

Feedback Form

Technical Requirements for Large Computational Loads Connecting to the Ontario Power System – May 1st, 2026

Feedback Provided by:

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Date: May 28, 2026

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- Yes – there is confidential information, do not post**
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Following the posting of Technical Requirements for Large Computational Loads Connecting to the Ontario Power System, the Independent Electricity System Operator (IESO) is seeking feedback from stakeholders on the requirements. The stakeholders can request one-on-one sessions with the IESO for clarification and discussion if needed before submitting feedback. Please submit the meeting request to engagement@ieso.ca.

Please submit feedback to engagement@ieso.ca by **May 28th, 2026.**

General Comments/Feedback

XMight Smart Energy Corp. submits this voluntary technical input as a contributor to the Open Compute Project (OCP) Rack & Power and DCF LVDC work streams.

We note the framing in the IESO's engagement: data centres are not dispatchable resources; the reliability framework therefore rests on automated ride-through and physical recovery behaviour, rather than active operator dispatch. Our comments are technical, organised around clauses where the requirement language appears either internally inconsistent or — given typical AC-DC PSU design — operationally difficult to apply.

Where we reference the parallel ERCOT NOGRR 282 stakeholder process and the Data Center Coalition's formal comments on it, we do so to share lessons surfaced through that process rather than to recommend direct adoption of specific ERCOT language. References are at the end.

Editorial note — "PFAPC" in §5

§5 lists "Post-fault active power recovery (PFAPC) time (seconds) for UPS loads" as a required data element. The established industry term is PFAPR — Post-Fault Active Power Recovery (used in ERCOT NOGRR 282 §2.15(3) and in broader power systems literature). The §5 data requirement does not cross-reference the normative behaviour set out in §6.7.1(2). We suggest IESO either adopt PFAPR consistently in both §5 and §6.7.1(2), or remove the abbreviation in §5 and rely on the descriptive language in §6.7.1(2); either approach should add an explicit cross-reference from §5 to §6.7.1(2).

Issue 1 — §6.1 vs §6.7.1(2): Internal Contradiction on Backup Energy Engagement During Deep Sag

§6.1 states that "automatic load transfer between different supplies from system to the project is not acceptable." §6.7.1(2) states that during a voltage sag, the load "may cease to withdraw power from the system only when the POI voltage goes below 0.5 pu." These two clauses appear to be in tension.

The physical reality at $V = 0.5$ pu is that two things must happen simultaneously for the facility to meet the §6.7.1 ride-through requirement: (a) the load must current-limit at the PSU input — both to avoid drawing more current from an already-stressed grid and to protect the equipment; and (b) internal backup energy must engage to support the IT load while AC supply is below the PSU's operational range. Without (b), (a) cannot be sustained — the IT load loses its DC bus and the facility trips, which is the opposite of "ride-through."

Internal backup energy engaging automatically when AC supply falls outside the PSU's operational range is the architectural purpose of any backup energy device — facility UPS or rack-internal BBU. If §6.1 is read literally to prohibit this engagement, it prohibits the behaviour §6.7.1(2) requires.

Recommendation: Amend §6.1 to clarify that the prohibition on automatic load transfer applies to inter-supply switching between independent facility-level power supplies during normal operation (e.g., system supply vs. backup generation), and does not apply to automatic engagement of internal energy storage during a voltage disturbance within the ride-through bounds of §6.7.1.

Issue 2 — §6.7.1(2) vs §6.7.2–§6.7.5: Concurrent Voltage and Frequency Events

§6.7.1(2) permits the load to cease withdrawing power when POI voltage falls below 0.5 pu. §6.7.2–§6.7.5 each state that the use of UPS is not allowed during the ride-through period for frequency, RoCoF, phase angle, and V/Hz events.

In a cascading disturbance, voltage and frequency excursions occur concurrently. A simultaneous $V < 0.5$ pu and $f < 58.8$ Hz condition triggers conflicting instructions: §6.7.1(2) permits backup engagement on the basis of voltage; §6.7.2 prohibits it on the basis of frequency. Without a defined priority, two operators applying §6.7 in good faith may implement opposite responses to the same event class.

Recommendation: Publish a priority resolution rule defining facility behaviour under simultaneous voltage + frequency / RoCoF / phase / V/Hz conditions, so operators and equipment vendors can design control schemes deterministically.

