AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Level 12
171 Collins Street
Melbourne VIC 3000

**Postal address**
GPO Box 2008
Melbourne VIC 3001

**T** 1300 858 724
**F** 03 9609 8010
**E** info@aemo.com.au

12 May 2026

Ms Anna Collyer
Chair
Australian Energy Market Commission
Level 15, 60 Castlereagh Street
Sydney, NSW 2000

Dear Ms Collyer,

**Submission to the AEMC on the Improving the NEM access standards – Package 2 draft determination**

AEMO welcomes the opportunity to make this submission to the AEMC's draft determination and draft rule to improve the NEM access standards. AEMO supports the draft rule and the AEMC's overarching objective of updating the access standards framework to better manage emerging power system security risks associated with the rapid growth of large loads.

AEMO considers that the proposed rule changes will benefit electricity consumers as they promote an efficient balance between enabling the timely connection of new large loads while embedding resilience into the power system to mitigate the security risks associated with the different operational characteristics of these large loads. The AEMC's draft rule is also consistent with the approaches being adopted to address the same operational risks internationally. AEMO considers that the proposed access standards for large inverter-based loads, in particular, are appropriate and proportionate.

Please contact Hannah Heath, Group Manager – Strategic Market Reform, at [redacted] should you wish to discuss this submission.

Yours sincerely,

[redacted]

Violette Mouchaileh
**Executive General Manager – Policy and Corporate Affairs**

**Attachment:** AEMO Submission, Improving the NEM Access Standards – Package 2 draft determination, May 2026

Attachment: AEMO submission, Improving the NEM access standards – Package 2 draft determination, May 2026

# 1 Overview

The Australian Energy Market Operator (AEMO) welcomes the opportunity to provide this submission to the Australian Energy Market Commission (AEMC) on the draft determination on Improving the National Electricity Market (NEM) Access Standards – Package 2 (the draft determination), initiated by AEMO's April 2024 rule change request.[1]

It is timely to update the access standards for large loads given AEMO's forecast growth in new large loads in the NEM over the next five years.[2] The characteristics of many of these new large loads will differ from the NEM's existing large loads in that they will be inverter-based loads (IBL), have back-up generation, are likely to consume more energy, and be more clustered.

AEMO supports the timely and efficient connection of these new large loads to the NEM, recognising the broad economic benefits they can deliver for Australia. AEMO considers the AEMC's draft Rule will facilitate the connection of these new large loads by making their connection process clearer and more predictable. This includes setting necessary but minimal new regulations to help maintain system security to the benefit of all consumers.

# 2 Benefits of the draft rule

## 2.1 Proportionate application of standards

The AEMC's application of the access standards under the draft rule is proportionate to the risks posed by connecting loads, as:

- The new ride-through requirements only apply to loads that materially increase risks – large IBL,
- The access standards are flexible so that they can be tailored to the specific circumstances of connecting loads,[3] and
- The three-tiered application of the access standards to large IBL connecting at the distribution network level proportionately applies the standards to connecting loads depending on their size.

[1] AEMC. Consultation paper, National Electricity Amendment (Improving the NEM access standards - Package 2) Rule 2025, May 2025.
[2] AEMO. 2025 Inputs, Assumptions and Scenarios Report, August 2025.
[3] The access standards allow for negotiation between minimum and automatic access standards. The automatic access standard must be accepted by the NSP and AEMO without negotiation – facilitating a faster connection where this is desired by the connection applicant. The minimum access standard sets an appropriate baseline and allows for negotiation to reduce connection costs where security risks can be appropriately managed.

## 2.2 Clear, consistent and efficient management of risks

The draft rules create new nationally consistent access standards to manage the risks introduced by large IBLs in a consistent and transparent matter. Currently, networks are managing the risks posed by new inverter based large loads on a case-by-case basis. This approach is opaque and differs depending on the network. Specifying access standards within the rules publicly clarifies connection requirements creating greater investment certainty.

The AEMC's draft rule promotes efficient management of risks (leading to lower costs for consumers). Under the draft rule, new large loads that create risks will be responsible for mitigating those risks. This means that the costs of managing risks are considered and managed prior to connection by the connecting party.

