Working Group

June 29th, 2026

Purpose & Key Takeaway



Purpose

Review tariff redline for the large load interconnection reliability requirements based on stakeholder feedback.

Key Takeaways

- MISO is targeting an end of July Tariff filing to establish clear, enforceable interconnection reliability requirements that protect system reliability.
 - Revised Tariff language is posted with today's material.
- MISO's proposed framework is consistent with the recent FERC show cause order, as well as the emerging NERC guidance and broader industry practices.
- Stakeholder feedback has significantly influenced the revised Tariff language, particularly around applicability, transition provisions, and requirement specific language.
- A well-defined transition plan is critical to manage active projects while preventing unnecessary retroactive obligations.

Stakeholder Coordination



Large Load
Interconnection
Reliability
Requirements
Introduction

Workshop:

January 30, 2026*



Large Load definition
development

PAC Meeting:

February 25, 2026*

April 22, 2026

May 27, 2026



Review drafts on
requirements and
discuss tariff language

LLWG Meeting:

April 20, 2026*

May 14, 2026*

June 10, 2026

June 29, 2026*

July 16, 2026



File Tariff

End of July

* Formal Stakeholder Feedback Requested

FERC's Show Cause Order – Paragraph 1

1	Large-load definition	As explained below, it appears that it would be reasonable to define a large load as (1) a new commercial or industrial customer,
1	Large-load definition	(2) located at a single site behind one or more points of interconnection,
1	Large-load definition	(3) that has a peak load of 50 MW or greater,
1	Large-load definition	(4) interconnects to the transmission system at a voltage level of greater than 69 kV, and
1	Large-load definition	(5) is not part of a co-location arrangement. See infra P 58.

FERC's Show Cause Order – Paragraph 64

64	Ongoing operational requirements	Third, we preliminarily find that MISO's Tariff appears to be unjust and unreasonable because it lacks provisions addressing ongoing operational requirements for transmission customers taking transmission service on behalf of large loads. We are concerned that without such requirements the rates, terms, and conditions of transmission service may be unjust and unreasonable.
64	Monitoring, telemetry, equipment, and controls	For example, we are concerned that MISO's Tariff does not require transmission customers to provide MISO hourly forecasts, telemetry data, and other data to ensure sufficient visibility or specify requirements for maintaining communication channels between MISO and the transmission customer on behalf of the large load. Additionally, we are concerned that the Tariff does not require transmission owners to install, and transmission customers to pay for, equipment to enable MISO to monitor large loads for impacts of, for example, fast-ramping load that may impact the transmission system too quickly to be captured by conventional data acquisition systems (e.g., the need for phasor measurement units or similar equipment).
64	Remote disconnect, ramp-rate, ride-through, and protection systems	We are also concerned that the Tariff does not require the transmission customer to enable MISO to remotely disconnect large loads when necessary to maintain reliability of the transmission system, with the costs of such equipment directly assigned to the transmission customer, as well as the terms and conditions under which MISO may remotely disconnect the large load. Further, we are concerned that the Tariff does not specify ramp rate or ride-through requirements with which the transmission customer taking transmission service on behalf of the large load must comply. Lastly, we are concerned that the Tariff does not specify requirements for necessary control technologies and/or protection systems that may be necessary to limit a transmission customer's withdrawals from the transmission system as appropriate.

Large Load Interconnection Reliability Requirements

July 2026 Filing Index

Large Load

- Computational Load Definition*
- Large Load Definition*
- Point(s) of Withdrawal*
- Applicability
- Transitional Provision*

Ramp

- Up-ramp and Down-ramp*

Visibility

- Basic Facility Data
- Modeling
- Telemetry*
- PMU
- Forecast

Ride-through

- Voltage
- Frequency

MISO's interconnection framework relies on the Tariff to set requirements and the BPM to guide consistent implementation

Tariff Filing

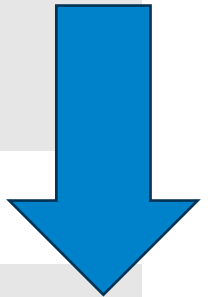


- Provides high-level framework and requirements, focusing on who, what, when, and where
- Legally binding through FERC
- Target Filing: July 2026

Large Load BPM



- Provides specific guidelines for how the Tariff requirements are implemented
- Must be consistent with Tariff
- Target Development: June 2026 – September 2026



Large Load definition was updated based on stakeholder feedback

Updated Tariff Language

Computational Load: Load comprised of ~~1 MW or greater of demand~~ from information technology equipment, such as servers, storage, and networking hardware, ~~that constitutes 50 percent or more of the Demand of a Large Load.~~

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

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 Load to the Transmission System.

