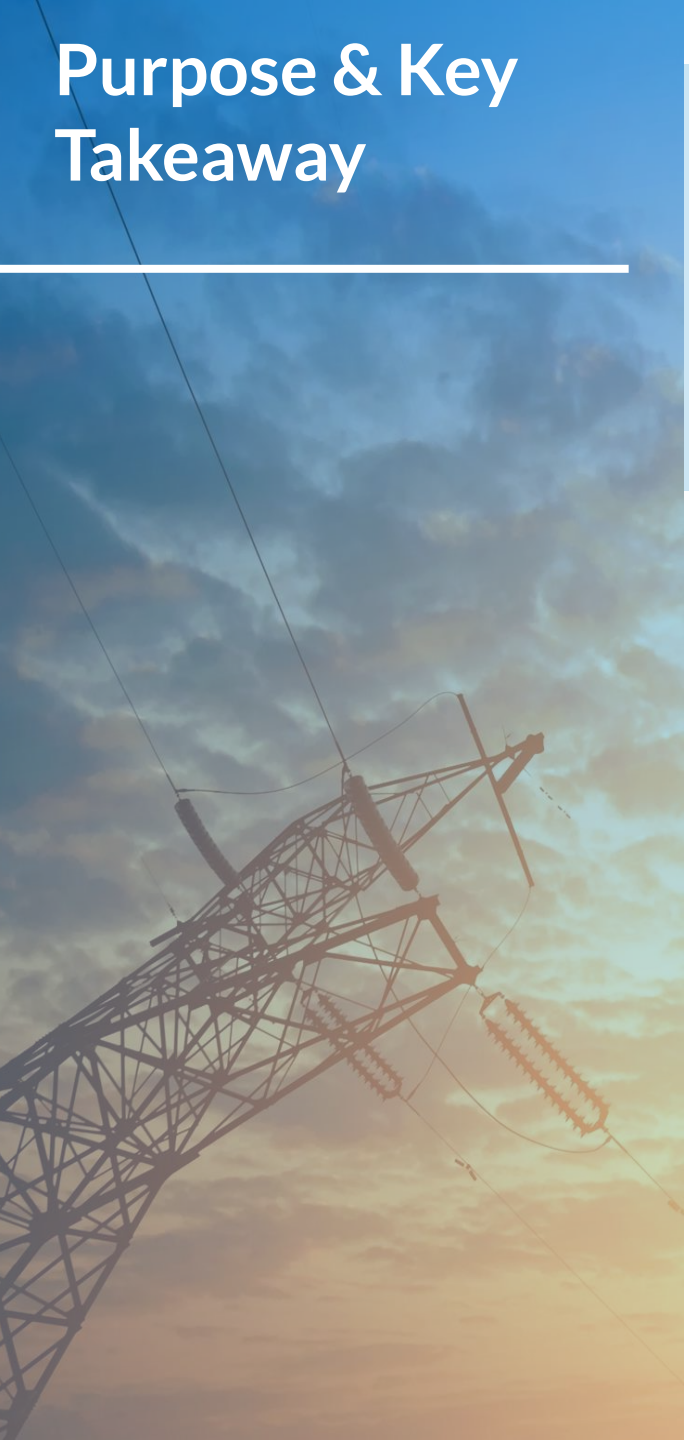
MISO Response to Feedback

Large Load Interconnection Reliability Requirements (May 14 LLWG)

June 16, 2026

Purpose & Key Takeaway



Purpose

Share summarized stakeholder feedback requested at the May 14 Large Load Working Group

Key Takeaways

- Overall stakeholder support of the framework, but stakeholders desired clearer roles, definitions, and more alignment with NERC.
- Stakeholders requested longer transition timelines, with explicit waiver/grandfathering paths.
- Stakeholders requested Large Load requirements be tailored to load characteristics, not business type, and avoid a one-size-fits-all approach.
- Stakeholders stated requirements need clearer scoping and assignment (modeling, telemetry, PMU, forecasting); and ramp and ride-through, and stability requirements need refinement, justification, and exemptions.
- Stakeholder feedback and revised Tariff language was discussed during June 10 LLWG.

