NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Large Loads Frequently Asked Questions

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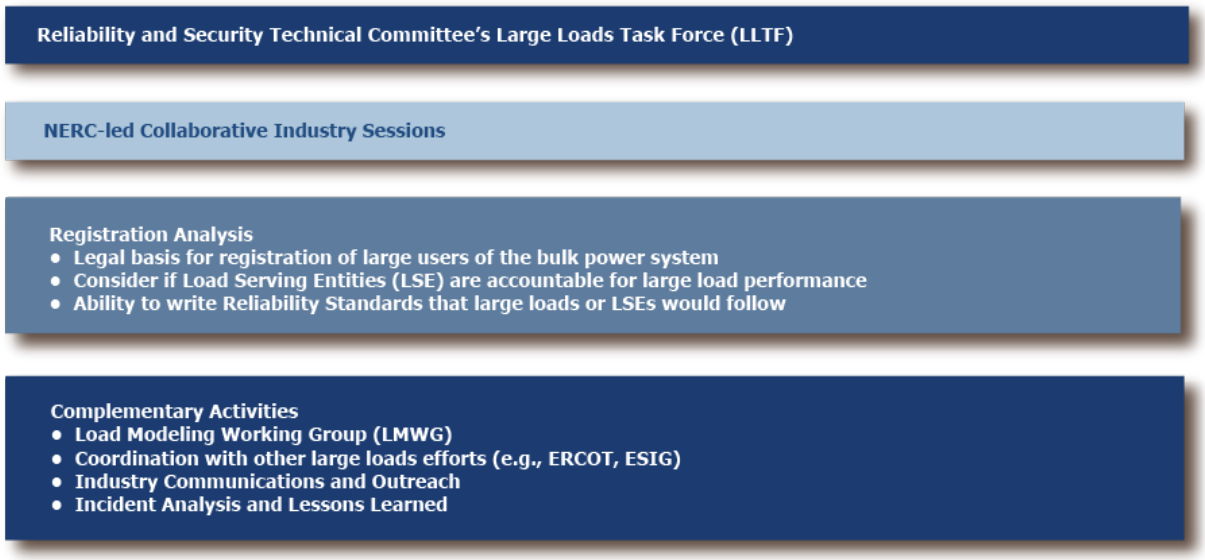
An increasing number of large commercial and industrial loads are rapidly connecting to the bulk power system (BPS). Emerging large loads, such as data centers (including cryptocurrency and artificial intelligence), hydrogen fuel plants, and others, present unique challenges in forecasting and planning for increased demand.

What is NERC Doing to Address Large Loads on the Grid?

To begin understanding large loads and identifying effective pathways for their integration, NERC established the Large Loads Task Force (LLTF) in August 2024 and developed a work plan; the Member Representatives Committee provided written input and hosted a technical panel session at the February 2025 Board meeting; and NERC's Board issued a resolution in February 2025 directing NERC staff to develop an action plan, which will complement the work of the task force and provide additional structure to NERC's efforts related to large loads integration.

NERC's Large Loads Action Plan



NERC's LLTF has several ongoing projects including a published white paper on *Characteristics and Risks of Emerging Large Loads* which finds that peak demand is just one of several factors that can impact bulk power system (BPS) reliability, and further action is needed to address these risks. A Report Summary and webinar accompanied the white paper and provide further insights into the findings.

A second white paper is currently in progress, and will examine *Gaps in Existing Practices, Requirements, and Reliability Standards for Emerging Loads*. A reliability guideline on *Risk Mitigation for Emerging Large Loads* is also included in the LLTF Work Plan.

About Large Loads

What characteristics are typical for large loads?

Historically, large loads referred to industrial facilities with high electrical demand. They had long interconnection[1] timelines that allowed for more study time under traditional planning processes. Currently, emerging large loads include cryptocurrency mining, data centers (conventional and artificial intelligence), oil field loads, and hydrogen production facilities. Many have a shorter timeline to interconnect (months vs. years) to the grid. In addition to these rapid timelines, some emerging large loads introduce new challenges to grid operators like rapid demand fluctuations and increased voltage sensitivity.