Large Load: ~~The~~ **A new commercial or industrial** Load associated with any facility or aggregation of facilities located at a single substation 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) a group of entities that will coordinate with respect to the profile of the Load, and that results in either:

- (i) any new Load with a forecast Demand of 50 MW or more or,
- (ii) any modification or series of modifications that results in a cumulative increase of Demand by 25 MW or more, provided the total aggregate Load is 50 MW or more .

Point(s) of Withdrawal: The point(s) where a non-transmission facility ~~that is~~ used to withdraw Energy from the Transmission System to serve ~~a Large~~ Load connects to the Transmission System.

MISO applies interconnection reliability requirements based on the specific characteristics of Large Load

Non - Computational Load			
Process and mechanical equipment driven load behavior			
Load Type	Description	Profile	Ramping
Industrial Production & Extraction	Process-driven industrial operations	Cyclical / Process-driven	Low - Medium
Infrastructure & Public Service	Essential service	Mostly flat to peaky	Low - Medium
Agricultural & Processing	Product-processing demand	Seasonal / Process driven	Medium

Baseline Requirements

Basic Facility Data, Modeling, Telemetry, Forecast

Computational Load			
Digitally driven, software-managed load behavior			
Load Type	Description	Profile	Ramping
Data Center Cloud Storage	Computing infrastructure for data storage	Mostly flat / Continuous	Low-Medium
Data Center Artificial Intelligence; HPC ¹	Computing infrastructure for data processing	Dynamic / Workload-driven	High
Cryptocurrency Mining	Highly concentrated digital facility for validating blockchain	Moderate / Controllable	High

All Requirements

Baseline Requirements + Advanced Modeling + Ramp + PMU + Ride-through²

¹HPC: High-performance Computing
²Applied to the computational component of the Large Load

Applicability of Reliability Requirements to Large Load

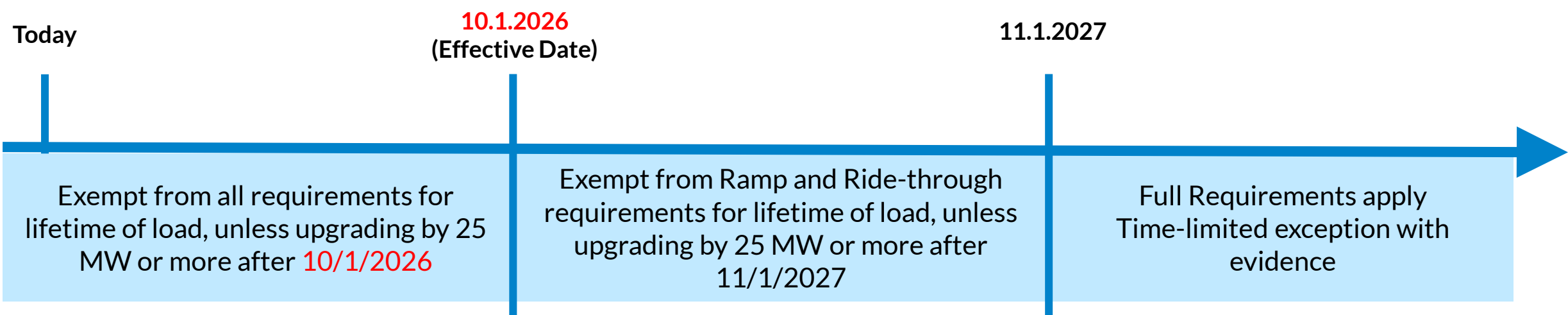
No change

All Large Load shall be subject to the Basic Facility Data, Modeling, Telemetry, Forecast Data, and Audit requirements set forth in Sections 37A.2 through 37A.5 and section 37A.9 of the Tariff.

