6 May 2026

Australian Energy Market Commission

By email: submissions@aemc.gov.au

Dear Sir/ Madam

Re: Draft rule determination for Improving the NEM access standards – Package 2 – ElectraNet Comments

ElectraNet welcomes the opportunity to provide this submission in response to the AEMC's draft rule determination for *Improving the NEM access standards – Package 2 (ERC0394)*.

ElectraNet supports the development of a clearer access standards framework for the connection and operation of large or complex Inverter Based Loads (IBLs) in the National Electricity Market (NEM). As these loads increase in size, concentration and technical complexity, their aggregate behaviour can have a material impact on power system security.

The draft rule introduces a tiered framework for large IBLs, new access standards for frequency disturbance (clause S5.3.12) and voltage disturbance (clause S5.3.13) ride through, SCR requirements (clause S5.3.11), and instability monitoring and detection (clause S5.3.14). ElectraNet supports these developments.

However, ElectraNet considers that further refinement is required to ensure the framework adequately reflects local system conditions, captures the aggregate and coordinated behaviour of large inverter based facilities, and operates consistently within the broader Chapter 5 connection framework.

In particular, ElectraNet considers that:

- generic access standard envelopes should not, in isolation, be treated as sufficient evidence that acceptable power system security outcomes will be maintained under all local network conditions;
- the negotiated access standard framework must retain the ability for AEMO and NSPs to impose technically justified location specific performance obligations, including where necessary requirements beyond the generic access standard envelopes, to maintain power system security; and
- consequential amendments to existing Chapter 5 provisions may also be necessary to ensure the new Schedule 5.3 access standards operate consistently within the broader connection, information, assessment and negotiated access standard framework.

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Executive summary

ElectraNet considers that the final rule should more clearly recognise that generic access standard envelopes define minimum plant capability, but do not necessarily assure acceptable system outcomes under all local network conditions.

As large IBLs increase in scale, concentration and control sophistication, system security will increasingly be influenced by aggregate dynamic behaviour, including coordinated disconnection, fast active power recovery, restoration sequencing, and interactions with weak grid and low inertia system conditions.

ElectraNet's key recommendation is that the final framework should preserve a clear, transparent and proportionate mechanism for AEMO and NSPs to specify location specific performance obligations where technically justified to maintain power system security.

This submission addresses the following areas:

- aggregated response and campus style connections;
- alignment of fault ride through requirements with Schedule 5.2;
- load shedding block size and restoration;
- SCR requirements and interaction assessment (clause S5.3.11);
- voltage disturbance requirements (clause S5.3.13) and post fault active power recovery;
- frequency disturbance requirements (clause S5.3.12), RoCoF ride through and UFLS interaction;
- disconnection and reintegration;
- location specific system security requirements under the negotiated access standard framework;
- consequential amendments and consistency of the Chapter 5 access standards framework; and
- PMU requirements under clause S5.3.14.
- Creation of Large Inverter Based Load Guideline from AEMO (included in S5.3)
- Modelling, R1 and R2 (Clauses 5.2.4, and 5.3.7A)

1. Aggregated Response and Campus Style Connections

ElectraNet considers that the framework should more explicitly address campus style developments where multiple smaller load blocks are connected behind a common point or operated as an integrated facility.

The tiering framework in clause S5.3.1a distinguishes connections as Tier 1 (<30 MW), Tier 2 (30–100 MW) and Tier 3 (≥100 MW). These thresholds are applied at the individual connection level. This creates a risk of regulatory arbitrage where a large integrated facility may be segmented into multiple smaller connection blocks to fall within lower tier requirements, despite the aggregate facility having a materially larger system impact. Campus style facilities may also comprise multiple separately connected blocks, each below the relevant tier threshold, while operating as a single integrated entity.

These developments may deploy similar UPS systems, rectifiers, inverter technologies and protection settings across multiple units. This creates a risk of correlated behaviour during disturbances, including simultaneous disconnection, automatic transfer to alternate supply paths, or staged restoration behaviour, which may constitute a form of common-mode failure. International experience has demonstrated that common-mode behaviour across multiple large data centre facilities using similar protection settings and OEM equipment can result in simultaneous large-scale load disconnection following a single disturbance event. Assessing such facilities on a per-connection basis may therefore not reflect their aggregate system impact.