Common stakeholder feedback themes were addressed with Tariff revisions, and discussed at the June 10 LLWG

Feedback Theme	MISO Response
Provide more clarity in Large Load definition.	MISO updated Tariff and BPM language to clarify treatment of existing loads, any expansions, and applicability date.
Lengthen 1-year transitional period, which is not feasible for mitigations with hardware upgrades.	MISO is adjusting the Transitional Provision to allow more flexibility in transitional period and conditions.
Apply requirements based on characteristics of Load rather than all Large Loads.	MISO updated the Applicability section to distinguish between Computational and Non-Computational Loads, and applied only ramp, PMU, ride-through, and advanced modeling requirements to Computational Loads.
Clearly define roles and responsibilities.	MISO updated the Large Load Customer definition in Module A terms
Provide more detail on MISO process for applicability and transitional.	MISO expanded process detail across several Tariff sections, including applicability screening, pre-MTEP/EPR timing, and transitional provisions for in-flight projects.
Coordinate Tariff content with NERC efforts.	MISO clarified that Tariff applicability for ramp/PMU/ride-through requirements aligns with NERC's emerging definition of Computational Loads and NERC's Load Modeling Task Force technical discussions.

Definition – Large Load / Large Load Campus feedback

Feedback Theme	MISO Response
Apply a consistent material-modification trigger to existing facilities, including facilities above and below 50 MW.	The revised Large Load definition covers any modification or series of modifications that results in a cumulative Demand increase of 25 MW or more, provided the resulting aggregate Load is at least 50 MW. This applies the material-modification trigger consistently to facilities above and below 50 MW.
Consider whether applicability should be tied to contract execution rather than energization or in-service date, actual power consumption	MISO has adjusted the applicability to better clarify which loads are subject to requirements. Applicability will continue to be tied to in-service timing due to the reliability impact to the system of not addressing the large amount of currently in-flight projects
Clarify how geographic proximity, ownership, coordinated operations, and shared infrastructure determine whether facilities are treated as one Large Load.	The revised definition applies to a facility or aggregation of facilities located at a single substation behind one or more Points of Withdrawal. It also covers a single entity or a group of entities that coordinate with respect to the Load profile.
Clarify how a Large Load served through more than one Point of Withdrawal is evaluated.	The Large Load definition expressly allows one or more Point(s) of Withdrawal. The Tariff separately defines a Point of Withdrawal as the connection point where a non-transmission facility used to withdraw Energy to serve the Large Load connects to the Transmission System.
Clarify how the requirements apply when a Large Load is associated with a ZGIA request or other co-located generation arrangement, including alignment between the load Point of Withdrawal and generation Point of Interconnection.	The Tariff defines ZG Associated Load and ZG Interconnection Service. The ramp section also measures the Large Load in aggregate across the applicable Points of Withdrawal and includes ramp smoothing provided by generation serving ZG Associated Load.
Clarify who is responsible for meeting the requirements	The Tariff identifies the Large Load Customer as the responsible party for complying with each Section 37A requirement for each Large Load it represents. The customer must demonstrate that it has agreements and access to the information needed to comply and verify compliance. The draft also requires coordination with the Transmission Owner where the Point of Withdrawal is located.