Any Computational Load associated with a Large Load shall be subject to the Phasor Measurement, Ride-Through and Ramp requirements set forth in Sections 37A.6 through 37A.8 of the Tariff. The Transmission Provider shall determine whether Computational Load is associated with a Large Load based on information provided by the Large Load Customer to the Transmission Provider for such purpose.

Prior to the Service Commencement Date of a Large Load, the Large Load Customer must provide all information required by the Transmission Provider to demonstrate that the Large Load Customer, or its Designated Agent, complies with all applicable basic facility information, modeling, metering, telemetry, data storage and transmission, and other reliability, operation, planning and accounting standards and requirements for the operation the Large Load in the Transmission Provider Region.

The transitional provision ensures in-flight Large Loads are given a defined path and reasonable timeframe to meet reliability requirements while mitigating system impacts in the interim



Trigger: ~~Service Commencement Date~~ metered Demand equal to or greater than 50 MW

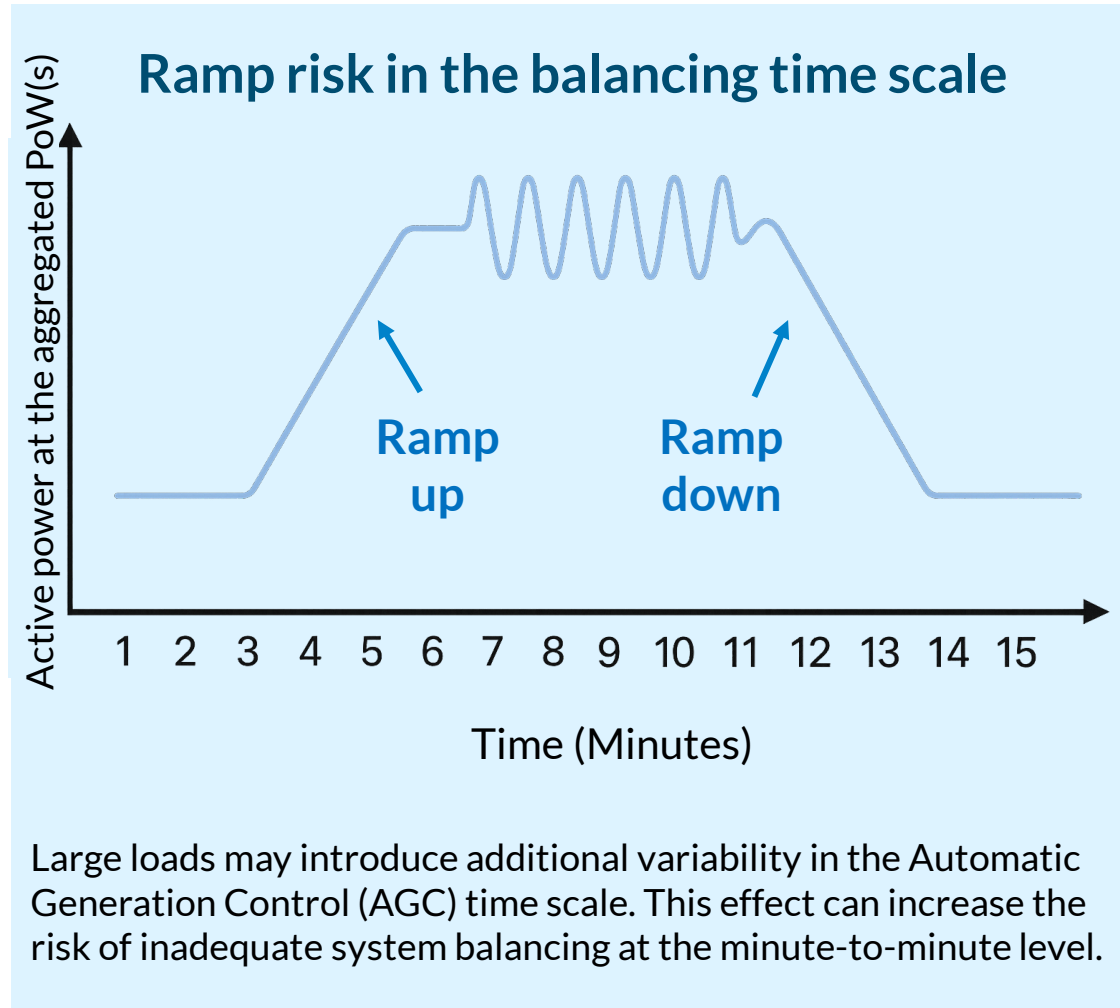
Transition Provision

All Large Load shall be subject to all requirements as set forth in this Section 37A, except that:

- a) A Large Load with ~~a Service Commencement Date~~ metered Demand equal to or greater than 50 MW prior to ~~October~~ ~~September~~ 1, 2026, shall not be subject to the requirements set forth in this Section 37A;
- b) A Large Load with ~~a Service Commencement Date~~ metered Demand equal to or greater than 50 MW after ~~October~~ ~~September~~ 1, 2026, but prior to November 1, 2027, shall be subject to all requirements set forth in Section 37A except for the ride-through requirements set forth in Section 37A.7 and the ramp requirements set forth in Section 37A.8; and
- c) A Large Load with ~~a Service Commencement Date~~ metered Demand equal to or greater than 50 MW after November 1, 2027, shall be subject to all requirements set forth in Section 37A except to the extent that the Large Load Customer demonstrates to the satisfaction of Transmission Provider that additional time is necessary to meet any such requirement(s) after the Service Commencement Date. In such case, the Large Load Customer must establish operating protocols with the Transmission Provider and the applicable Transmission Owner and/or Local Balancing Authority necessary to mitigate any reliability impacts to the Transmission System or Bulk Electric System to be in effect until compliance with the applicable requirement(s) is achieved. Such operating protocols shall address the specific actions, operational limitations, or equipment