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7 May 2026

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Victoria Mollard
Executive General Manager, Economics and System Security
Australian Energy Market Commission (AEMC)

Via electronic lodgement

Dear Victoria

Improving the NEM access standards – Package 2 Draft Determination [ERC0394]

AusNet welcomes the opportunity to make this submission in response to the Improving the NEM access standards – Package 2 Draft Determination (the **Draft Determination**).

AusNet is the largest diversified energy network business in Victoria with over $13 billion of regulated and contracted assets. We bring three distinct and unique perspectives on the application of technical requirements that govern new connections, including inverter-based loads (**IBL**).

Firstly, as a joint planning partner to VicGrid (and the distribution planners) and owner-operator of the Victorian transmission network, our regulated transmission business is seeing gigawatts of new data centre interest emerging around key terminal stations. As these connection progress, our regulated transmission business also works alongside the Australian Energy Market Operator (**AEMO**) retaining operational responsibility to keep the network secure.[1] Secondly, as a connections manager, our distribution connections business is actively managing connection applications from data centre proponents to its system. Finally, as an experienced provider of contestable connection services, our unregulated transmission business is facilitating data centre developers to physically connect projects to the transmission system and reducing barriers to connection for its clients.

Our submission draws on experience from these perspectives to offer the following observations:

- **We strongly support the intent of the draft rule to introduce performance requirements that respond to known behaviour of data centres.** Data centres are a new class of load that exhibit fast coincident MW variability independent of power system conditions, can have uncertain ramping profiles during normal operation and are sensitive to network disturbance risks. This behaviour make them less predictable and more likely to trigger system stability issues than traditional loads. Our view is individual or clustered data centres can be safely integrated into the power system if we continue to develop the right power system tools and processes. This includes formalising a robust set of performance and modelling requirements focussing on data centres real world behaviours.
- **Policymakers should consider whether some decisions made in this draft rule are overly reliant on international benchmarks and could benefit from NEM-specific evidence.** IBL performance requirements are relatively new to the NEM and understandably reliant on international benchmarks. This allows the NEM to set requirements that address common power-electronics driven behaviour (e.g. sensitivity to disturbances) but may not reflect the modelled or real-world operational impacts of data centre behaviour in the NEM. Individual or clustered behaviour of data centres may have a more material impact on smaller power systems. IBL-related standards should remain cognisant of our power system features (e.g. network size and power flow constraints, system strength resources, size of ancillary service markets, mix and penetration level of inverter-based assets–generation, load and non-network). We have made specific comments to reflect this concern in our submission.
- **We are supportive of the proposed definition of IBL and large IBL.** We agree that the NER does not clearly distinguish between passive loads and IBLs. A new class of load would help draw focus towards integration

[1] Note under Victoria's declared shared network (DSN) arrangements, VicGrid oversees planning of the Victorian transmission system and manages connection applications to this network including performance requirements and approval. AusNet builds, owns, operates and replaces DSN transmission assets including high voltage lines, stations and connections. Our joint planning role includes the provision of non-contestable elements of a connection (e.g. cut-ins to our existing network).

challenges specific to data centres and set the foundation for a shared language around technical performance for this new plant type.

- **The proposed tiered classification will not achieve its intended objectives in its current form.** AusNet's principal concern with the draft rule is the tiering system of classifying plant proposed for Schedule 5.3. It is not practical to expect distribution network service providers (**DNSPs**) to apply IBL performance requirements consistently if assessment of IBL performance requirements is subject to individual technical discretion. We are concerned that this framework will lead to situations where requirements are relaxed in circumstances where they are needed from a whole-of-system perspective and may not provide transmission operators with sufficient visibility to actively manage potential aggregate impacts. We are also concerned that the framework implies that IBLs less than 100 MW are unlikely to hold material system security implications as requirements are applied on an 'opt-in' basis. Overtime, the benefits of relaxing IBL requirements (e.g. timely connection approval) are likely to be eroded by costly operational controls required to manage connected plant and modelling gaps that delay assessment of future connecting IBLs.
- **AusNet has developed an alternative tiered classification framework in consultation with its transmission and distribution business units.** The framework offers greater regulatory certainty and consistency across the NEM in response to the power system impacts of IBLs. Key changes include: (1) consolidating Tier 2 and 3 IBL to automatically apply all IBL performance standards to IBL 30 MW and above (2) applying all IBL performance standards automatically for Tier 1 IBL unless there are no adverse impacts (i.e. opt out approach having regard to aggregate impact on the transmission network service provider (**TNSP**) and DNSP's network). The jurisdictional planning body (**JPB**) must be consulted as part of the above-mentioned assessment for Tier 1 IBL only. This recognises the JPB is the only party that can resolve power system instability impacts from cumulative data centre load and has direct interfaces with all DNSPs in their region.
- **The scope of performance requirements identified in the draft rule reflect known IBL integration needs in the NEM but should also consider a requirement to manage fast ramping.** AusNet supports technical performance and modelling requirements for connection being updated to better reflect and respond to the behaviour of data centres' power-electronic components. We suggest the final rule consider a requirement introducing active power ramp-up / ramp-down limits to agreed MW/s to address the risk of IBL ramping bidirectionally at rates of hundreds of megawatts in seconds. This requirement would help reduce duty on frequency control ancillary services (**FCAS**) markets and fast acting VAR support. The AEMC could also consider whether a change to the market could be allowed that enabled data centres to procure FCAS to cover their impact.
- **AusNet has identified some areas of targeted feedback on the proposed performance standards.** This includes support for the proposed clause for multi-fault ride through as general requirement, flexibility to negotiate short circuit ratio (**SCR**) requirements and the introduction of frequency ride through requirements. We support the proposed clauses requiring data centres not to disconnect following a voltage disturbance, noting the minimum access standard is appropriate for most connections. We also encourage the AEMC to consider how the proposed active power requirements could better mitigate IBL reconnection risks following a disturbance clearance (e.g. staged reconnection of IBL).