The Commission may also wish to consider whether the framework should retain flexibility to assess aggregate performance and coordinated behaviour for large integrated or campus-style inverter-based load developments, particularly where automatic feeder transfer arrangements, multiple supply configurations, or shared control architectures may materially influence power system security outcomes beyond what is observable from a single steady-state connection point assessment.

In some distribution network configurations, automatic feeder transfer arrangements may allow large facilities to operate through multiple alternative feeder supply paths under contingency or emergency conditions. These operating states may materially alter fault levels, system strength conditions, power flow distribution, or disturbance response characteristics observed by the facility and the surrounding network. This is particularly relevant where normal and emergency operating configurations may expose materially different system strength or dynamic interaction characteristics.

ElectraNet therefore considers that the assessment framework should retain the flexibility to consider credible emergency or alternate network operating configurations where these arrangements could materially influence aggregate system behaviour or power system security outcomes, particularly for large integrated inverter-based load developments.

ElectraNet notes that clause S5.3.14(b) already recognises the concept of a single integrated facility where components are connected at separate connection points, for the purposes of instability monitoring. ElectraNet supports extending this principle more broadly across the access standards framework.

ElectraNet recommends that:

- electrically or operationally integrated load units be assessed as a single IBL based on aggregate capacity for the purposes of tier classification and access standard application;
- campus style developments where the aggregate capacity exceeds the relevant tier threshold be subject to the higher tier requirements in their entirety;
- the definition of "single integrated facility" in clause S5.3.14(b) be extended or cross-referenced in clause S5.3.1a to apply the tiering framework on an aggregate basis;
- interaction studies be required to assess coordinated behaviour across the integrated facility, including UPS transfer schemes, automatic feeder transfer arrangements, internal control interactions and staged restoration; and
- credible emergency or alternate network operating configurations be considered where they may materially influence aggregate system behaviour or power system security outcomes.

In assessing large or integrated IBL facilities, ElectraNet considers it important to distinguish between three related but distinct layers of performance: plant capability, connection point behaviour and system outcome. A plant may demonstrate the capability to remain connected through a disturbance, but the resulting active power, reactive power, voltage and frequency response at the connection point may still produce an unacceptable system outcome under local weak grid or low inertia conditions.

The core issue is therefore not the absence of technical requirements, but that the draft framework remains plant capability focused rather than system outcome driven. A connection that satisfies all applicable access standards may still introduce location specific adverse impacts, including:

- material active power disturbances (ΔP),
- excessive recovery rates (dP/dt), and
- degradation of damping or interconnector stability.

The framework therefore requires an explicit mechanism to ensure that measured performance at the connection point is compatible with maintaining power system security under local conditions, not merely that plant-level capability is demonstrated.

2. Alignment of Fault Ride Through with Schedule 5.2

ElectraNet considers that large IBL disturbance performance should be subject to ride through expectations proportionate to their potential system impact and more closely aligned with those applied to generating systems under Schedule 5.2.

The automatic access standard for generating systems under clause S5.2.5.5(d) requires continuous uninterrupted operation through a series of up to 15 disturbances within any five minute period, including up to six events causing voltage to drop below 50% of nominal voltage. The minimum access standard under clause S5.2.5.5(l) requires ride through of up to six disturbances within five minutes.

The draft rule's access standards for IBL disturbance performance in clauses S5.3.12 and S5.3.13 do not contain equivalent multiple disturbance ride through requirements. The frequency disturbance AAS in clause S5.3.12(c) and the voltage disturbance AAS in clause S5.3.13(c) are framed primarily as single event requirements. There is no equivalent to the multiple disturbance ride through obligations in clause S5.2.5.5(d).

The system impact of a large IBL disconnecting during a fault sequence can be comparable to a major generation contingency, particularly where multiple IBL units or facilities respond in a correlated manner. Repeated disturbances associated with severe weather events, fault sequences, or automatic reclosure operations may therefore create a heightened risk of aggregate load disconnection exceeding the contingency assumptions typically applied in system planning and operational studies.

