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| **Comments** |

AEP submits these comments to Nodal Operating Guide Revision Request (NOGRR) 282.

First, AEP proposes revising Section 2.6.4 Table A as shown below by flipping the frequency excursion magnitudes for which ride through (“RT”) is required between high and low, that is, a 3.0 Hz reach on the high end and 1.8 Hz on the low end. AEP believes there should be a greater margin between the proposed over-frequency RT requirement (61.8 Hz) and the load loss scenario over-frequency study results deemed acceptable (i.e., 60.4 Hz reported elsewhere), especially if there might be extreme events beyond the scenarios studied that could push load loss amounts, and thus frequency, even higher than scenarios being studied. It’s imperative to do everything possible to avoid further load loss during a load loss–high frequency excursion event. Since it does not appear that Large Electronic Load (LEL) is sensitive to frequency, the high Hz RT value could be increased. On the low end, 57.0 Hz is well below the last stage of UFLS; the last stage is 58.5 Hz. If then, during a UFLS event, all UFLS stages have activated and frequency is still not recovered, LEL could be permitted to drop out below 58.2 Hz because the interconnection is not likely to survive much longer below that level and electronic load drop out, even though uncontrolled, could help keep it afloat.

Second, it’s not inconceivable that events could drive voltage into the may-trip zone of Section 2.14 Table A either on the high end or low. Such events could be delayed clearing three-phase fault extreme events as defined in TPL-001 producing low voltage durations exceeding Table A durations or unanticipated load loss during voltage dips that lead to temporary overvoltages exceeding 1.2 per unit after fault clearing. On the high voltage end particularly, there is higher vulnerability because any unanticipated load drop out during an overvoltage would likely increase the overvoltage possibly leading to a runaway overvoltage–overfrequency scenario.

Therefore, because the initial proposal does not include consideration of events driving voltage outside of the no-trip zone of Table A, and because restoration of UPS equipped LEL may still be feasible, AEP proposes that the one-second restoration time requirement could be extended to UPS equipped LELs once voltage returns to the Table A continuous range after going outside the must RT zone, even if the LEL UPS(s) transfers the entire load to UPS battery during the voltage excursion. An exception should allow for UPS battery charge decreases to within a to-be-determined percentage of the charge necessary to initiate transfer to back up generation. It is important to note that some battery charge is necessary to do the switch over to backup generation because load must be transferred over in steps to avoid overwhelming the backup generators. Proposed text is inserted as 2.14 (2)(e) below.

Finally, there are two competing factors that are relevant to the 125% maximum current limit (paragraph 2.14 (2)(d)): Lowering the permissible value would lessen overall voltage dip magnitude by further restricting data center current draw during a dip thereby exposing (the same) data centers throughout an area experiencing a dip to a shallower dip; Increasing the permissible value would allow more power draw from the system during a dip and consequently less frequency overshoot. The understanding of which of these two factors dominates, if either, could be determined through a study. AEP requests ERCOT to consider performing a study to gain further insight into the most appropriate value of the maximum current limit.

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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 > 63.0 | May ride-through or trip |
| 61.2 < f ≤ 63.0 | 299 |
| 58.8 ≤ f ≤ 61.2 | continuous |
| 58.2 ≤ f < 58.8 | 299 |
| f < 58.2 | 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) 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.

(6) 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.

(7) 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) When a voltage disturbance causes the voltage at the Service Delivery Point or POIB to exceed the boundaries of the ride-through range as specified in Table A of paragraph (2) above, either exceeding 1.2 per unit voltage or exceeding the minimum ride-through time durations, a UPS-equipped LEL 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 the continuous range (0.90 ≤ V ≤ 1.10) unless UPS battery charge has decreased to within TBD percent of the charge necessary to initiate transfer to back up generation.

(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.