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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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| Date | December 18, 2025 |

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| Comments |

Tesla understands ERCOT’s objective to enhance grid reliability through voltage and frequency ride-through requirements for Large Electronic Loads (LELs) and appreciates ERCOT’s collaborative stakeholder engagement through this process.

In these comments, Tesla suggests modest language refinements intended to preserve ERCOT’s reliability objectives while providing greater flexibility, innovation potential and technology neutrality in how the required ride-through performance may be achieved.

To support ERCOT’s objectives for grid reliability, Tesla believes Nodal Operating Guide Revision Request (NOGRR) 282 should focus on performance outcomes at the Point of Interconnection (POI), rather than implicitly assuming a specific load-side technology or internal control architecture. As currently drafted, certain provisions may be interpreted as presuming a UPS-centric architecture as the primary means of achieving fault ride-through requirements, which risks being overly prescriptive with respect to how POI performance is achieved. A technology-neutral approach ensures that a range of site-level infrastructure solutions – including UPS-based systems, load banks, or BESS – may comply, provided the required behavior is met at the grid interface. Structuring requirements around measurable POI performance supports innovation, avoids inadvertently favoring a particular technology, and allows ERCOT to benefit from the full range of solutions capable of delivering stable fault ride-through behavior.

Specifically, we recommend the following concepts be included in the NOGRR:

*For voltage deviations outside the 0.9-1.1pu range and frequency deviations outside of the 58.8 - 61.2 Hz range, an internal load-transfer or control stabilization interval of up to 250 millisecond is permitted.*

*For LELs composed of multiple internal devices, one load-transfer or control action per disturbance event will be permitted for each individual device.*

This alternate language - specifically the inclusion of the load-transfer window (currently drafted as 250 millisecond) enables the use of additional technologies, including Load Banks and BESS, to meet the desired load stability outcomes across voltage and frequency ranges.

For example, if a power supply or UPS systems were to trip due to a voltage or frequency deviation, a load bank or BESS device could be quickly turned on to draw current equivalent of the tripped load – maintaining the effective load seen by the ERCOT system and supporting system stability.

Regarding the load-transfer window timeline, currently drafted as 250 milliseconds, Tesla would welcome further discussion with ERCOT to understand the appropriate timeline needed to support grid reliability. In the December LLWG meeting, ERCOT’s frequency analysis indicated that system frequency reached unacceptable levels following large load-loss events after approximately one second. In the May LLWG meeting, ERCOT’s voltage sensitivity analysis identified a 0.5-second threshold associated with voltage-related inverter-based resource trip risk. In this context, a 0.25-second interval represents a reasonable threshold for system security, while still allowing flexibility in implementation. As a BESS manufacturer, Tesla notes that its Megapack platform can return the load within 0.25 seconds or less and could satisfy this requirement.

Finally, with respect to the voltage and frequency ride-through ranges proposed by ERCOT, the Megapack product can handle ride-through ranges wider than currently proposed, so we have no concerns with Megapack being capable of supporting developers with these ranges.

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| Revised Cover Page Language |

None

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| Revised Proposed Guide Language |

**2.6.4** **Frequency Ride-Through Requirements for Large Electronic Loads**

(1) A Customer that proposes to interconnect or maintains an interconnection of a Large Electronic Load (LEL) with the ERCOT System shall ensure the LEL complies with the frequency ride-through requirements of this section, unless:

(a) The LEL received approval to energize from ERCOT on or before November 14, 2025; or

(b) The LEL satisfied the following requirements on or before November 14, 2025:

(i) Its Large Load Interconnection Study (LLIS) has been completed and results communicated in the manner contemplated by paragraph (6) of Planning Guide Section 9.4, LLIS Report and Follow-up; and

(ii) The interconnecting TDSP for the LEL has provided the confirmation or letter contemplated in Planning Guide Section 9.5, Interconnection Agreements and Responsibilities.

(2) An LEL shall ride through frequency disturbances of the magnitude and duration specified in Table A below, as measured at the LEL’s Service Delivery Point, or if the LEL is co-located with a Generation Resource or Energy Storage Resource, at the Point of Interconnection Bus (POIB) of that Resource. An LEL is not required to ride-through if it is either performing in accordance with its interconnecting TDSP’s Under-Frequency Load Shed (UFLS) program or providing an Ancillary Service that would require the LEL to trip or reduce consumption due to a frequency disturbance.

**Table A**

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| Frequency (f) in (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 |

(3) Nothing in paragraph (2) above shall be interpreted to require an LEL to trip or transfer load to backup generation for frequency conditions beyond those for which ride-through is required.