Applicability feedback

Feedback Theme	MISO Response
Clarify applicability by non-computational loads; load type versus technical behavior	Computational Load has been added to Module A as a new defined term. The Tariff has been updated to apply baseline requirements to all Large Loads and additional requirements to Large Loads with any Computational Load.
Provide additional details for process entry point and data-submission timing	The revised tariff identifies several timing points: application submission at least two years before expected service commencement; annual forecast updates; final verified models after applicable studies and before service commencement; and telemetry installation before service commencement. More detailed milestone sequencing can be addressed in the BPM.
Clarify who makes the applicability determination, and better define roles and responsibilities	The Large Load Customer is responsible for complying with each requirement for each Large Load it represents and must demonstrate access to the information needed to verify compliance. The Large Load Customer may use a Designated Agent and coordinate through agreements with the entities that own, operate, or use the Large Load, but remains accountable for compliance. The Large Load Customer must also coordinate with the Transmission Owner at the Point of Withdrawal.
Clarify the exemption process, Local Planning Criteria and firm-service safeguards in the transitional provision	The updated Transitional Provision allow additional time where the customer demonstrates that it is necessary, subject to operating protocols, operational limitations, monitoring, and inspection.
Clarify binding obligations, verification rights, and noncompliance definition	The updated tariff contains binding obligations, verification rights, record-retention requirements, audit rights, telemetry obligations, and modeling requirements. It also requires the Large Load Customer to demonstrate its ability to effectuate compliance, including through agreements with the entities that own, operate, or use the Large Load.
Define corrective actions, process delay, and/or operational restrictions	The updated Transitional Provision identifies escalation tools: delayed Service Commencement Date, operational limitations, operating protocols, disconnection, and disqualification from taking service under the Tariff.

Transition provisions & effective date feedback

Feedback Theme	MISO Response
Extend the transition period to reflect hardware design, procurement, permitting, and implementation needs. Several stakeholders indicated that one year is insufficient and recommended at least three years	The updated Transitional Provision recognize the challenges raised, and established a phased transition through November 1, 2027 and permit additional time where justified
Consider staging the requirements rather than applying the full framework at once. Ensure foundational concepts and screening processes are sufficiently defined before compliance is required.	The updated Transitional Provision outlines that baseline data, modeling, telemetry, and forecasting apply first, while ramp and ride-through requirements become applicable later. After November 1, 2027, additional time may still be granted for individual requirements where justified.
Clarify how the framework applies to operational, approved, committed, and late-stage projects, including projects with significant land, permitting, engineering, or procurement investments.	Tariff has been updated to provide additional clarity on which Large Load projects are subject to requirements.
Establish a transparent process for requesting waivers, extensions, or requirement adjustments, including eligibility criteria, decision authority, and timing.	For Loads that meet the applicability requirement, the Large Load Customer may demonstrate that additional time is necessary to satisfy one or more requirements after service commencement. The Transmission Provider may allow additional time subject to interim operating protocols.
Consider allowing staged or conditional service where a customer can operate within defined limits while completing required mitigation.	The Tariff allows service commencement before full compliance where additional time is justified. Interim operating protocols must identify actions, operational limitations, or equipment needed to mitigate reliability impacts and allow monitoring and inspection until compliance is achieved.
Recommend MISO to delay filing to adopt NERC standards.	MISO will continue to coordinate with NERC and evaluate future updates as NERC guidance and standards evolve. The proposal addresses near-term regional reliability gaps and is not intended to replace or conflict with applicable NERC requirements.

Basic facility data feedback

Feedback Theme	MISO Response
Need standardization of required intake information for Large Loads.	MISO is standardizing the Large Load intake package to include configuration details, Points of Withdrawal, staged MW buildout, firm and non-firm demand, dispatchable demand, power factor, load composition, breaker configuration, and material-change notifications.
Clarify responsibilities for providing basic facility data and information.	MISO updated the Tariff to allow for Large Load Customer or designee to submit required information. Roles to be clarified in the Large Load BPM.
Avoid requesting excessive or unnecessary basic facility data and information.	The data-submission requirements have been refined to include only information materially relevant to planning and operational reliability. Standardized templates and data categories will be provided in the BPM.
Clarify definition and handling of material changes.	MISO added the following language to the Tariff to clarify material modifications: 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.

