CHARACTERISTICS AND RISKS OF EMERGING LARGE LOADS

Report Summary

LLTF
Large Loads Task Force

Overview

Emerging large loads, such as computational, industrial, and hydrogen production facilities, are seeking to connect to the bulk power system (BPS) faster than ever before and at a magnitude beyond the largest currently operating loads. In addition to the rapid growth, their electrical behavior is distinctive and less predictable than that of conventional loads. These unique characteristics pose specific risks to the BPS that need to be understood and mitigated.

Addressing an Emerging Reliability Issue

To effectively plan for and mitigate the risks posed by emerging large loads on the bulk power system, the NERC Large Loads Task Force (LLTF) has characterized these loads and identified the reliability risks associated with them. These loads vary in size from several megawatts to several gigawatts, creating unique challenges for the reliability and security of the BPS. While several Reliability Coordinators and utilities have established large-load frameworks primarily based on facility sizing, it is essential to consider additional criteria and characteristics when defining large loads. The Characteristics and Risks of Emerging Large Loads White Paper demonstrates that peak demand is just one of many factors that can affect the BPS.

Risks Examined

- Large Load Observability and Data Risks
- Long-Term Planning
- Operations and Balancing
- Stability
- Power Quality
- Physical and Cyber Security Risks
- Load Shedding Programs and System Restoration

Load-Reduction Events—A Key Risk

NERC has observed load reduction events, and if these events were more significant in scale, we would likely face severe reliability issues. The Eastern and Texas Interconnections have experienced load-reduction events, with each Interconnection seeing approximately 1,500 MW of voltage-sensitive load reduction. These events highlight risks associated with the increasing number of loads connecting to the BPS.

Large Loads Task Force

NERC's Reliability and Security Technical Committee established the LLTF to analyze the reliability impacts related to emerging large loads (e.g., data centers (including cryptocurrency mining and AI), industrial facilities, and hydrogen production facilities). The LLTF characterizes large loads and defines the reliability risks that they may pose to the BPS. A reliability gap analysis white paper will follow this initial report, providing more insight on where the most significant risks exist.

Deliverables

1. Risk Identification
2. Gap Analysis
3. Risk Mitigation

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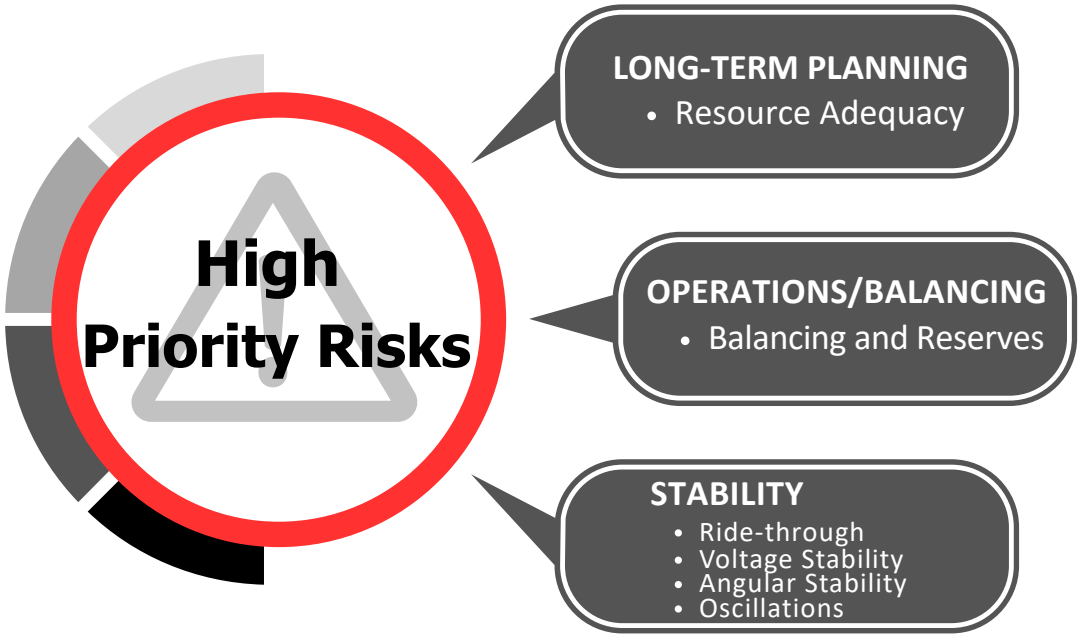
Large Load Definition

Any commercial or industrial individual load facility or aggregation of load facilities at a single site behind one or more point(s) of interconnection that can pose reliability risks to the BPS due to its demand, operational characteristics, or other factors. Examples include, but are not limited to, data centers, cryptocurrency mining facilities, hydrogen electrolyzers, manufacturing facilities, and arc furnaces.

NERC's LLTF was tasked with defining large loads. The definition is expected to be modified in the future for specific applications, like the NERC Glossary of Terms Used in NERC Reliability Standards. The LLTF has not yet provided a MW threshold or more granular characteristics of large loads, as further analysis and development are forthcoming.



Key Outcomes to Guide Future NERC and Industry Efforts for Large Loads

- ***Identify*** current processes and standards that do not adequately address the risks.
- ***Recommend potential mitigations*** for these risks through improvements to planning, operations, and interconnection procedures.
- ***Clearly define*** each of the characteristics and develop a framework for classification.
- ***Investigate*** potential security risks focused on:
  - Load Modeling
  - System Protection and Control
  - Energy Reliability Assessment

Specific recommendations can be found in the report.

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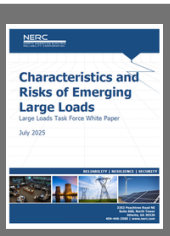
Large Load Resources