Issue 3 — §6.6: Load Ramping — POI-Level vs Internal Workload Swing

§6.6 requires linear ramp rates not exceeding 20 MW per minute during normal operation. Generative AI workloads exhibit internal power swings of 30–80% of nameplate within sub-100 ms intervals (training-step boundaries, batch starts, model loads). At the facility level — as observed at the POI — these internal swings are absorbed by PSU bulk capacitance and rack-internal energy storage; POI-observable ramp is substantially smoother than rack-internal behaviour.

Recommendation: Clarify that §6.6 applies at the POI, not at the internal compute-load level, and that internal compute power swings absorbed within the facility power architecture are not subject to the 20 MW/min constraint.

Issue 4 — §6.7.1(2): Proportional Reduction and 1-Second Restoration — Phased Path Consistent with ERCOT / DCC Experience

§6.7.1(2) requires the load to (i) reduce active power proportionally to voltage during a 0.5–0.8 pu sag while remaining connected, and (ii) after voltage recovers, restore active power to the pre-disturbance level within 1 second. Two characteristics of typical AC-DC PSU implementations make both parts difficult to meet today:

During the sag, standard PSU front-end protection (PFC stage) tends to trip within a few milliseconds rather than remaining connected and derating proportionally. From the grid's perspective, the load disconnects — the opposite of intended ride-through.

After voltage recovers, restarting a PSU from a tripped state is a cold-start sequence taking several seconds, which exceeds the 1-second restoration window.

These behaviours are not unique to any one manufacturer; they reflect typical AC-DC power supply design. Through the ERCOT NOGRR 282 process, the Data Center Coalition observed (Comments 282NOGRR-09 dated February 9, 2026):

"As the industry stands, some of the VRT regulations established in NOGRR282 are several years from being achievable... the technology simply has not been developed yet."

ERCOT consequently adopted a phased applicability (Comments 282NOGRR-30 dated May 11, 2026, Sections 2.6.4(1) and 2.15(1)): a November 14, 2025 exemption reference date, an "if capable" basis through January 1, 2028, and strict compliance for facilities commissioned thereafter.

Recommendation: Drawing on the experience reflected in the ERCOT process, would IESO consider a similar phased path for §6.7.1(2) — facilities commissioned before a defined Ontario reference date applying the clause on an "if-capable" basis with documented fallback behaviour, and strict compliance for facilities commissioned thereafter?

Issue 5 — §6.7.1: Cooling / Mechanical Load Treatment Under Deep Sag

§6.7.1 Table 1 requires uniform ride-through to 0.25 s between 0.2 and 0.5 Vnom, and 0.16 s below 0.2 Vnom. Cooling load is commonly 20–40% of total facility power and consists predominantly of induction motors. Induction motors below approximately 0.7 pu input voltage enter unstable regions of their torque-speed characteristic and risk stall, with consequential mechanical damage. This is a physical limit of the motor, not a control choice.

In the ERCOT NOGRR 282 stakeholder process, this issue surfaced through formal comments from the Data Center Coalition and others. The version recommended for approval by ERCOT's Technical Advisory Committee on April 29, 2026 (Comments 282NOGRR-30, Section 2.15(2)) included:

"Cooling or mechanical load at the LCEL facility may ride through or trip when voltage conditions are below 0.35 p.u. for any duration."

Section 2.15(3) further provided a recovery-baseline accommodation:

"For purposes of determining compliance with this requirement, if any cooling load at an LCEL facility were to trip for voltage conditions below 0.35 p.u.... the amount of pre-disturbance cooling load would be subtracted from the total pre-disturbance consumption. This adjustment applies to the remaining requirements of this Section."

Recommendation: Would IESO consider an analogous approach — (a) permitting cooling and mechanical load to ride through or trip below approximately 0.35 pu, with the IT load remaining subject to the full §6.7.1 ride-through requirement; and (b) excluding tripped cooling load from the post-disturbance active power recovery target?

Issue 6 — §6.7.1(2): "No Ramp" and Sub-Second Inrush Coordination

§6.7.1(2) requires restoration to pre-disturbance level within 1 second and states that no ramp rate limitations shall restrict recovery. At large data centre scale, thousands of distributed energy storage devices and PSU input bulk capacitors would recharge simultaneously upon

voltage recovery if no coordination is permitted within the 1-second window. The aggregate inrush can stress PSU input rectification, busbars, and upstream switchgear, and may trigger protection — paradoxically delaying restoration. Individual soft-start limiters do not coordinate across the fleet; synchronous engagement aggregates to a large step at the POI.