to be used to address any reliability impacts to the Transmission System or Bulk Electric System, and shall provide a mechanism for the Transmission Provider and the applicable Transmission Owner and/or Local Balancing Authority to monitor and inspect the performance of the Large Load in order to verify compliance. Any operating protocols established pursuant to this Section shall remain in effect until the Large Load is capable of compliance with the applicable requirement(s).

Ramp Requirements

Large Load Ramp Rate Requirements



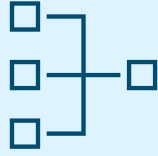
Updated Tariff Language

Large Load comprised of any Computational Load shall be subject to the ramp requirements set forth in this section. Ramp limits shall be measured in **the** aggregate across the applicable Point(s) of Withdrawal of a Large Load during stable-state transition. **The measurement shall account for including any reduction/ramp smoothing provided by generation that meets the eligibility requirements specified in the Business Practices Manual for Large Load generation for which the Large Load constitutes ZG Associated Load.**

Large Load shall 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 Large Load must have an effective up and down ramp rate not exceeding the specified limit outlined in the Business Practices Manual for Large Load unless otherwise directed by the Balancing Authority, Reliability Coordinator, or Transmission Operator.

Visibility requirements

Basic Facility Data Requirements



- ❑ Basic facility data required to be provided to the Transmission Provider
- ❑ Load MW amounts, firm and non-firm MW amounts, any dispatchable Load MWs, power factor, metering, telemetry, breaker configuration
- ❑ Staged additions and annual energy

No change

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, breaker configuration, staged additions and annual energy 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 Requirements



- ❑ Modeling data required to be provided to the Transmission Provider
- ❑ Modeling data including validated electrical models, detailed load profiles, and applicable modeling updates to evaluate system performance
- ❑ Dynamic model(s) necessary to evaluate Large Load performance

No change

A Large Load Customer shall provide the Transmission Provider with verified and complete electrical models of the Large Load, as well as detailed Load Profiles, for modeled Loads, as set forth in the Business Practices Manual for Transmission Planning. Such model information must include sufficient detail for Transmission Provider to evaluate system performance under contingency conditions in accordance with currently active versions of Transmission System Planning Performance Standards.

