

Sungrow Australia Consultation Submission

Response to AEMC's Improving the NEM access standards – Package 2 (12 March 2026)

Submission Letter

To

Australian Energy Market Commission (AEMC)
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*Re: Sungrow Submission on AEMC Improving the NEM access standards –
Package 2 (12 March 2026)*

Dear AEMC Team,

Sungrow Australia welcomes the opportunity to provide feedback on the AEMC's Improving the NEM access standards – Package 2 (12 March 2026).

Sungrow is a global provider of advanced power conversion technologies, including grid-forming battery energy storage systems (BESS), inverter-based resources (IBR) and AI data centre (AIDC) power supply, with extensive experience supporting renewable integration and grid stability across multiple markets. In the National Electricity Market (NEM), Sungrow participates as an original equipment manufacturer (OEM) and technology provider and recognizes the growing role of inverter-based technologies in power system security.

The following feedback is provided by Sungrow Australia of the draft determination, considering our role as an OEM and potential future provider of AIDC power supply:

Sungrow generally supports the intent of the proposed Package 2 reforms and agrees that large inverter-based loads (IBLs), including data centres, can have material impacts on power system security, particularly during disturbances and in weak grid conditions. However, we consider several areas would benefit from further clarification and additional technical justification.

Tiering Framework and Upper Size Consideration

The proposed tiering framework up to Tier 3 (≥ 100 MW) is reasonable as an initial approach. However, some future data centres and AI-related facilities may significantly exceed 100 MW, potentially reaching several hundred MW or even above 1 GW. It would therefore be useful for the draft determination to provide additional justification regarding why all facilities above 100 MW are treated equivalently under Tier 3 despite potentially very different system impacts. The aggregate impact of a 120 MW facility versus a 1 GW facility on system strength, transient stability, voltage recovery, frequency behaviour, and operational reserve requirements can differ

substantially. Further discussion on whether additional subclasses or scalable requirements may be needed for ultra-large loads would improve clarity for industry participants and NSPs.

Modelling Requirements and Validation

The modelling framework is one of the most critical aspects of successfully integrating large IBLs into the NEM. Without accurate and validated RMS and EMT models, there is significant risk that performance capability may be overestimated or system impacts underestimated. Accordingly, modelling requirements should be prioritised as one of the first implementation steps. If modelling gaps remain unresolved, the true impact of data centres on system security, stability, and network interactions may not be properly assessed. Clear RMS and EMT model requirements are needed, including expectations regarding site-specific versus generic models, acceptable model fidelity, and validation processes. The use of generic models for highly control-dependent facilities could create inconsistent assessments across NSPs and regions and may lead to inaccurate conclusions regarding weak-grid performance, instability risk, or disturbance behaviour.

Low SCR Performance and Site-Specific Models

The draft determination appropriately recognises the importance of low-SCR and weak-grid performance assessment. However, low-SCR performance assessments are heavily dependent on model accuracy. Therefore, the connection framework should clearly define from the connection application stage how proponents must ensure development of site-specific validated models, particularly for UPS systems, active front-end converters, VFD-based cooling systems, on-site generation or BESS systems, and PPC or supervisory controls. Without clear modelling guidelines, inconsistencies may arise across NSPs, connection processes, and regions. In this regard, it would also be useful to clarify whether a formal model validation or DMAT-style process will apply to large loads like generation projects. This is particularly important given the increasing complexity and control dependence of large IBLs. Clear requirements regarding model acceptance, benchmarking, validation testing, and post-commissioning verification would improve transparency and consistency.

Commissioning and Operational Coordination

Another important consideration is commissioning and operational timing. Data centres can often be commissioned and energised significantly faster than large IBR generation projects. As a result, there may be situations where large new loads become operational before supporting generation or network augmentation is fully available. This operational timing mismatch may create temporary resource adequacy or system security concerns. The framework should therefore consider how operational coordination between large load commissioning and supporting generation or network infrastructure will be managed.