ElectraNet recommends that:

- clauses S5.3.12 and S5.3.13 be amended to include multiple disturbance ride through requirements for large IBLs, proportionate to their size and potential system impact;
- for Tier 3 connections, the number of sequential disturbances an IBL must ride through be aligned with the fault sequence expectations in clause S5.2.5.5(d) for generating systems with comparable system impact; and
- automatic reclosure operations be explicitly addressed, with each re-established fault counted as a separate disturbance in a manner consistent with clause S5.2.5.5(t).

3. Load Shedding, Fast Ramp Down and Restoration

ElectraNet supports the inclusion of fast ramp down capability in the AAS under clause S5.3.10(b)(2), which requires schedule 5.3 plant to provide automatic interruptible load capable of both disconnection and fast reduction of active power consumption. However, for very large connections, binary load shedding where the entire connection is shed as a single block is not an effective primary control mechanism. A single step change at the full connection size can result in excessive demand change, frequency overshoot and secondary disturbances. At the scale of the largest Tier 3 connections now being contemplated, a full connection size shed event is effectively a major contingency in itself.

The draft rule records the nature of load shedding capability in performance standards under clause S5.3.10(d) but does not prescribe maximum step sizes for either shedding or restoration. ElectraNet considers that more specific requirements are needed to ensure that large IBL load shedding is executed in a manner consistent with system security.

ElectraNet recommends that:

- for Tier 3 connections, performance standards under clause S5.3.10(d) be required to specify that load shedding is segmented into blocks materially smaller than the total connection size;
- guidance be developed by AEMO on maximum step sizes for fast ramp down, with a default limit for Tier 3 connections of no greater than 50 MW or 10% of maximum demand per step, unless otherwise agreed with the NSP and AEMO;

- restoration be staged and coordinated with system conditions, with step sizes subject to the same limits as shedding; and
- the performance standards record both the maximum shed block size and the restoration sequencing arrangements.
- Potential new class of clause 2.3.4A participant to place increased response requirements as recommended.

4. SCR Requirements and Interaction Assessment (Clause S5.3.11)

ElectraNet supports the introduction of SCR requirements for IBLs under clause S5.3.11. The minimum access standard of SCR 3.0, assessed in accordance with the system strength impact assessment guidelines, is an appropriate starting point and is broadly consistent with the approach applied to asynchronous generating systems under clause S5.2.5.15 and HVDC networks under clause S5.3a.7.

However, ElectraNet considers that further clarification is required on how the SCR 3.0 requirement is intended to operate in parts of the NEM where minimum credible system strength conditions may already fall below SCR 3.0 under certain dispatch, outage or post contingent conditions. This is particularly relevant in high IBR regions such as South Australia, where local SCR can vary materially with synchronous unit commitment, network topology and interconnector operating conditions.

In this context, it is important to clarify whether clause S5.3.11 is intended to establish:

- a minimum withstand capability requirement for the connecting IBL;
- a minimum permissible operating SCR at the connection point; or
- a benchmark assessment condition within the broader system strength framework.

ElectraNet considers this distinction important to ensure that the framework remains practically implementable in weak grid areas while still maintaining appropriate system security outcomes.

ElectraNet notes that clause S5.3.11(b) allows a “reasonable higher value agreed with the Network Service Provider and AEMO having regard to expected three phase fault levels at the connection point.” ElectraNet supports this flexibility, particularly in strong parts of the network where SCR 3.0 may be readily achievable and a higher agreed value may impose no additional cost. However, equivalent clarity is also required for weaker parts of the network where SCR 3.0 may not represent the minimum credible operating condition.

Where minimum credible system conditions fall below SCR 3.0, compliance may require consideration of operational constraints, remedial network actions, dynamic support schemes, additional plant performance obligations, or alternative assessment methodologies beyond static SCR metrics alone. This should be made clear in the framework or supporting guidance.

ElectraNet also notes that the system strength impact assessment guidelines have been developed primarily around generating systems. AEMO has recognised that the treatment of IBLs under these guidelines is still developing and has proposed treating IBL withstand SCR assessment similarly to bi-directional plant in active power absorption mode on a case-by-case basis until a revised method is available.