Following completion of applicable studies and prior to its Service Commencement Date, the Large Load Customer shall submit final verified models to the Transmission Provider in accordance with the Business Practices Manual for Large Load. The Large Load Customer shall provide notice to Transmission Provider of any material modifications to the Large Load and shall not implement any such proposed modifications until studied and approved by Transmission Provider in accordance with the Business Practices Manual for Large Load.

The final models of a Large Load shall reflect the as-built configuration and actual operating characteristics of the Large Load and Large Load Equipment. The Large Load Customer shall maintain and update models as required by the Transmission Provider. Failure to provide requested information may result in a delayed Service Commencement Date, operational limitations, or disconnection from the Transmission System.

Telemetry Data Requirements



- ☐ Accurate data feed to the State Estimator
- ☐ Synchronizing with Security Constrained Economic Dispatch (SCED)
- ☐ Details to be discussed in Reliable Operations Workstream

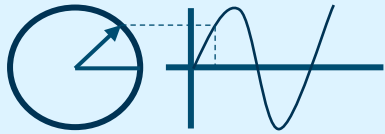
Updated Tariff Language

Prior to the Service Commencement Date of a Large Load, a Large Load Customer must provide real-time telemetry for the ~~all~~ Large Load ~~Equipment~~, either directly, through the applicable Transmission Owner, or other Transmission Provider-approved communication path, in the form and manner as set forth in the Business Practices Manual for Large Load.

Individual metering will be required for ~~all~~ Large Load ~~Equipment~~ and ~~any generation resources serving such Large Load that is located behind the same Point of Interconnection to the Transmission System as the Large Load on-site-related generation resources~~ meeting thresholds outlined in the Business Practices Manual for Large Load. All telemetry shall be provided via ICCP and must meet Transmission Provider update requirements as specified in the Business Practices Manual for Large Load. The Large Load Customer must use commercially reasonable efforts to maintain telemetry availability and accuracy for the Large Load and must promptly correct erroneous data, bad mappings, and ICCP modeling issues.

The Transmission Owner must provide disturbance monitoring and event recording capability sufficient to support post-event analysis, model validation, and reliability assessment.

Phasor Measurement Requirements



- ☐ Invest in Phasor measurement unit (PMU) or better
- ☐ Details related to measured quantities, data recording and retention, power quality, and infrastructure to be discussed in Reliable Operations Workstream

No change

Large Load comprised of any Computational Load shall be subject to the Phasor Measurement Unit (PMU) requirements set forth in this section. Prior to the Service Commencement Date of a Large Load, phasor measurement recording and communications equipment must be installed that is capable, at a minimum, of gathering phasor measurements as specified in Business Practices Manual for Large Load. To the extent similar quality equipment is being added or already exists, such as relays or digital fault recorders, that can collect data at least at the same rate as PMU and which data is synchronized via a high-accuracy satellite clock, such equipment may be utilized to satisfy this requirement if the equipment is located on the Transmission Owner's side of the Point of Withdrawal. The phasor measurement equipment must be installed at the Transmission Owner's side of the Point of Withdrawal and become part of the Transmission Owner interconnection facilities. Phasor measurements must be streamed in Institute of Electrical and Electronics Engineers (IEEE) C37.118 or equivalent format and be provided to the Transmission Provider by the Transmission Owner.

Forecasting Requirements



- ❑ **Rationale:** 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.
- ❑ Requirements will include hourly and five-minute granularity, as appropriate.

No change

The Large Load Customer must provide day(s) ahead and real-time Load Forecasts for a Large Load 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 shall be updated to reflect the most current information on the expected Demand, in accordance with the Business Practices Manual for Operations Forecasting.