(4) If an LEL is consuming electric current from the grid at the time of the frequency disturbance, the LEL shall continue to consume electric current from the grid during frequency deviations requiring ride-through. In addition, an LEL should continue to consume active power within 10% of the pre-disturbance level during frequency deviations requiring ride-through.

(5) For frequency deviations outside the continuous operating range specified in Table A of paragraph (2) above, an LEL may implement an internal load-transfer or control-stabilization interval for a duration of up to 250 milliseconds.

(a) For LELs composed of multiple internal devices, one load-transfer or control action per disturbance event per individual device shall be permitted.

(6) If protection systems are installed and activated to trip the LEL, they shall enable the LEL to ride-through frequency conditions beyond those defined in paragraph (2) above to the maximum level the equipment allows, unless the protection systems are set to respond to an UFLS event or Ancillary Service obligation.

(7) If frequency protection schemes are installed and activated to trip an LEL, they shall use filtered quantities or add sufficient time delays to prevent misoperations while providing the desired equipment protection. Protection schemes shall not trip an LEL based on an instantaneous frequency measurement.

(8) If ERCOT determines that an LEL has failed to ride through a frequency disturbance in accordance with any requirement in this Section 2.6.4:

(a) The interconnecting TDSP shall provide available information to ERCOT to assist with ERCOT’s event analysis;

(b) The Customer representing the LEL shall:

(i) Investigate and determine the root cause of the frequency ride-through failure and report the results of the investigation to ERCOT within 90 days of ERCOT’s request;

(ii) Develop a plan to ensure the LEL can meet the applicable ride-through performance requirements and submit the plan to ERCOT within 90 days of completion of (i) above; and

(iii) Implement the plan upon ERCOT approval within 180 days of (ii) above unless ERCOT approves a longer timeline.

(c) Notwithstanding the requirements of paragraph (b) above, if ERCOT determines that the operation of an LEL following a failure to comply with the requirements of this Section 2.6.4 poses an imminent risk to local or system reliability, ERCOT may require the LEL to disconnect from the ERCOT System and remain disconnected until the Customer representing the LEL has demonstrated to ERCOT’s satisfaction that the LEL can comply with the ride-through performance requirements of this Section.

**2.14 Voltage Ride-Through Requirements for Large Electronic Loads**

(1) A Customer that proposes to interconnect or maintains an interconnection of a Large Electronic Load (LEL) with the ERCOT System shall ensure the LEL complies with the voltage ride-through requirements of this section, unless:

(a) The LEL received approval to energize from ERCOT on or before November 14, 2025; or

(b) The LEL satisfied the following requirements on or before November 14, 2025:

(i) Its Large Load Interconnection Study (LLIS) has been completed and results communicated in the manner contemplated by paragraph (6) of Planning Guide Section 9.4, LLIS Report and Follow-up; and

(ii) The interconnecting TDSP for the LEL has provided the confirmation or letter contemplated in Planning Guide Section 9.5, Interconnection Agreements and Responsibilities.

(2) An LEL interconnecting with the ERCOT System shall ride through the root-mean-square positive sequence voltage conditions of the magnitude and duration specified in Table A below, as measured at the LEL’s Service Delivery Point, or if the LEL is co-located with a Generation Resource or Energy Storage Resource, at the Point of Interconnection Bus (POIB) of that Resource. An LEL shall remain connected to the Transmission Grid during voltage conditions requiring ride-through. Additional LEL performance requirements for voltage conditions requiring ride-through are listed below.

**Table A**

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| Root-Mean-Square 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 | 2.0 |
| 0.90 ≤ V ≤ 1.10 | Continuous |
| 0.80 ≤ V < 0.90 | 2.0 |
| 0.50 ≤ V < 0.80 | 0.5 |
| 0.20 ≤ V < 0.50 | 0.25 |
| V < 0.20 | 0.15 |

(a) When voltage at the Service Delivery Point or, if the LEL co-located with a Generation Resource or Energy Storage Resource, at the POIB, remains within the continuous operating range in Table A during a disturbance or exceeds 1.1 per unit and remains below 1.2 per unit for less than 2 seconds for an overvoltage condition, the LEL shall continue consuming active power from the grid at the pre-disturbance level during the disturbance.