Modeling requirements feedback

Feedback Theme	MISO Response
Need clarity regarding modeling responsibilities.	The modeling obligation is assigned to the Large Load Customer rather than the end user, ensuring accountability resides with the entity interfacing with the Transmission Provider.
Need explicit triggers for model updates.	MISO has established clear triggers for when updated models must be submitted, particularly in association with material modifications.
Need more specific modeling requirements by technology type.	MISO will include steady-state and positive-sequence dynamic modeling requirements in the Large Load BPM. Computational Load portions must include PERC-type models, whereas non-computational portions must use Composite Load Model Dynamics (CLMD).
Need confidentiality assurances for modeling data.	Confidentiality is already addressed through MISO's normal data confidentiality provisions.
Concern that existing planning models do not adequately capture Large Load behavior.	MISO is requiring verified as-built electrical models and detailed load profiles to ensure planning models reflect actual system behavior and performance.

Telemetry requirements feedback

Feedback Theme	MISO Response
Need clarity around responsibility for disturbance monitoring.	The Transmission Owner is responsible for providing disturbance-monitoring and event-recording capabilities consistent with NERC PRC-002 and PRC-028.
Clarify whether telemetry must be provided at the transmission or distribution level.	Telemetry requirements will be defined based on reliability needs, with thresholds for equipment-level metering and ICCP data exchange specified in the Large Load BPM.
Need clear identification of required telemetry data and equipment.	MISO is defining a standardized telemetry dataset in the Large Load BPM, including required measurement types, equipment applicability, ICCP update frequencies, and data quality expectations.
Preference for on-request rather than continuous transmission of all data.	The LL BPM will specify data-retention windows and criteria under which disturbance-related telemetry must be provided upon request.
Need to separate load telemetry from generation telemetry.	Individual metering will be required for all Large Load Equipment and generation resources meeting thresholds outlined in the Business Practices Manual for Large Load.

Phasor measurement unit requirement feedback

Feedback Theme	MISO Response
Need clarity regarding ownership and installation of PMU equipment.	PMUs must be owned by the Transmission Owner and installed on the Transmission Owner's side of the Point of Withdrawal
PMU requirement should not be universally applied.	The PMU requirement is applied to computational Large Loads and is not universally imposed across all load types.
PMU specification should allow for technological advancement.	The requirement allows the use of a "PMU or better" device to accommodate equivalent or superior metering technologies.
Need clear sampling-rate and data-quality expectations.	Sampling rates must support oscillation detection (e.g., ≥30 samples per second), and phasor data must conform to IEEE C37.118 or equivalent standards.
Need clearly defined communication and retention requirements.	Time-synchronized phasor data must be transmitted to the Transmission Provider by the Transmission Owner, with retention and access requirements defined in the Large Load BPM.

Audit rights feedback

Feedback Theme	MISO Response
Affirm Transmission Owner rights to audit or verify information provided by Large Load Customers.	MISO intends to keep the current Tariff language as drafted, granting audit/verification rights to the Transmission Provider (MISO). The Tariff does not grant those rights to the Transmission Owner (TO), and the language does not implicitly extend MISO's rights to the TO. The TO can exercise its authorities with agreements in place with the Large Load Customer or end-user(s).
Limit audit rights to information with direct reliability relevance; avoid overly broad or intrusive audit authority.	MISO understands the concern that audit authority should not extend into areas unrelated to BES reliability. The intent of the Tariff's audit provision is narrow, allowing MISO to verify the information submitted under Section 37A that is necessary for planning and operating a reliable Transmission System. The draft Tariff language does not authorize broad review of Large Load operations or end-user equipment details, nor does it replace the role of NERC and/or Regional Entities. Maintaining this audit provision is important to ensure that data critical to reliability is accurate, but its use will remain targeted, risk-based, and limited to the information required under the Tariff.