ElectraNet recommends that AEMO expedite development/updating of the Power System Modelling Guide (PSMG) to include a standardised methodology for assessing IBL performance under low system strength conditions, including:

- representation of UPS systems, rectifiers, active front end drives and internal control schemes in SCR and system strength assessments;
- treatment of plant interactions under weak grid conditions, including the impact of UPS transfer on fault level contribution;
- modelling requirements for RMS and EMT studies specific to IBL plant types; and
- consideration of frequency domain or impedance based assessment techniques as a complement to existing SCR, RMS and EMT approaches.

Until this methodology is in place, ElectraNet supports the continuation of case-by-case review, provided that assessment outcomes are documented in a way that informs development of the standardised approach.

5. Voltage Disturbance Requirements (Clause S5.3.13)

The principal issue is not whether an IBL can technically recover following a voltage disturbance, but whether the resulting recovery trajectory remains compatible with secure system operation at the relevant connection point. ElectraNet supports the inclusion of voltage disturbance ride through requirements in clause S5.3.13. The AAS ride through envelope, which requires IBLs to remain connected across voltage ranges from 0% to 130% of nominal voltage for specified durations, provides an important baseline for avoiding uncontrolled disconnection of large IBLs during credible network events.

ElectraNet acknowledges that clause S5.3.13(c) introduces a post disturbance active power recovery requirement (90–110% within 500 ms), which is an important step forward. However, this requirement defines a generic recovery envelope rather than a control on the system impact of recovery behaviour at a specific location.

In weak or low inertia systems, a compliant recovery within 500 ms may still produce an unacceptable system response depending on the magnitude of the active power change (ΔP), recovery synchronisation, and interaction with voltage dynamics. Compliance with a generic recovery envelope does not necessarily ensure acceptable system level dynamic performance where one or more large inverter based facilities recover in a coordinated or synchronised manner following a disturbance.

The acceptable post fault recovery behaviour of a large IBL is therefore not determined by plant capability alone. It is also influenced by local system strength, network topology, available damping, interconnector stability limits, and the behaviour of nearby generation and load.

Accordingly, a recovery profile that is achievable from a plant perspective may still adversely interact with local system dynamics where:

- the rate or coordination of active power restoration exceeds the capability of the local system to maintain stable dynamic performance;
- multiple IBRs recover in a coordinated or synchronised manner; or
- the magnitude and rate of active power restoration at the connection point adversely affects damping, voltage recovery, or inter area oscillatory behaviour.

ElectraNet considers that post fault active power recovery should also be assessed against local system capability, including:

- magnitude of active power change at the connection point during and following the disturbance;

- rate of active power recovery (dP/dt) relative to local system damping and inertia;
- interaction between active power recovery and voltage recovery, particularly under weak grid conditions; and
- risk of oscillatory or unstable system response arising from rapid or poorly coordinated reintegration.

ElectraNet recommends that the framework make clear that compliance with the generic post fault active power recovery envelope in clause S5.3.13(c) does not preclude AEMO or the NSP, through the negotiated access standard framework, from requiring more stringent or otherwise different location specific recovery performance where technically justified to maintain power system security.

6. Frequency Disturbance Requirements (Clause S5.3.12)

ElectraNet supports the inclusion of frequency disturbance ride through requirements in clause S5.3.12. The AAS requires IBLs to remain connected across the full frequency operating standard range from the lower extreme frequency excursion tolerance limit to the upper extreme frequency excursion tolerance limit for the durations specified in the applicable frequency operating standards.

ElectraNet notes that the AAS in clause S5.3.12(c) provides an explicit RoCoF exemption: an IBL may disconnect if the RoCoF exceeds ±4 Hz/s for more than 0.25 seconds, or ±3 Hz/s for more than one second, or such other range as determined by the Reliability Panel. ElectraNet considers that this exemption, and the broader frequency disturbance ride-through framework, require further consideration to ensure they remain consistent with secure operation of low inertia, inverter dominated parts of the power system.

RoCoF Ride Through and Embedded Protection

High rates of change of frequency (RoCoF) are increasingly common in low inertia operating conditions, including in South Australia. The RoCoF exemption in clause S5.3.12(c) addresses the case where system RoCoF exceeds the threshold at the connection point. However, large IBLs may also contain embedded RoCoF protection within UPS systems, rectifiers and inverter control modules that operate on internal measurements and may respond to RoCoF levels below the clause S5.3.12(c) threshold.