AEMO's comments on the specific new requirements are as follows:

- **Ride through requirements** – there is a risk that large IBLs may not ride through voltage and frequency disturbances.[4] AEMO's analysis is that the AEMC's proposed new access standards will appropriately address this risk. This will minimise the impacts of disturbances on the broader network and consumers and reduce costs associated with managing this risk.[5]
- **Compliance monitoring and visibility** – AEMO supports the draft rule that requires connection agreements for non-registered large loads include enforceable performance obligations. This addresses a gap in the current compliance monitoring framework.[6]
- **Instability and detection requirements** – the draft rule introduces a standard for instability detection and response for large IBLs with the potential to contribute to instability.[7] The capability to detect oscillations and take necessary actions to mitigate their impact is critical to maintaining power system security.

## 2.3 More detailed consideration of ride through requirements

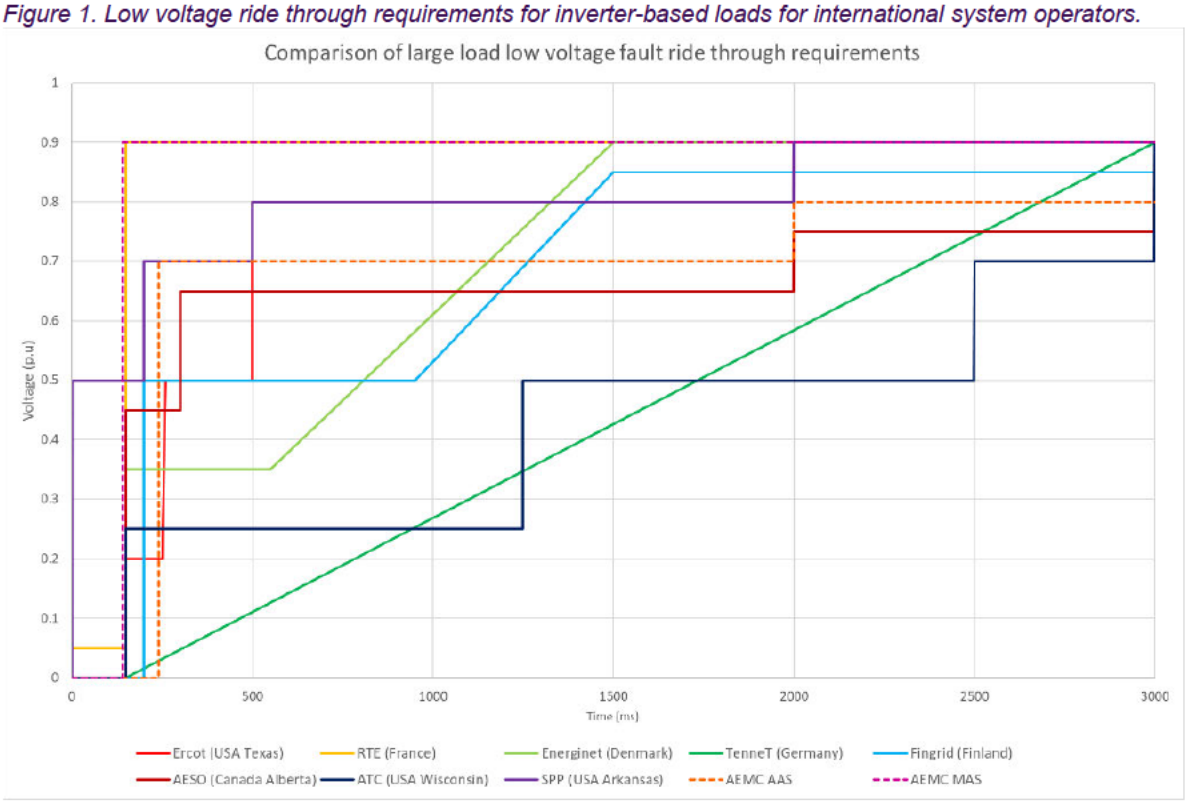
This section sets out AEMO's more detailed considerations on the new ride-through requirements, including how they compare to similar international regulations.