Additional detail is available in the attached submission. If you have any questions related to our submission, please contact Jason Jina, Policy & Reform Manager by email at [redacted]

Sincerely,

[redacted]

Laura Walsh

General Manager, Network Management (Transmission), AusNet

[redacted]

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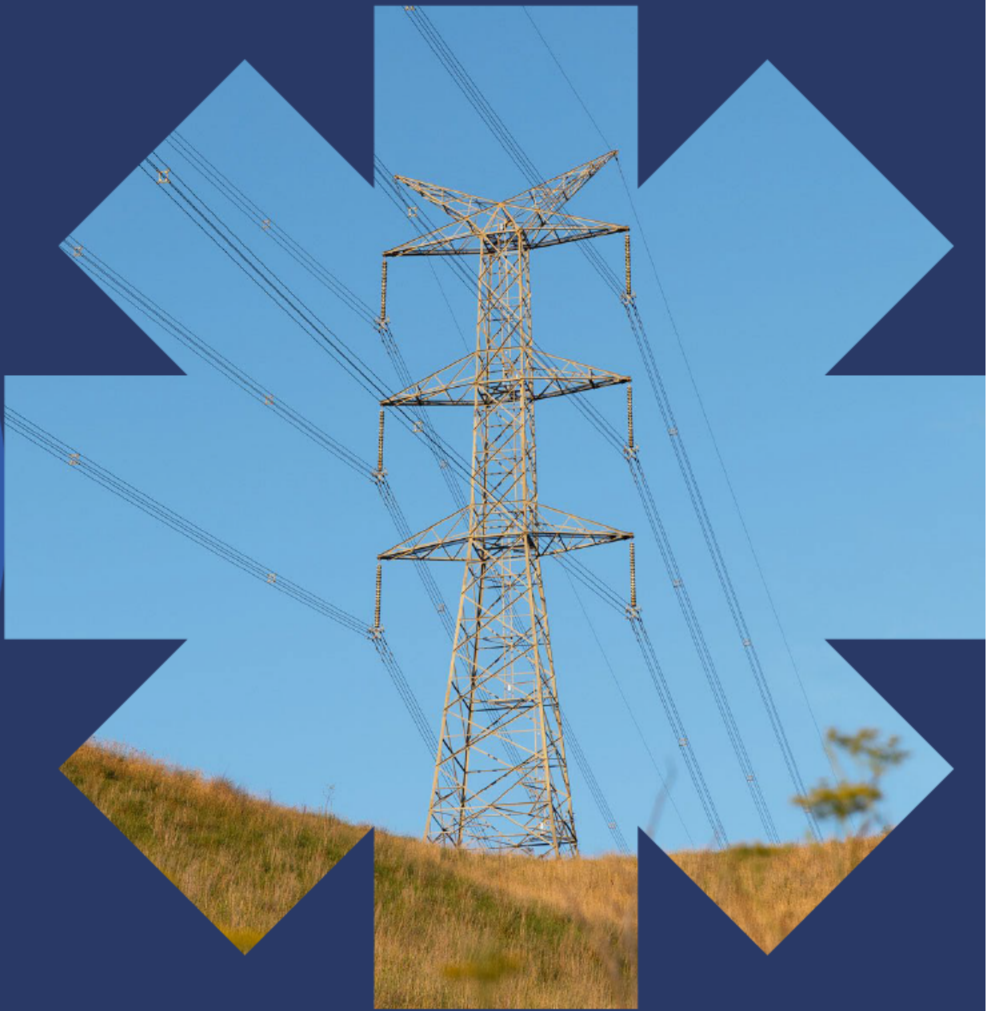