Disturbance Ride-Through Requirements

Sungrow supports the introduction of voltage ride-through (VRT) and frequency ride-through (FRT) capability requirements for large IBLs. We agree that sudden disconnection of large loads during disturbances could contribute to cascading outages or broader system instability. However,

additional technical justification regarding the selected voltage ride-through profile would assist industry understanding. Further explanation would be useful regarding why disconnection below approximately 0.7 pu is considered acceptable, how the selected voltage profile aligns with realistic network disturbance behaviour, and how the balance between equipment protection and system security objectives has been considered. This would provide clearer rationale for participants, OEMs, and NSPs.

Active Power Recovery (APR) Requirements

Additional clarification regarding the proposed active power recovery (APR) requirements would also be beneficial. It would be useful to clarify whether the same APR requirement applies across all tiers, whether APR expectations scale with load size, and whether system-level RMS studies were conducted assessing different data centre sizes and recovery characteristics. The system impact of a 1 GW data centre recovering active power following a disturbance could be materially different from that of a smaller facility. Accordingly, the selected APR requirement may need to consider facility size, network strength, regional system conditions, network configuration, and coincident recovery behaviour of multiple facilities. Further explanation regarding the technical basis for the selected APR values, as well as the operational implications for very large facilities, would strengthen the proposed framework. Clarification regarding the precise APR definition would also be beneficial.

Power Factor and Reactive Power Performance

The framework would also benefit from clearer requirements regarding steady-state power factor capability, filter operation and switching, reactive power behaviour during normal operation, and reactive current or reactive power behaviour during faults and FRT events. Many large loads may utilise harmonic filters or reactive compensation systems which can materially change plant reactive behaviour depending on operating state or filter availability. If power factor and reactive power obligations are not clearly defined, operational inconsistencies may arise across facilities. Expectations regarding reactive response during faults and post-fault conditions should be clearly defined.

Load Cycling and Oscillatory Behaviour

Large AI-focused data centres may also exhibit rapid and cyclic load variations due to GPU-intensive workloads, training processes, and batch-processing operations. These facilities may therefore introduce rapid load ramps, repetitive cycling behaviour, oscillatory demand patterns, and short-term demand volatility. The potential interaction of these behaviours with weak-grid conditions, voltage stability, oscillatory modes, and frequency performance should be further considered within the framework.

Protection System Impacts

Although data centres are unlikely to contribute significant fault current due to the predominance of power electronic equipment and converter-based cooling systems, they may still materially affect network protection system performance. Rapid load variability, harmonics, and any grid-parallel

onsite generation may influence fault detection, relay sensitivity, protection coordination, and fault clearance performance. Accordingly, utilities and NSPs should assess how large load connections interact with existing protection schemes, including distance protection, differential protection, communication-assisted schemes, and weak-grid protection systems. Protection studies should confirm that faults can still be reliably detected and cleared within required timeframes and identify whether protection modifications are required following connection of large IBL facilities.

Network Assessment and S5.2.5.12 Considerations

The applicability of S5.2.5.12-style transient stability or broader network impact assessments for very large loads should be further clarified where their system impact becomes material. Although these requirements have historically focused on generation connections, very large data centres may also materially influence transient voltage stability, oscillatory behaviour, rotor angle stability, and broader network performance following contingencies. Additional guidance regarding when broader network studies, system-level RMS assessments, or EMT-based transient stability assessments are required for large loads would improve transparency and consistency across NSPs and connection applications.

Harmonics and Power Quality

Additional guidance should also be considered regarding harmonic modelling requirements, harmonic emission limits, harmonic interaction assessment, and power quality or voltage fluctuation assessment. Large inverter-based facilities incorporating UPS systems, active front-end converters, VFDs, harmonic filters, and onsite inverter-based resources can create complex harmonic interactions, particularly in weak-grid environments. Accordingly, clear guidance regarding harmonic study methodologies, acceptable harmonic models, resonance assessment requirements, and ongoing compliance expectations would improve consistency across projects and NSPs. Voltage fluctuation and flicker impacts associated with rapid AI-driven load variations should also be considered within the framework.