(b) When voltage at the Service Delivery Point or POIB falls below 0.9 per unit but remains above 0.8 per unit and then returns to above 0.9 per unit within 2 seconds, the LEL shall continue consuming active power from the grid during the low voltage condition. In such cases, the LEL may reduce its active power consumption proportional to the voltage drop but shall return to 90% of its pre-disturbance consumption level from the grid within one second of voltage at the Service Delivery Point or POIB returning to above 0.9 per unit.

(c) For any voltage condition at the Service Delivery Point or POIB that an LEL is required to ride-through and involves a voltage condition below 0.8 per unit, the LEL may decrease active power consumption from the grid but shall return to at least 90% of its pre-disturbance consumption level from the grid within one second of voltage at the Service Delivery Point or POIB returning to above 0.90 per unit. Additional performance requirements for the allowable reduction of consumption in active power when voltage drops below 0.8 per unit are defined as follows:

(i) For any LEL that satisfies the requirements in paragraph (1)(b) above after November 14, 2025 but on or before January 1, 2028, if the LEL needs to temporarily reduce active power consumption from the grid to allow the facility to ride through the voltage disturbance in accordance with the performance requirements defined in paragraph (c) above, that reduction in active power shall be proportional to the voltage drop for any voltage between 0.8 and 0.5 per unit at the Service Delivery Point or POIB, if capable. The LEL may reduce active power consumption as much as needed for voltage drops below 0.5 per unit. If the LEL equipment is not capable of the performance described above, then the LEL may reduce active power consumption as much as necessary to remain connected to the grid but shall return to pre-disturbance consumption as defined in paragraph (c) above.

(ii) For any LEL that satisfies the requirements in paragraph (1)(b) above after January 1, 2028, the LEL shall continue consuming active power from the grid when the voltage at the Service Delivery Point or POIB is between 0.8 and 0.5 per unit but may temporarily reduce active power consumption from the grid proportional to the voltage drop. When the voltage at the Service Delivery Point or POIB is below 0.5 per unit, the LEL may reduce active power consumption as needed to allow the facility to ride through the voltage disturbance in accordance with the performance requirements defined in paragraph (c) above.

(d) When a voltage disturbance causes the voltage at the Service Delivery Point or POIB to drop outside the continuous operating range in Table A of paragraph (2) above, an LEL shall not consume electric current during the disturbance at a level that exceeds 125% of its maximum electric current consumption during normal operations.

(e) For voltage deviations outside the continuous operating range specified in Table A of paragraph (2) above, an LEL may implement load-transfer or control stabilization interval for a duration of up to 250 milliseconds.

(i) For LELs composed of multiple internal devices, one load-transfer or control action per disturbance event per individual device shall be permitted.

(3) Nothing in paragraph (2) above shall be interpreted to require an LEL to trip or transfer load to backup generation for voltage conditions beyond those for which ride-through is required.

(4) If installed and activated to trip or transfer the LEL, all protection systems (including but not limited to protection for over-/under-voltage) shall enable the LEL to ride-through voltage conditions beyond those defined in paragraph (2) above to the maximum level the equipment allows.

(5) If instantaneous over-current or over-voltage protection systems are installed and activated to trip or transfer the LEL, they shall use filtered quantities or time delays to prevent misoperation while providing the desired equipment protection. Any alternating current instantaneous over-voltage protection that could disrupt the LEL power consumption shall use a measurement window of at least one cycle of fundamental frequency.

(6) An LEL shall not implement a load trip or transfer scheme that disconnects or transfers load to backup generation due solely to a certain number of voltage sags or swells within a certain period of time if the LEL is required under paragraph (2) above to ride through each such condition.

(7) If ERCOT determines that an LEL has failed to ride through a voltage disturbance in accordance with any requirement in this Section 2.14:

(a) The interconnecting TDSP shall provide available information to ERCOT to assist with ERCOT’s event analysis;

(b) The Customer representing the LEL shall:

(i) Investigate and determine the root cause of the voltage ride-through failure and report the results of the investigation to ERCOT within 90 days of ERCOT’s request;

(ii) Develop a plan to ensure the LEL can meet the applicable ride-through performance requirements and submit the plan to ERCOT within 90 days of completion of (i) above; and

(iii) Implement the plan upon ERCOT approval within 180 days of (ii) above unless ERCOT approves a longer timeline.

(c) Notwithstanding the requirements of paragraph (b) above, if ERCOT determines that the operation of an LEL following a failure to comply with the requirements of this Section 2.14 poses an imminent risk to local or system reliability, ERCOT may require the LEL to disconnect from the ERCOT System and remain disconnected until the Customer representing the LEL has demonstrated to ERCOT’s satisfaction that the LEL can comply with the ride-through performance requirements of this Section.