Internal RoCoF protection that triggers before the clause S5.3.12(c) thresholds would result in effective non-compliance with the AAS. This is unlikely to be detected by standard connection assessments, which typically assess behaviour at the connection point rather than within the plant.

ElectraNet recommends that:

- the information requirements under clause S5.3.1(a1) explicitly include the RoCoF sensitivity of embedded protection in UPS systems, rectifiers and inverter control modules;
- connection assessments for Tier 2 and Tier 3 IBLs include verification that embedded RoCoF protection settings are consistent with the clause S5.3.12(c) thresholds; and
- the Power System Model Guidelines be updated to address RoCoF sensitivity in IBL models.

Multiple Frequency Disturbances

As discussed in Section 2 above, clause S5.3.12 does not contain multiple disturbance ride through requirements equivalent to those in clause S5.2.5.5(d) for generating systems. This gap is particularly relevant for frequency disturbances, where fault sequences, automatic reclosure operations or network reconfiguration may result in repeated frequency or RoCoF events in quick succession.

ElectraNet recommends that clause S5.3.12 be amended to require IBLs to remain connected through multiple sequential frequency disturbances, consistent with the approach applied to generating systems under clause S5.2.5.5.

Location Specific Frequency Risk

Clause S5.3.12(b) defines the frequency ranges and durations by reference to the widest frequency operating standard applicable in the region where the plant is located, including island conditions. ElectraNet considers this is the correct approach in principle, as it captures the more severe frequency excursions that can arise during islanding of South Australia.

However, ElectraNet recommends that the framework also enable NSPs and AEMO to specify more stringent location specific frequency disturbance requirements above the AAS where connection studies indicate that the IBL's response could adversely affect system frequency in the relevant region. This is consistent with ElectraNet's broader position on location specific performance requirements set out in Section 8 below.

Interaction with UFLS Schemes

Large IBLs may be subject to UFLS (under frequency load shedding) scheme obligations under clause 4.3.5 or may have ancillary services agreements that involve load shedding at specified frequencies. The frequency disturbance AAS in clause S5.3.12(c) requires IBLs to remain connected within the frequency operating standard range, which may overlap with the frequency bands at which UFLS operates.

ElectraNet considers that the framework should clarify the relationship between clause S5.3.12 ride through obligations and UFLS scheme obligations, to avoid inadvertent conflict where an IBL is simultaneously required to ride through a frequency event under clause S5.3.12 and to shed load under its UFLS obligations. Any conflict should be resolved in a manner that is consistent with maintaining power system security.

7. Disconnection and Reintegration

ElectraNet notes that large IBLs may be designed to disconnect, transfer to alternate supply, or reduce demand during disturbances and subsequently reintegrate. While the draft rule's ride through requirements in clauses S5.3.12 and S5.3.13 establish a baseline against uncontrolled disconnection, they do not fully address the system security consequences of disconnection followed by reintegration.

At scale, disconnection of an IBL can be equivalent to a major contingency event. Subsequent reconnection or restoration introduces a further active power step at the connection point that, if not properly coordinated, can itself constitute a system disturbance. This risk is compounded where multiple IBLs or units within a campus style facility reconnect simultaneously.

ElectraNet considers that disconnection and reintegration should not become the default means of satisfying disturbance performance requirements for large IBLs. The framework should evolve towards continuous and controlled behaviour through disturbances. In particular, large IBLs should:

- avoid uncontrolled disconnection during credible disturbances, consistent with the ride through requirements in clauses S5.3.12 and S5.3.13;
- manage any temporary reduction in demand in a controlled manner, consistent with the ramp down requirements discussed in Section 3;
- avoid large step changes at the connection point during both disconnection and reintegration; and
- recover progressively and in coordination with system conditions, consistent with the restoration step size principles discussed in Section 3.

8. Location Specific System Security Requirements under the Negotiated Access Standard Framework

ElectraNet considers that the draft framework may leave a gap between the Automatic Access Standard (AAS) and the level of performance required to maintain power system security at specific connection points.