[4] Large IBL can concurrently disconnect in response to disturbances. Concurrent disconnections are likely to exacerbate voltage and frequency disturbances resulting in interruptions to the supply of electricity to consumers.
[5] Without the AEMC's draft access standards, it would fall to AEMO and network service providers (NSPs) to manage the risks of concurrent disconnection. Managing these risks would involve procuring more frequency control ancillary services and constraining the operation of plant in the NEM, including interconnectors – leading to higher wholesale and network costs paid for by consumers.
[6] As it stands, most connecting loads aren't required to register and the requirements to maintain (and monitor) compliance with access standards under NER 4.15 don't apply. Codifying compliance requirements for access standards in connection agreements provides a level of assurance and oversight that otherwise wouldn't be present for large loads.
[7] Large IBLs typically employ active front-end converters which means they can have rapid changes in demand and can actively contribute to voltage, frequency, and oscillatory instability.

### 2.3.1 Voltage ride through requirements

The proposed low voltage ride through requirements are aligned with other international system operators (ISOs), as set out in Figure 1. The AEMC's proposed automatic access standard (AAS) and minimum access standard (MAS) are shown via the dashed lines. While specific requirements will vary depending on unique network characteristics and protection clearing times, the alignment in values indicates that the proposed standards should not be more difficult to achieve than those in other jurisdictions.

*Figure 1. Low voltage ride through requirements for inverter-based loads for international system operators.*




Source: ESIG, Large load performance requirements, February 2026, p. 9.

The AEMC's proposed high voltage ride through requirements aligns with Figure S5.1a.1 in NER S5.1a.4. As shown in the *ESIG Large Loads Performance Requirements* report, there is also alignment with other high voltage ride through requirements in international jurisdictions[8].

### 2.3.2 Active power recovery time

The active power recovery time requirements proposed by the AEMC are in line with most international requirements. The draft rule specifies restoring active power to 90% of pre-disturbance load within 500 ms for AAS and within 1 second for MAS. As shown in the *ESIG*

[8] ESIG, Large load performance requirements, February 2026, p. 11.

*Large Loads Performance Requirements report*, the majority of requirements internationally specify active power recovery times between 500 ms and 1 second[9].

### 2.3.3 Frequency ride through requirements

Frequency deviations are a system-wide phenomenon that require a co-ordinated response from all connections. If the behaviour of IBLs is not aligned with the rest of the system, the magnitude of frequency events may be exacerbated. The draft rule seeks to align the requirements for IBLs and generators in the NEM, which will improve behaviour predictability and supports a balanced response across the system.

### 2.3.4 Multiple disturbance ride through

For multiple disturbance ride through, the AEMC's proposed access standards specify that protection settings must not operate based solely on the number of faults or disturbances that occur during a period of time. The proposed measures relate to limiting the application of protection settings that operate solely on a disturbance counter. This will address issues observed overseas where large quantities of IBL have disconnected after a third reclosure event due to common disturbance counter settings. The AEMC's draft rule does not require detailed modelling or analysis of multiple disturbance ride-through. This is less onerous than other international requirements specified in the *ESIG Large Loads Performance Requirements* report which require demonstrated fault ride through for multiple disturbances.

## 2.4 AEMO's interim guideline

Absent nationally consistent requirements, NSPs are looking to impose their own ride-through requirements, which are unlikely to be consistent across jurisdictions. To support transparency and consistency, AEMO is developing an interim guideline to provide guidance on the connection process for IBLs. The intent of the interim guideline is to:

- Clarify and improve certainty (for proponents and others involved in IBL connections) on the process to connect IBLs to the power system.
- Align with the AEMC draft rules, while acknowledging that the NER may be refined as the AEMC makes further improvements or changes in their final determination.
- Harmonise NSP and AEMO requirements by providing a standardised approach in the period between publication of the draft rule, the final rule and completion of AEMO's updated guidelines. [10] This includes providing guidance on key aspects of the connection process such as IBL connection size thresholds, performance expectations, and modelling requirements.