Short-term LL forecast feedback

Feedback Theme	MISO Response
Require clarity on forecasting obligations.	Large Load Customers must submit Day-Ahead and Real-Time load forecasts reflecting the most recent and accurate expected demand.
Need confidentiality protections.	Confidentiality is already address through MISO's normal data confidentiality provisions.
Need expectations for accuracy and deviation treatment.	The Large Load BPM will define expectations for forecast accuracy and provides guidance on the treatment of deviations.
Must avoid duplication with existing LSE forecasting processes.	MISO's requirements align with existing Day-Ahead and Real-Time LSE forecasting processes to prevent duplicative submissions.
Address inadequacy of historical-pattern forecasting for Large Loads.	Short-term forecasts are required because computational and other Large Load types cannot be reliably modeled using weather-based historical forecasting methods.

Long-term LL forecast feedback

Feedback Theme	MISO Response
Need clarity regarding roles and submission expectations for long-term forecasts.	Long-term forecast items have been incorporated into the Basic Facility Data submission to ensure consistent and streamlined reporting.
Need long-term forecasts that account for staged buildup and phased operations.	Long-term forecasting requirements now include staged buildout expectations and annual energy data.
Need standardized templates for long-term information.	The Large Load BPM will provide standardized templates and data fields to ensure consistent long-term information collection across Large Loads.
Concern about using long-term forecasts prematurely in planning.	Long-term forecasts are used primarily for planning visibility and do not impose compliance obligations beyond standard data-submission requirements.
Need alignment with current planning and resource-adequacy processes.	Long-term forecasting requirements are aligned with existing MISO planning, resource-adequacy, and operational forecast processes.

Ride-through requirements feedback

Feedback Theme	MISO Response
Stakeholders request differentiation between computational and traditional industrial loads, noting industrial facilities may not feasibly meet ride-through expectations due to motors, VFDs, process equipment, safety systems, environmental controls, and manufacturer settings. Requests were made for load-specific treatment supported by demonstrated system need.	MISO agrees different load technologies warrant different disturbance-performance expectations and intends to clarify tariff applicability such that ride-through requirements apply to computational loads, whose inverter-interface and power-electronic behavior may present reliability risks similar to IBRs.
Stakeholders support alignment with PRC-029 and IEEE 2800 while requesting technical justification for applying generator/IBR-based concepts to loads and clearer load-specific rationale.	MISO recognizes concerns regarding the application of generator-based ride-through criteria to loads. To address these concerns, MISO proposes to adopt the ITIC voltage tolerance curve, consistent with SPP's large data-centric load ride-through requirements and commonly applied to information technology equipment. MISO's proposed requirements establish a minimum regional reliability expectation and do not preclude more stringent requirements identified through local planning criteria or project-specific studies.
Stakeholders request labeled quantitative ride-through curves, clarification of measurement points, tolerances, compliance assessment, BPM maturity, stakeholder update process, and clear implementation expectations.	MISO agrees additional implementation clarity improves predictability, mitigation analysis, and compliance consistency. MISO intends to maintain tariff-level reliability obligation while defining technical implementation details (curves, measurement point, tolerances, testing, stakeholder update process) in BPM and supporting guidance.

Ramp requirements feedback

Feedback Theme	MISO Response
Apply ramp requirements when a facility starts, stops, or materially changes a large process to reach a new operating level. The requirements should support reserves, scheduling, contingency analysis, and other operator needs.	The updated section 37A.8 states that ramp limits are measured during stable-state transition. This aligns the requirement with controlled up-ramps and down-ramps as a Large Load moves toward a new operating level.
Distinguish controllable transitions from repetitive oscillations, trips, environmental-control responses, and other behavior outside normal ramp management.	By limiting Section 37A.8 to stable-state transitions, the Tariff distinguishes routine ramp management from disturbance-driven behavior.
Do not rely on customer tripping where it could create additional reliability risk.	Section 37A.8 does not use tripping as the routine mechanism for maintaining ramp compliance.
Explain the basis for the proposed 30 MW/min limit and consider whether limits should vary by location, system strength, and load characteristics.	The Tariff establishes enforceable up-ramp and down-ramp limits but delegates the numeric limit and process to the BPM. The reserve-based rational is included in the Technical Compendium.

Send questions or comments to:

LargeLoadProgram@misoenergy.org