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| NOGRR Number | [282](https://www.ercot.com/mktrules/issues/NOGRR282) | NOGRR Title | Board Priority - Large Electronic Load Ride-Through Requirements |

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| Market Segment | Not applicable |

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| Comments |

*Low Voltage Ride-Through is Too Important; Punishing a Few Hurts the Market*

Large Flexible Loads (“LFLs”) serve as a cornerstone of grid stability in Texas. As ERCOT leadership has affirmed in Legislative testimony, and even most recently during Winter Storm Fern, these loads perform a dual function essential to maintaining both economic viability and operational reliability across the system. During periods of excess supply, LFLs absorb substantial volumes of low-cost generation, preserving market conditions that keep thermal generation assets economically viable and available when demand surges. When grid stress occurs, these same loads can curtail operations rapidly, providing immediate demand relief and safeguarding service continuity for residential and critical-use customers.

Preserving these benefits requires regulatory frameworks that enable Large Flexible Loads (LFLs) to remain operational and economically viable participants in the ERCOT market. The low voltage ride-through (“LVRT”) requirements recently proposed by ERCOT’s Large Load Working Group (LLWG) are a constructive step toward ensuring system stability as Large Electronic Loads (LELs) continue to grow across Texas. We support the overall objective of improving grid reliability and recognize the importance of ensuring that LFLs behave in a predictable and supportive manner during system disturbances.

Based on current engineering data and manufacturer input, we believe that much of the proposed framework is achievable. Existing facilities and currently deployed hardware can meet the proposed frequency ride-through requirements and the voltage ride-through requirements in normal and moderate disturbance ranges (generally ≥0.8 p.u.). We are committed to working with ERCOT to ensure compliance in these areas and to implementing site-level controls and operational practices that further support system reliability.

However, there are limited portions of the proposed standards, specifically certain deep voltage sag ride-through durations below approximately 0.8 p.u., that are not fully achievable. While manufacturers are actively developing modifications to address these conditions, these solutions are still in progress and will require time for testing, validation, and deployment across existing fleets.

**Internal Testing**

Using a Preen AFV-P-5000 Programmable AC Power Supply, one of our member’s engineers tested four representative mining units selected from a production batch of over 50,000 units based on engineering commonality and performance, executing 50 test runs per unit: 25 runs in normal operation mode and 25 runs in the economic power reduction setting.

Below is the result table mapped to the format provided by ERCOT, demonstrating the hardware ride-through capabilities of these device classes. These real-world test results were generally consistent with manufacturer specifications, though observed ride-through durations were shorter in practice than nominal manufacturer data:

|  |  |
| --- | --- |
| Positive Sequence Voltage (p.u. of nominal) | Minimum Ride-Through Time  (seconds) |
| V > 1.20 | May ride-through or trip |
| 1.10 < V ≤ 1.20 | Continuous |
| 0.90 ≤ V ≤ 1.10 | Continuous |
| 0.80 ≤ V < 0.90 | Continuous |
| 0.50 ≤ V < 0.80 | 0.0273 |
| 0.20 ≤ V < 0.50 | 0.0128 |
| V < 0.20 | 0 |

A recent Texas A&M / IEEE study modeling and validating LVRT behavior of commercial ASIC mining equipment against laboratory hardware closely aligns with both manufacturer specifications and the internal testing summarized above. *Source: Samanta et al., “Electromagnetic Transient Model of Cryptocurrency Mining Loads for Low-Voltage Ride Through Assessment in Transmission Grids,” Texas A&M University / IEEE, 2023.*

In addition, specifications can align with ERCOT’s proposals with regards to frequency disturbances:

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| --- | --- |
| Frequency (Hz) | Minimum Ride-Through Time  (seconds) |
| f > 61.8 | May ride-through or trip |
| 61.2 < f ≤ 61.8 | > 299 |
| 58.8 ≤ f ≤ 61.2 | Continuous |
| 57.0 ≤ f < 58.8 | > 299 |
| f < 57.0 | May ride-through or trip |

Proposed mitigation approaches such as installing dedicated battery storage at each LFL are neither practical nor economical at scale. While battery solutions have been suggested, we are not aware of any that have been successfully tested or deployed at the scale required for LELs. Even if pursued, mandating dedicated batteries for each facility would be unlikely to fully resolve the underlying technical challenges and would impose substantial costs, currently estimated at more than $1.6 million per MW, making such an approach economically prohibitive for most operations.

In the near term, as additional battery energy storage systems (BESS) come online across ERCOT, there may be meaningful opportunities for collaboration between large electronic loads (LELs) and nearby BESS operators to enhance system resilience during voltage disturbances. In certain locations where BESS facilities are geographically proximate to LELs, coordinated operational approaches or bilateral arrangements could help mitigate the system impacts of low-voltage events by providing localized support during disturbances.

We are currently exploring the feasibility of identifying a West Texas location where an LEL and a nearby BESS operator could evaluate this concept through a pilot effort. We would welcome ERCOT’s participation in observing and providing technical guidance as this work develops. While the creation of a formal ancillary service tailored to this purpose may require additional time and market development, voluntary coordination between LELs and proximate BESS operators represents a practical near-term pathway to explore solutions that support grid reliability while remaining operationally and economically realistic.

**Computational LFLs Want to be Part of the Solution**

Across the state, LFLs provide thousands of jobs and pay millions in taxes every year. More importantly, LFLs are active participants in ERCOT’s many reliability programs that protect residential and small-business customers in large and small cities. We agree that Low Voltage Ride-Through is an important initiative and a viable solid Texas plan would both increase the security of the Grid and serve as an economic model for the rest of the country. We respectfully offer to work collaboratively with ERCOT to conduct joint engineering and economic feasibility assessments and to establish a forward-looking implementation roadmap that achieves reliability objectives without undermining the operational viability of these resources. Finally, we also request clarification as to whether existing, currently operating LFLs will be subject to newly proposed LVRT requirements, as regulatory certainty on this point is essential for ongoing operations and future investment decisions.

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| Revised Cover Page Language |

None

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| Revised Proposed Guide Language |

None