The AAS in clauses S5.3.11, S5.3.12 and S5.3.13 provides a useful and consistent baseline applicable across the NEM. However, it cannot capture all location specific system limitations, including low system strength, limited system damping, network topology constraints, interconnector stability limits, or the low inertia operating conditions that can arise in South Australia and other weakly connected parts of the network.

The increasing scale and concentration of inverter based technologies means that system security is increasingly influenced by aggregate dynamic behaviour rather than the capability of any single facility in isolation. Access standards therefore need to support assessment not only of whether an individual plant remains connected during a disturbance, but also whether the aggregate response trajectory of multiple facilities remains compatible with secure system operation under local network conditions.

The minimum access standard provisions in clauses S5.3.12(d) and S5.3.13(f) provide flexibility for AEMO and the NSP to agree a lower level of performance than the MAS where technically justified. However, the draft rule does not provide equivalent clarity that, through the negotiated access standard framework under clause 5.3.4A, AEMO and the NSP may specify additional or more stringent location specific performance obligations beyond the generic AAS parameters where technically justified to maintain power system security.

ElectraNet considers this clarification important in weak grid or low inertia areas where generic access standard envelopes may not adequately capture location specific dynamic performance risks. Residual risks introduced by a connecting facility should not be transferred to the NSP to manage through network augmentation or operational constraints where those risks can reasonably be addressed through connection performance requirements.

Any such location specific requirements should:

- be technically justified through connection studies and documented transparently;
- be expressed using system relevant metrics, including ΔP, dP/dt, RoCoF withstand capability, voltage response and damping contribution;
- be applied consistently across comparable connections; and
- be reflected in the agreed performance standards for the facility.

Compliance with the AAS should not automatically be taken as conclusive evidence that a connection will maintain acceptable system security outcomes under all local conditions.

9. Consequential Amendments and Consistency of the Chapter 5 Access Standards Framework

ElectraNet also notes that consequential amendments to existing Chapter 5 provisions may be required to ensure that the new Schedule 5.3 access standards operate consistently within the broader connection framework.

In particular, clause S5.2.4 currently operates within the generating system access standards regime. If the final rule introduces equivalent access standard obligations for Schedule 5.3 plant and S5.3 participants, ElectraNet recommends that the AEMC review whether clause S5.2.4, and any associated cross references, should also be amended to apply to Schedule 5.3 participants where appropriate.

Without such consequential amendments, there may be uncertainty as to whether the procedural, assessment and negotiation principles that currently apply to generating system access standards are intended to apply consistently to large inverter based loads and other Schedule 5.3 plant. This may create an unintended gap between the new technical access standards and the broader Chapter 5 connection process.

ElectraNet therefore recommends that the final rule include any necessary consequential amendments to clause S5.2.4 and related provisions to ensure that Schedule 5.3 participants are clearly captured where the policy intent is to apply equivalent access standard assessment, negotiation and compliance principles.

10. PMU Requirements (Clause S5.3.14)

ElectraNet considers that PMU capability is an important component of the framework for large IBLs and supports the inclusion of PMU requirements under clause S5.3.14.

As inverter based loads increase in scale, concentration and dynamic complexity, high resolution time synchronised measurements are becoming increasingly important for:

- model validation;
- disturbance investigation;
- oscillation monitoring;
- verification of dynamic performance; and
- identification of fast interactions between IBLs and the broader power system.

ElectraNet notes that the draft rule adopts a differentiated approach to PMU requirements:

- at the minimum access standard under clause S5.3.14(d)(2), PMU access is required for Tier 3 IBLs only where required by AEMO or the NSP; and
- at the automatic access standard under clause S5.3.14(c)(4), PMU access is a mandatory requirement for all Tier 3 IBLs.

ElectraNet supports mandatory PMU capability for Tier 3 IBLs being included as a general requirement under the Schedule 5.3 framework. Given the scale, concentration and potential system security impact of Tier 3 IBLs, PMU capability should not be treated as a negotiable access standard item, but as a baseline observability requirement necessary for disturbance monitoring, model validation, oscillation assessment and operational visibility.

However, ElectraNet considers that further clarification is required regarding implementation of the PMU requirement to ensure the framework remains technically effective, consistent and capable of supporting system security assessment and operational monitoring needs.

