

New York State Reliability Council – Large Loads Working Group (LLWG)

Reliability Risks for Large Loads

1. Active Power Variation Risk
2. Frequency Stability
 - While loads are generally expected to remain connected through “reasonable” frequency disturbances, there is no formal definition of what constitutes reasonable, nor any enforceable criteria for performance.
3. Voltage Stability/ fluctuations
 - The absence of a clearly defined voltage disturbance ride-through capability leads to highly variable responses among large loads.
 - The dynamic performance of large loads during voltage deviations needs more study.
 - Neutral overcurrent protection schemes.
 - Transformer winding configurations influence voltage sag severity. Delta-wye transformer stages help “temper” single-phase voltage depressions, reducing load-loss risk.
4. Harmonics
 - Electronic devices such as adjustable speed drives, rectifiers, and switched-mode power supplies—commonly found in emerging large loads—produce harmonics and inter-harmonics that can contribute to unacceptable levels of voltage and current distortion in the BPS.
5. Angular Stability
 - Large loads introduce rotor angle stability risks primarily as a result of their potential to cause gigawatt-scale changes in BPS real power flows within a few electrical cycles (50 milliseconds in a 60 Hz system). Of the two forms of rotor angle stability (transient and small signal), these characteristics are more relevant in the context of transient rotor angle stability.
6. Manual Load Shed Obligations
7. Automatic Under Frequency Load Shed Programs
 - Limitation of Overvoltage
 - The manual or UFLS shedding of the entirety of a very large load could lead to over-frequency or overvoltage.
8. Ramp rate requirements (down ramp and up ramp)
 - Current Reliability Standards lack specific guidance or constraints on how quickly large loads may ramp.
9. Power oscillation interaction
 - Large loads, particularly those with high reactive power consumption, can cause sub synchronous oscillation (SSO) that can damage generation and other equipment and ultimately destabilize the grid.
10. Degradation of interface transfer limits
11. Load Forecasting

12. Resource Adequacy

13. Transmission Security

14. Performance Verification & Monitoring

- System operators and planners need data and models about large loads to properly characterize the load's behavior and study potential risks to the BPS. To run steady-state and dynamic simulations, for example, the operator and planner need to know the expected interconnection timelines, peak demand, load behaviors, protection and control settings, and dynamic models for the load.
- High-speed disturbance data capture devices to monitor and assess the operational performance of Large Loads (e.g., Phasor Measurement Units (PMU)).
- High-resolution data monitoring and fault capture (e.g., advanced Digital Fault Recorders) for Large Loads.