Ride-through Requirement

Ride-through



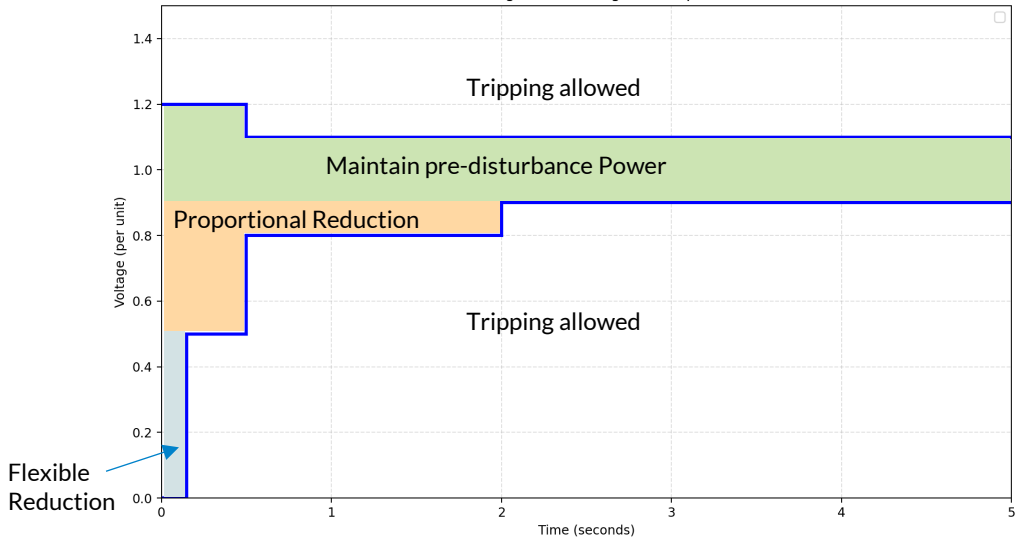
- ❑ Maintain Large Load connectivity during applicable voltage and frequency disturbances to support Bulk Electric System reliability
- ❑ Requirements include both voltage and frequency ride-through performance criteria

No Change

Computational Load that is associated with a Large Load shall remain connected to the Transmission System and continue operation during voltage and frequency disturbances within the performance criteria established by the Transmission Provider in the Business Practices Manual for Large Load.

Ride-through requirements apply at the Point(s) of Withdrawal and may include evaluation, testing, modeling, monitoring, and other compliance measures established by the Transmission Provider in the Business Practices Manual for Large Load.

Large Load Voltage Ride-through Technical Compendium



0.90 – 1.20 pu

CONTINUOUS RANGE

Maintain pre-disturbance active power. Control stability is mandatory. No power reduction is permitted between 0.9 and 1.2 pu.

0.50 – 0.90 pu

MANDATORY RECOVERY

Active power reduction is permitted but must be proportional. ~~Following voltage recovery above 0.90 pu, restoration of ≥90% power is required within 1s of recovery.~~

<0.50 pu

STABILITY PRIORITY

Flexible power reduction is allowed to maintain synchronization.

Phase Jump

Remain connected for sudden phase angle changes up to 25°.

V/Hz Limit

Ride through 1.1 pu for 45s or 1.18 pu for 2s.