A coordinated sub-second staggering within the 1-second window achieves full restoration on time while avoiding coincident inrush. This is not a ramp limitation on the recovery (which should remain prompt); it is coordination within the window. ERCOT NOGRR 282 Section 2.15(3)(a) similarly permits one control action per device per event.

Recommendation: Clarify that "no ramp rate limitations" prohibits ramp rates that would delay full restoration beyond the window, and does not preclude sub-second coordinated staggering within it. Alternatively, the System Impact Assessment process could approve facility-specific recovery profiles that achieve full restoration within the window while avoiding POI step disturbance.

Issue 7 — §5 / §6.16 / Appendix A: Modelling Framework and Distributed Energy Storage Architectures

The IESO's connection assessment framework is model-driven: EMT, composite load models, and User Defined Models for PSS/E and DSA are required, with cross-platform benchmark consistency. The fidelity of these models depends on the underlying facility behaviour being deterministic at the time scales the model represents (sub-cycle to sub-second).

Where a facility's response is mediated by a small number of large, vendor-defined backup energy units, deterministic modelling is straightforward; the facility behaviour at the POI is reasonably predicted by the unit specifications. Where it is mediated by many distributed energy storage devices engaging independently based on local conditions (state of charge, thermal state, internal load, soft-start sequencing), deterministic modelling requires that those devices behave in a coordinated, specifiable way. Without coordination, per-device behaviour is stochastic and the aggregate POI behaviour is difficult to predict in pre-commissioning study or validate in post-commissioning audit.

Recommendation: IESO consider whether its modelling requirements under §5, §6.16, and Appendix A should explicitly address facility designs in which behaviour at the POI is determined by a population of distributed energy storage devices — specifically, how the modelling framework expects coordination behaviour to be characterised so that the System Impact Assessment can rely on deterministic facility response.

Closing

XMight Smart Energy Corp. is available for follow-up technical discussion on any of the above. We would particularly welcome a one-on-one session on the following clarification questions:

1. §6.1 vs §6.7.1(2): Does the §6.1 prohibition on automatic load transfer apply to automatic engagement of internal backup energy during a voltage disturbance within the §6.7.1 ride-through bounds? (Issue 1)
2. §6.7 simultaneity: When $V < 0.5$ pu and $f < 58.8$ Hz occur concurrently, does §6.7.1(2) or §6.7.2 take precedence? (Issue 2)
3. §6.6: Is the 20 MW/min ramp constraint applied at the POI or at the internal compute-load level? (Issue 3)
4. §6.7.1(2): Would IESO consider a phased path for proportional reduction and 1-second restoration consistent with the ERCOT / DCC experience? (Issue 4)
5. §6.7.1: Would IESO consider cooling / mechanical load treatment analogous to the ERCOT stakeholder process accommodations? (Issue 5)
6. §6.7.1(2): Does "no ramp rate limitations" preclude sub-second coordinated staggering within the 1-second window? (Issue 6)
7. §5 / §6.16 / Appendix A: How does the modelling framework address facilities whose POI behaviour is determined by a population of distributed energy storage devices? (Issue 7)

We thank IESO for the open consultation process and the opportunity to provide feedback.

References

- [1] ERCOT. Comments on NOGRR 282 — Large Computational Load Ride-Through Requirements. Document 282NOGRR-30, dated May 11, 2026; reflects the language recommended for approval by the ERCOT Technical Advisory Committee on April 29, 2026. Sections cited: §2.6.4(1) (Frequency Ride-Through), §2.15(1) (Voltage Ride-Through), §2.15(2) (cooling/mechanical carve-out < 0.35 p.u.), §2.15(3) (post-fault active power recovery + cooling baseline subtraction), §2.15(3)(a) (one control action per device per event). Available via the ERCOT NOGRR 282 issue page: <https://www.ercot.com/mktrules/issues/NOGRR282>
- [2] Data Center Coalition. Comments on NOGRR 282. Document 282NOGRR-09, dated February 9, 2026. Cited observation: industry recognition that "the technology simply has not been developed yet" regarding NOGRR 282 VRT requirements. Available via the ERCOT NOGRR 282 issue page.
- [3] ERCOT. Questions and Answers About the Large Load Interconnection Process. Rev. 12.15.25. Available at <https://www.ercot.com/files/docs/2025/12/24/Large-Load-Interconnection-Process-Q-A.pdf>
- [4] IEEE SA Industry Connections. Review of Industry Efforts and Standards of Grid Readiness for Data Center Deployment. Publication IC25-004. Published 29 January 2026. ISBN 979-8-8557-3048-7.