[9] ESIG, Large load performance requirements, February 2026, pp. 13-14.
[10] These guideline are the Power System Modelling Guideline, System Strength Impact Assessment Guideline and Power System Stability Guideline.

This interim guideline is not intended to pre-empt the AEMC's final determination or any aspect of the rule change process. Rather, it is intended to provide guidance on likely outcomes so that proponents can be better prepared when the rule change is finalised. This interim guideline will be updated following publication of the AEMC's final determination (if necessary) to ensure ongoing relevance until AEMO has had the opportunity to update its other guidelines. This interim guideline is intended to be read in conjunction with the AEMC's draft determination (and final determination when it is made).

# 3 Further enhancements

AEMO has identified some ways the draft Rule could be further enhanced to improve outcomes for consumers.

## 3.1 Consideration and clarification of the tiered application of access standards

The minimum voltage of transmission assets can differ across transmission networks and may be the same as that of some distribution networks. AusNet, ElectraNet and TasNetworks have assets operating at or below 132 kV. Under the tiering system, lower voltage IBL connections in transmission networks may be treated differently to equivalent voltage-level connections in distribution networks. Given this, the AEMC could consider the application of the tiering framework in transmission networks as well.

Also, there would be benefit in the AEMC providing guidance regarding its intention for how DNSPs and AEMO should engage on the application of the new and updated standards for tier 1 and tier 2 distribution-connected IBLs. AEMO needs aggregate visibility of these loads to simulate IBL responses to disturbances and manage system security. However, AEMO has no intention or desire to become deeply embedded in DNSP connection assessment processes. AEMO's interim guideline is drafted with this in mind. In developing the interim guideline, AEMO is seeking to work with NSPs to establish a standard and efficient approach to provide the required visibility without introducing unnecessarily onerous modelling or assessment requirements. This is intended to minimise the need for AEMO involvement in performance standard negotiations, promote transparency and streamline the connection process.

## 3.2 Classification of uninterruptible power supply

The draft determination raised questions on the treatment of uninterruptible power supply (UPS) and whether they are classified as (1) bidirectional units for the purposes of market registration (under NER 2.2.2) or (2) are an integral component of the IBL.

AEMO agrees that the AEMC should consider the classification of UPS in its final rule to provide guidance and regulatory certainty and ensure consistent application. AEMO welcomes the opportunity to work with industry and the AEMC to inform the final rule

drafting (potentially leveraging the technical working group established to inform the draft determination).

## 3.3 Withstand short circuit ratio methodology

Submissions to the AEMC's Consultation Paper raised concerns that the current 'withstand short circuit ratio' (SCR) access standard that applies to loads (NER S5.3.11), calculated in accordance with the methodology set out in AEMO's System Strength Impact Assessment Guidelines (SSIAG), isn't suitable for application to IBL. AEMO agrees with these submissions. AEMO considered the SCR standard and outlined issues regarding its application to loads in a recent technical note.[11]

For context, the withstand SCR is used within the NER framework as an indicator of local system strength, supporting the assessment of whether new or modified inverter-based connections can be accommodated without undermining power system stability.[12] It is applied in connection and system strength assessments to inform:

- compliance with the system stability outcomes in NER S5.1a.3, and
- the system strength regime for new connections under NER 5.3.4B.

The withstand SCR assessment methodology, which is applied in a Single Machine Infinite Bus (SMIB) environment, was developed primarily for Schedule 5.2 plant, including asynchronous production units, to determine the minimum SCR where the plant can maintain stable operation. AEMO's studies confirm that this methodology can't meaningfully be applied to large IBL because unlike Schedule 5.2 plant, large IBL require reactive support from the network to operate in low SCR conditions and this cannot be fully represented in a SMIB environment.