Consecutive

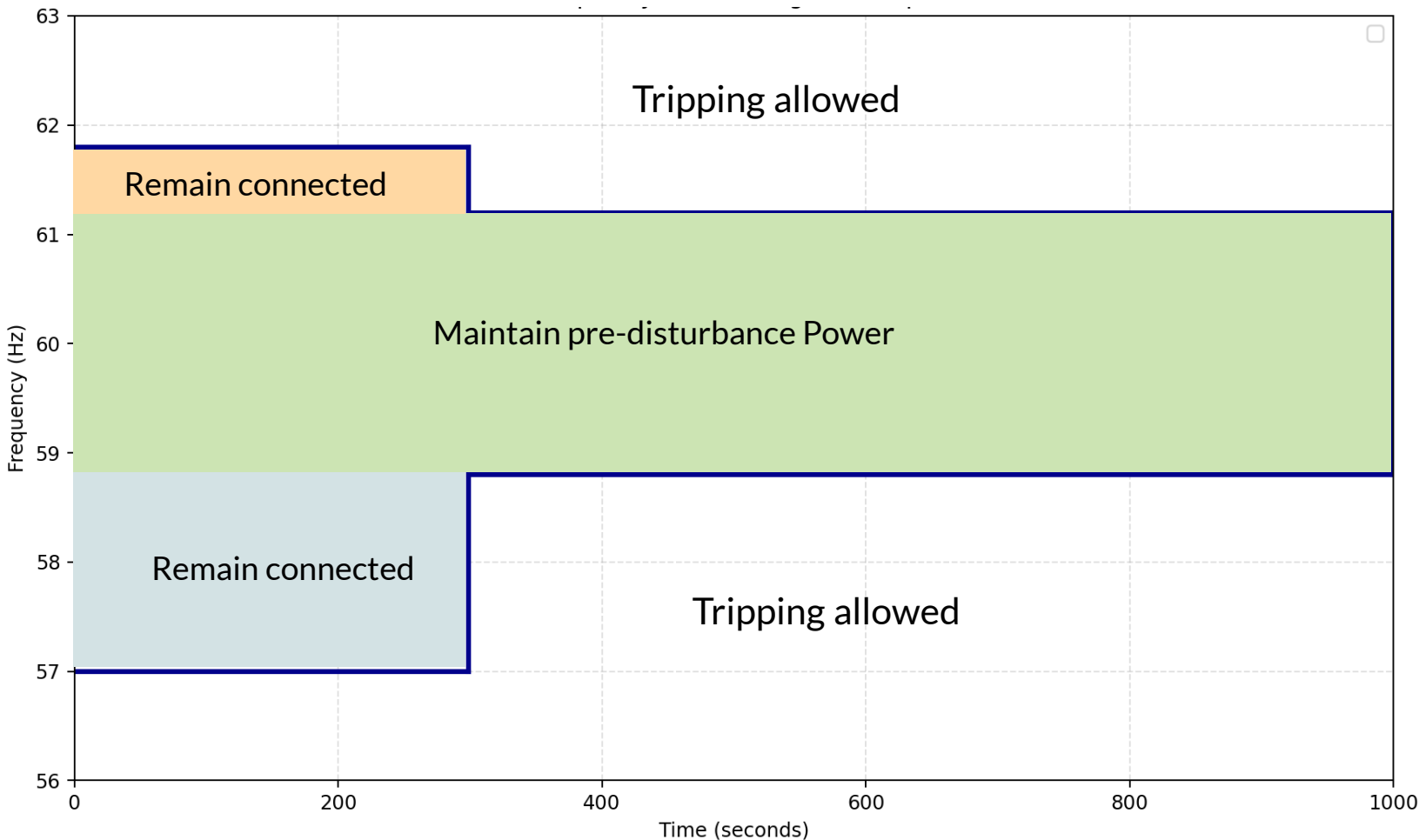
Must handle consecutive voltage disturbances, including at least three events within 10 seconds

Transient VRT

No tripping for normal system events like faults or switching

Large Load Frequency Ride-through Technical Compendium

Envelope, Compliance and Recovery



- 61.2 – 61.8 Hz**
Maintain active power within $\pm 10\%$ of pre-disturbance levels
- 58.8 – 61.2 Hz (Normal Operation)**
Maintain pre-disturbance active power
- 57.0 – 58.8 Hz**
Maintain active power within $\pm 10\%$ of pre-disturbance levels
- ★ RoCoF Ride-Through**
Remain connected for frequency within frequency ride-through envelop when $|\text{RoCoF}| \leq 5.0 \text{ Hz/s}$; coordinate protection with system reliability.

Stakeholder Feedback Request

- MISO requests feedback on the **Large Load Interconnection Reliability Requirements Tariff** updates by July 7, 2026
 - Suggested edits to the proposed requirements language in slides 8, 12,14,18, and 23
- Feedback requests and responses are managed through the Feedback Tool on the MISO website: <https://www.misoenergy.org/engage/stakeholder-feedback/>
- Stakeholders are encouraged to download and use the document located in the [Meeting Materials page](#). Please email feedback to StakeholderRelations@misoenergy.org. The “Submit Feedback” button will not be available for this request

Next Steps



Provide feedback on
today's content

Due:
July 7, 2026



Final Tariff language
review

LLWG Meeting:
July 16, 2026



File Tariff

End of July



Send questions or comments to:
LargeLoadProgram@misoenergy.org