What challenges exist with integrating emerging large loads onto the grid?

Integrating emerging large loads onto the grid poses several challenges including accurately forecasting future demand, ensuring that transmission and generation capacity keeps pace with this demand, and managing rapid fluctuations in consumption during all conditions – both fault and normal – which can destabilize the grid.

What Reliability Challenges do Large Loads Pose to the Bulk Power System?

NERC has observed several reliability challenges resulting from large loads around timing, data collection and forecasting, and modeling.

Timing

Some large loads seek to connect within one-to-two years, and the traditional planning processes are not equipped to ensure the grid can reliably serve this new demand. Additionally, the transmission upgrades required to handle the full new requested loads cannot be completed quickly enough. Since some loads want to connect to the bulk power system as soon as possible, they submit speculative interconnection requests to find the interconnection point with the fastest timeline, significantly increasing the number of interconnection studies utilities must perform. Due to the sheer number of interconnection requests, limited time is available to study the implications of these new loads.

Data Collection and Forecasting

To better quantify the risk, the electrical characteristics of large load facilities, such as ramping capabilities, power electronic settings, internal protection schemes, and coordination across multiple facilities, must be better understood. A better understanding of standardizing large-load modeling for long-term forecasting is needed.

Modeling

Current dynamic load models have challenges accurately representing the behavior of emerging large loads such as data centers. Considering the immense growth of these loads, modeling their dynamic behavior has become more critical than ever. NERC's Load Modeling Working Group (LMWG) is working on modeling methodologies that can accurately simulate these emerging loads' electrical behavior. These models can be used in studies to assess risks posed by large loads.

[1] Interconnection refers to the process of integrating new generators, loads, or other equipment into the grid.

Transmission Planning

Currently, transmission expansion projects can take a decade from planning to energization. There is a growing urgency for processes to address the shorter-term needs associated with this rapid load growth. Additionally, rapid integration of large loads may pose short and long-term resource adequacy concerns as generation can take years to be operational, longer than some large load interconnection timelines of months to years. A proactive, holistic approach is necessary for integrating large loads.

Voltage Ride-Through

Currently, there are no specific voltage ride-through Reliability Standards for large loads. Large loads, specifically data centers, frequently house a multitude of sensitive electronics that require ideal electrical conditions. If poor electrical conditions exist (like low voltage), large loads can disconnect from the grid to protect their equipment from damage.

Rapid Changes in Demand

Rapid and repeated changes in demand can lead to frequency and voltage concerns and even oscillations, which can threaten grid stability. Rapid changes in demand can occur for multiple reasons including sudden transfer of load to backup power, sudden transfer of load back to the grid, and controlled ramping up and down based on normal processes (electric arc furnaces, artificial intelligence training, artificial intelligence inference, etc.).

Getting Involved and Staying Informed

How Can Stakeholders Get Involved in NERC's Large Loads Efforts?

NERC developed and is implementing a strategic engagement and communications plan that sets a cadence for regular updates on large loads efforts, identifies opportunities to expand outreach to large loads entities, and establishes the foundations for collaborative industry sessions. NERC is focused on expanding its engagement with the large loads industry through direct outreach to trade organizations and large load companies. Stakeholders can get involved by reaching out to Zach Greene.

How Can I Stay Informed?

Information regarding the Large Loads Action Plan, along with additional resources, can be found on the Large Loads Action Plan initiatives page. This page provides quarterly updates and white paper releases. Additionally, details about the LLTF, including the project scope, FAQs, work plan, and upcoming meetings, is available on NERC's Large Loads Task Force web page. NERC has also provided a recent presentation to the Federal Energy Regulatory Commission about the large loads topic.