Maintaining the current NER S5.3.11 standard may result in requirements or signals that are not aligned with the actual system strength impacts of large load connections, reducing the effectiveness of the framework. A broader consideration of the application of the system strength framework to loads would likely be beneficial. However, in advance of a broader consideration, AEMO considers that it would be desirable to update NER S5.3.11 to address this immediate issue. This issue cannot be resolved without consultation and AEMO would like to work with industry and the AEMC on how to update the drafting of S5.3.11. AEMO will need to update the SSIAG when the AEMC makes its final rule regardless. If required under the NER, details on how NER 5.3.11 would be applied in practice could be specified in the SSIAG and consulted on as part of updating the SSIAG.

[11] AEMO, System Strength Impact Assessment Guideline Withstand SCR Methodology Review Technical note on assessing power transfer limits Version 2.1, February 2025.
[12] This withstand SCR is an input for the calculation of reduction in available fault level (AFL) which is a used as a proxy to quantify the indicative impact of Inverter Based Resource (IBR) on the power system.

### 3.4 Protection Settings

AEMO notes that, while the Commission's draft determination indicates it does not propose to make a rule in response to the separate Rod Hughes Consulting request on "conditions for generator protection systems", the draft package contemplates changes regarding "primary" and "backup" protection terminology. If the AEMC proceeds with the proposed changes, AEMO recommends the AEMC also clarify that the introduction of definitions for "primary protection system" and "back-up protection system" do not preclude AEMO from requiring duplicate / co-primary protection systems under NER 4.6.2 where it is reasonably considered that the protection could affect power system security as described in Section 13 of AEMO's *Power System Security Guidelines*.

## 4 Areas of future reform

While the AEMC's draft rule is a positive reform, AEMO has identified some areas of further reform to support the effective integration of new large loads into the NEM while maintaining security and reliability. While these reforms are beyond the scope of this rule change, AEMO is highlighting the relevant reform areas and the forums in which they are being considered, to raise awareness and support stakeholder engagement in these concurrent processes.

### 4.1 Ramp rate limits

Large IBLs can rapidly ramp demand up and down by hundreds of MWs within a dispatch interval, creating risks to operational forecasting, frequency reserves, interconnector flows and voltage stability.

The ability of IBLs to rapidly increase or decrease their active power without ramp rate limits can have several implications for power system operations:

- Rapid demand ramping within a dispatch interval can impact the accuracy of short-term forecasting, potentially resulting in the over or under procurement of energy and ancillary services.
- Large increases or decreases in demand within a dispatch interval may result in interconnector drift if the surplus or deficit in demand is met across regions. This may result in interconnectors operating above their secure limits, or reductions in system transfer capacity if the system has to be operated more conservatively to allow for this.
- Demand ramping may impact the procurement of ancillary services. Rapid changes in demand within a dispatch interval may also materially impact frequency ancillary service reserves by consuming available headroom and reducing the system's ability to respond to disturbances. This increases the risk of reserve insufficiency, energy shortfalls, and even load shedding. These risks would increase further in the event of a non-credible contingency event or when occurring in an islanded region.

This risk has also been considered by other network operators internationally as highlighted in the *ESIG Large Loads Performance Requirements* report[13]. Some proposed maximum ramp rate limits in other networks include:

- Fingrid: A limit that is adjustable from 5% to 100% of Pmax/min but with a maximum of 50 MW/minute.
- Energinet: 60 MW/min.
- American Transmission Company (ATC):
  - Changes in active power must be less than 25 MW for any period of time less than 5 seconds
  - Any change in active power greater than 50 MW should be limited to a rate of change less than 0.5 MW/s (i.e. 30MW/minute).
- Alberta Electric System Operator (AESO): 10 MW/minute.

This is an emerging risk with the current level of IBLs in the NEM. It is likely that the risk will increase as more IBLs connect to the system and the potential uncertainty in active power change within a dispatch interval increases.

The rate at which generators and bi-directional plant can ramp their demand is covered by NER S5.2.5.14 concerning active power control. This access standard requires S5.2 plant to maintain and change active power in accordance with dispatch instructions. A similar access standard is likely necessary for large loads. However, as most loads aren't subject to dispatch instructions, the load standard would need to take another form.