AusNet submission to the Improving the NEM access standards – Package 2 Draft Determination

Australian Energy Market Commission (AEMC)

Thursday, 7 May 2026

1. Introduction

AusNet thanks the AEMC for the opportunity to make this submission in response to the Improving the NEM access standards – Package 2 Draft Determination.

AusNet is supportive of the introduction of NEM-wide connection performance requirements that apply to load customers under Schedule 5.3, including data centres connecting to distribution and transmission systems. A proactive and coordinated approach to accommodating data centres will support power system security and Australia's continued digital and economic growth.

In the remaining sections of this submission, AusNet:

- Shares reflections from our own investigation into how data centres interact with the power system that reinforce the importance of the draft rule introducing connection performance requirements (**Section 2**).
- Supports the proposed definition of inverter-based load and proposes an alternative tiered classification framework that offers greater regulatory certainty and consistency across the NEM in response to power system instability impacts (**Section 3**).
- Supports the scope of performance requirements identified in the draft rule, proposes an additional requirement to manage fast ramping behaviour and offers targeted feedback on the draft performance requirements included (**Section 4**).

Observations have drawn on internal subject matter experts across AusNet's regulated and unregulated businesses to respond to the AEMC.

2. Importance of the draft rule and NEM specific evidence

Data centres' technical performance differs from traditional loads, bringing new engineering challenges that require proactive controls to protect the power system.

We strongly support the intent of the draft rule to introduce connection performance requirements that respond to system security risks from IBL connections.

AusNet recently completed a detailed investigation into how data centres interact with the electricity system and priority implications on system security, power quality, planning and operational decisions. Our approach leveraged real-world Australian and international evidence and expert insight from AusNet and Bespoke Energy across grid connection, network planning and power system operations.

In short, we have found:

- **Data centres are a new class of load that exhibit fast coincident megawatt (MW) variability independent of power system conditions, can have uncertain ramping profiles during normal operation and are sensitive to network disturbance risks.** This behaviour make them less predictable and more likely to trigger power system stability issues than the traditional loads we are used to.
- **No two data centres are the same. There are a wide variety and scale of data centre load profiles observed today, with rapid ramping behaviour driven by application-specific tasks and workloads.** For example, data centres that host AI training, gaming or media streaming events have computationally intensive "bursts", with large variations in power and cooling requirements. Some data centre proponents are working with original equipment manufacturers (**OEMs**) to develop rack-level controls that help smooth data centre load behaviour. These controls are emerging and not universal.
- **Data centre development can emerge quickly in specific regions and scale rapidly as multiple proponents compete with one another to connect as quickly as possible.** In Victoria, large clusters of future development are forming at key terminal stations and substations. While not all interest will proceed to connection, advanced data centre development across distribution and transmission-connected facilities far exceeds current system capacity, with a race to connect underway. New terminal stations on or near the 500kV system are expected to offer a simpler and faster development pathway for data centres to connect.
- **Clustered large loads with similar control philosophies and disturbance thresholds can turn localised events into material network-wide events that exceed what the network and power system were designed to accommodate.** This risk can extend beyond data centres themselves to interact with nearby inverter-based devices (e.g.

distributed solar photovoltaics (**PV**s), inverter-based generation systems, and high voltage direct current (**HVDC**) links).

- **If not appropriately addressed, data centre behaviour can have adverse system stability impacts beyond existing network operational controls.** Potential impacts include a lower-than-expected fault ride through capability, rapid active power ramping leading to frequency control challenges, power quality issues, and risk of forced oscillations.
- **Power system tools and processes to accommodate data centres in the NEM and internationally are still maturing.** We have lifted capabilities to connect inverter-based renewables and now we will need to do the same for emerging large data centre loads. This includes clearer technical connection frameworks, stronger locational signals, improved operational visibility and control, and collaboration between planners, networks and developers to accommodate them.
- **Establishing a robust set of performance and modelling requirements is one area where action should be taken.** Generator-specific instability mechanisms should not be assumed to translate directly to data centres without supporting studies. Technical performance requirements for data centre connections should reflect the behaviour of power-electronic components including uninterruptible power supply (**UPS**) rectifiers and inverters, and variable frequency drive pumps and compressors. Technical performance requirements should also be guided by observed, real-world performance of these components and the integrated system.