Frequency Variation, FCAS, and Demand Fluctuation Impacts

Large data centres, particularly AI-focused facilities, may exhibit rapid and substantial demand variations due to GPU-intensive workloads, training cycles, inference operations, and batch-processing behaviour. These rapid changes in demand can potentially influence local and regional frequency behaviour, particularly in weaker parts of the network or during already stressed operating conditions. Consideration should therefore be given to the impact of large load demand variability on system frequency stability, FCAS requirements, and operational reserve management. Additional clarification regarding whether these facilities may require specific operational constraints, ramp-rate considerations, or coordination with FCAS procurement frameworks would improve understanding of their broader system impacts. It would also be useful to clarify how coincident load recovery or sudden load reduction from multiple large data centres may affect frequency recovery following major contingencies.

Cyber Security Considerations

Given the highly digital and control-system-dependent nature of modern data centres and inverter-based load infrastructure, cyber security considerations may become increasingly important from both operational and system security perspectives. Large IBL facilities may rely on extensive communication systems, remote monitoring, PPC controls, energy management systems, cloud-based coordination platforms, and onsite inverter-based resources. Accordingly, additional guidance regarding cyber security expectations, communication resilience, operational redundancy, and secure control system architecture may be beneficial, particularly where loss of control, coordinated tripping, or malicious operational manipulation could have broader impacts on power system security or system restoration capability.

Black Start and System Restoration Considerations

The increasing penetration of very large inverter-based loads may also have implications for black start and system restoration processes. During restoration conditions, the reconnection sequence and behaviour of large data centres may materially affect restoration island stability, voltage recovery, frequency stability, and available generation reserves. Additional guidance regarding expected behaviour of large loads during restoration conditions, staged reconnection expectations, coordination with AEMO restoration procedures, and interaction with black system recovery processes would improve clarity for both NSPs and participants. Consideration should also be given to whether large IBLs may require specific restoration operating modes or controlled reconnection arrangements to avoid adverse impacts during restoration events.

Coordination Between Large Loads and System Strength Remediation

Additional clarification may be beneficial regarding how large IBLs interact with future system strength remediation frameworks, particularly where multiple large loads connect within the same region over a relatively short period. It would be useful to clarify how system strength obligations, remediation allocation, and coordination responsibilities will be managed where cumulative impacts from multiple data centres materially alter local network conditions over time.

EMT Study Scope and Wide-Area Interaction Assessment

The framework would benefit from further clarification regarding when wide-area EMT studies may be required instead of localised connection point studies only. As inverter-based loads become larger and more geographically concentrated, interactions may extend beyond the immediate connection point and involve broader network oscillatory or control interactions. Guidance regarding study boundaries, assessment scope, and expectations for multi-plant EMT studies would improve transparency.

Staged Compliance and Future Expandability

Many data centre projects may be developed in stages over multiple years. Additional clarification regarding how staged augmentation, future expansion, and incremental capacity increases will be assessed under the proposed framework would improve predictability for proponents and NSPs. This is particularly important where cumulative impacts may materially differ from initial connection assessments.

Interaction With UFLS and System Protection Schemes

Additional guidance may also be beneficial regarding how large inverter-based loads interact with under-frequency load shedding (UFLS), special protection schemes (SPS), remedial action schemes (RAS), and broader emergency control systems. Very large loads may materially alter regional load composition and contingency response behaviour. Clarification regarding whether these facilities may participate in, be exempt from, or require coordination with existing system protection frameworks would improve understanding of operational impacts.

Interaction Between Onsite Generation, BESS, and Large Load Behaviour

Many future data centres are expected to incorporate onsite generation, battery energy storage systems (BESS), renewable integration, or hybrid operating modes. Additional clarification regarding how these integrated facilities will be assessed from both load and generation perspectives would be useful, particularly where operating modes dynamically change between import-dominant and export-capable operation.

In summary, Sungrow acknowledges and appreciates the significant effort undertaken by the AEMC in developing a forward-looking framework for large inverter-based loads and data centres within the NEM. The proposed direction is timely and broadly aligned with evolving international industry practices as power systems transition toward increasingly inverter-dominated networks and rapidly growing large AI-driven loads.

Sungrow generally supports the intent of the framework and considers it an important step toward maintaining future system security and operational resilience. The comments and suggestions provided above are intended constructively to support further refinement and clarification within the final determination. Sungrow looks forward to continued engagement with AEMC and industry stakeholders to support the development of frameworks for enhanced power system security.

Yours sincerely,

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