Should a case for introducing ramp rate limits for large loads to manage system security risks be identified, possible implementation pathways may include:

- New access standard for load MW ramp rate
- Provisions in load connection agreements for MW ramp rate

Ramp rates will be a matter that AEMO considers in its *2026 General Power System Risk Review* (GPSRR) [14], with the draft GPSRR due to be published later this month.

## 4.2 Remote monitoring and communications requirements

Many IBL connections are comparable in size to large generators in the NEM and have the potential to significantly impact power system operations in similar ways to generators. Visibility of data centre operations is necessary for AEMO to maintain power system

[13] ESIG, Large load performance requirements, February 2026, p. 21.
[14] The draft 2026 GPSRR report is due to be published in late May 2026.

security. AEMO also needs to be able to communicate with IBL to undertake its market or power system security functions.

AEMO's *GPSRR* will highlight the power system security risks that IBLs may present.

As connecting IBLs increase in size, clarity regarding data centre energy consumption will become progressively more important for AEMO to discharge its market and power system security functions efficiently. Real-time consumption data will allow AEMO to better forecast data centre demand and respond appropriately when this demand shifts. This facilitates efficient commitment and dispatch generation, procurement of frequency control ancillary services and management of congestion in line with the power system's physical constraints and with minimal interventions. Communication channels enable AEMO to coordinate proportionate actions in response to market disruption — such as issuing market notices, adjusting dispatch, or requesting demand response — rather than relying on assumptions that can lead to inefficient constraints or interventions. Key requirements include the provision and maintenance of:

- Remote monitoring equipment and remote-control equipment.
- A telephone facility for the purposes of operational communications between the inverter-based load's responsible operator and AEMO's control centre.

There are currently avenues where the requirement for remote monitoring and communication could be specified, such as in connection agreements or registration exemptions. However, this necessitates a bespoke and separate process for each load. Implementing remote monitoring via registration exemptions is only possible when a load seeks a registration exemption (such as for back-up generation). The negotiation of terms and conditions of connection agreements specific to the NSP and connecting load are largely private[15]. A nationally consistent approach for all loads would likely be clearer, more effective and more efficient.

Remote monitoring and communications requirements are specified for generators and integrated resource providers in S5.2.6.1 and S5.2.6.2 and a similar requirement could be specified for loads under S5.3.

Remote monitoring and communication requirements for large IBL will be considered in several different contexts. This will be a consideration in the GPSRR. The ECMC is considering AEMO's visibility of data centres.[16] AEMO has also been tasked by Energy Ministers to develop a Market Visibility Framework to establish fit-for-purpose arrangements for the provision and use of information on price responsive behaviour of resources

[15] AEMO is involved in the negotiation of 'AEMO advisory matters' access standards
[16] Energy and Climate Change Ministerial Council, Meeting Communique, Tuesday 16 December 2025.

(including large loads).[17] AEMO has published a paper setting out its planned approach to developing the framework.[18] AEMO is conscious about ensuring reforms are aligned across these parallel processes to streamline the new requirements and avoid duplicative or conflicting obligations.

## 4.3 Instability and detection requirements

A future area of development in oscillation detection for all plant (and not just loads) could consider expanding the requirements to include the capability to detect the source of instability. While there is not current industry consensus on how this is achieved, having information pertaining to whether a plant is actively contributing to or providing damping for the oscillation would deliver valuable inputs to determine the correct hierarchy of actions when oscillations are present. More advanced capability to identify the source of oscillation, and the extent to which a plant is contributing or damping an oscillation remains an area of development.

The capability to identify the source of oscillatory behaviour will improve confidence in the effectiveness of operational actions to mitigate the impacts of oscillations if they occur. AEMO will continue to progress this work in collaboration with industry and may propose future changes to embed the requirement once the capability is further developed.

[17] National Electricity Market Wholesale Market Settings Review (NEM Review) Recommendations – Implementation Pathways (2026), available at https://www.energy.gov.au/energy-and-climate-change-ministerial-council/working-groups/electricity-working-group/nem-wholesale-market-settings-review.

[18] For further details please see: AEMO | Market Visibility Framework (MVF) consultation