In particular, ElectraNet recommends that:

- the framework focus on ensuring PMU quality observability, time synchronisation and data accessibility, including where equivalent monitoring capability can be demonstrated to AEMO and the NSP;
- AEMO publish guidance on minimum PMU technical specifications, reporting channels, sampling rates, data retention requirements and data access arrangements;
- the framework clarifies minimum measurement locations for large IBL facilities, including campus style or integrated developments; and
- PMU data requirements be aligned with model validation, disturbance investigation and power system performance assessment requirements under the Power System Model Guidelines and related frameworks.

ElectraNet also considers that PMU capability will become increasingly important as the NEM transitions toward higher concentrations of inverter based resources and lower system inertia, particularly for understanding aggregate IBL interactions and validating system strength and dynamic performance assessments.

11. Provision of information and modelling consistencies

ElectraNet notes that to align with the information and modelling requirement of inverter based resources additional inclusions for IBL in the Modelling, R1 and R2 (Clauses 5.2.4, and 5.3.7A) functions within the rules need to be called out.

It is ElectraNet's recommendation to include S5.3 participants in:

- The provision of information clause S5.2.4 to ensure the latest modelling information is asset and alignment to the PSMG and;
- Registered Data (R1) and (R2) assessment requirements under clause 5.3.7A and S5.5.2.

12. Creation of Large Inverter Based Load Guideline

ElectraNet recommends the introduction of a new rules-based guideline from AEMO to encapsulate the fast-paced technology changes while still enabling suitable considerations from participants, NSP's and rule makers associated with S5.3.1a.

13. Conclusion

ElectraNet supports the development of a clearer and more robust framework for large inverter based loads and welcomes the draft rule as a positive step. The key issue is to ensure that the framework reflects the actual system impact of these loads as their scale increases, and that the access standards can be applied in a location sensitive manner consistent with maintaining power system security.

ElectraNet recommends that the final rule:

- extend the integrated facility concept in clause S5.3.14(b) to apply tier classification and access standards on an aggregate basis for campus style and electrically integrated load developments;
- amend clauses S5.3.12 and S5.3.13 to include multiple disturbance ride through requirements for Tier 3 IBLs, aligned with the approach in clause S5.2.5.5(d) for generating systems of comparable system impact;
- require performance standards under clause S5.3.10(d) to specify segmented load shedding and staged restoration with step sizes materially smaller than the total connection size;
- expedite development of a standardised SCR and system strength assessment methodology for IBLs under clause S5.3.11, including representation of UPS systems, rectifiers, active front end drives and associated internal control schemes;
- address embedded RoCoF protection in IBL plant as part of the clause S5.3.12 framework and clarify the interaction between clause S5.3.12 ride through obligations and UFLS scheme obligations;
- clarify that compliance with the generic post fault active power recovery envelope in clause S5.3.13(c) does not preclude AEMO or the NSP, through the negotiated access standard framework, from requiring more stringent or otherwise different location specific recovery performance where technically justified to maintain power system security;

- clarify that, through the negotiated access standard framework under clause 5.3.4A, AEMO and NSPs may specify additional or more stringent location specific performance obligations beyond the generic AAS parameters where technically justified to maintain power system security;
- include any necessary consequential amendments to clause S5.2.4 and related provisions to ensure that Schedule 5.3 participants are consistently integrated into the broader Chapter 5 access standards framework where equivalent assessment, negotiation and compliance principles are intended to apply; and
- include mandatory PMU capability for Tier 3 IBLs as a general requirement under the Schedule 5.3 framework, rather than as a negotiable access standard item, while clarifying that:
  - the framework should ensure PMU quality observability, time synchronisation and data accessibility sufficient to support disturbance monitoring, model validation, oscillation assessment and operational visibility, including where equivalent monitoring capability can be demonstrated to AEMO and the NSP; and
  - AEMO should publish guidance on minimum PMU technical specifications, reporting channels, sampling rates, data retention requirements, data access arrangements and minimum measurement locations to ensure consistent implementation across the NEM.

ElectraNet would welcome further engagement with the AEMC and AEMO as the rule progresses. Should you have any queries, please contact myself in the first instance on [redacted] or Emma Wang

Yours sincerely,

[redacted]

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