These findings suggests that data centres can be integrated safely into the power system and that economic growth opportunities can be realised if the electricity and data centre industries work together. This includes formalising a robust set of performance and modelling requirements focussing on real-world behaviour of data centres.

We will have more to share with the AEMC and wider industry in the coming weeks as part of the upcoming release of our *Integrating Data Centre White Paper*.

Requirements in the draft rule are primarily based on international benchmarks. Looking ahead, performance should be driven by NEM specific evidence.

IBL performance requirements are relatively new to the NEM. Almost all existing connected data centres are smaller distribution-connected facilities. Victoria commissioned its first 145MW transmission-connected data centre at Brooklyn in 2024, with much larger-sized hyperscale data centres (>300 MW) currently in the connection process.

Outside of Victorian transmission connections, data centre connection applicants across the NEM have not been formally subject to requirements that reflect the behaviour of power-electronic components. This includes Victorian distribution connection requirements which are presently much less onerous than what is in place for transmission-connected facilities.[2]

The newness of IBL requirements in the NEM means that the requirements in the draft rule are understandably reliant on international benchmarks from jurisdictions which have a higher penetration of data centre load and more mature grid connection standards. Drawing on international benchmarks allows the NEM to set requirements that address common power-electronic driven behaviour (e.g. sensitivity to common disturbance risks). While we support this, we are also aware requirements may not reflect the modelled or real-world operational impact of data centre behaviour in the NEM.

Individual large IBL or clustered IBL behaviour can have a material impact in particular power systems depending on their features (e.g. network size, power flow constraints, system strength sources, size of ancillary service market, mix and penetration level of inverter-based assets – generation, load and non-network).

For example, the loss of 1500MW of voltage-sensitive data centre load which occurred in the US Eastern Interconnection in July 2024 has the potential to cause a larger frequency deviation in a much smaller system, such as the NEM. In the US Eastern Interconnection, an event this size resulted in only a small observable frequency response (increase in 0.05 Hz from nominal frequency). In contrast, the same sized event in the NEM has the potential to increase the duty on frequency control ancillary services (**FCAS**) response beyond our existing response capability.

We also continue to see rapid evolution in how data centres design and operate their electrical, control and cooling systems, orchestrate workloads and load profiles, and co-locate as 'islandable' systems. Some of this innovation may only be relevant to a certain jurisdiction or may be globally applicable but did not exist at the time a specific international grid connection standard was developed.

AusNet suggests that policymakers carefully consider whether some decisions made in this draft rule are overly reliant on international benchmarks and could benefit from NEM specific evidence.

Some of the comments in the remaining sections of our submission reflect this concern, including our feedback on the tiered classification system and request to consider a requirement to limit active power ramping.

[2] Victorian distribution businesses including AusNet are developing data centre connection application guidelines, however requirements have not been formalised. VicGrid released its updated data centre connection application guidelines in February 2026 which set requirements for transmission-connected data centres in Victoria only.

3. Defining and classifying inverter-based loads

We are supportive of the proposed definition of inverter-based loads and large IBL.

AusNet agrees that the national electricity rules (**NER**) does not clearly distinguish between passive loads and IBLs, and that this creates uncertainty and potential for inconsistency around the applicability of connection requirements.

A new class of 'inverter-based load' would help draw focus towards integration challenges specific to data centres and set the foundation for a shared language around technical performance for this new plant type. This recognises data centres are not like traditional loads or inverter-based generators; their operational philosophy, controls, and protection logic are materially different and therefore should be considered when specifying technical requirements.

The draft rule defines IBL with reference to plant 'susceptible to power-electronic control instability' and large IBL based on a nameplate rating of 30 MW of greater. We are supportive of these definitions, noting that 30 MW is a somewhat arbitrary figure – with scheduled status having limited correlation to power system impact. As we discuss in the next section, a prudent network planner may well consider that individual IBL less than 30 MW in size is material to power system instability.

The proposed tiered classification framework will not achieve its intended objectives in its current form.

AusNet's principal concern with the draft rule is the tiering system classifying load plants under Schedule 5.3 including large IBL. There are three reasons we do not support the tiering system in its current form:

1. **The potential for inconsistent application of access standards for distribution-connected IBL less than 100 MW, which puts the whole network at risk to cumulative impacts that may not be sufficiently visible to the responsible network service provider (NSP) or the AEMO.**

The Draft Determination outlines the purpose of three-tiered classification framework is to address the growing risk that large IBL are being treated inconsistently across the NEM, reducing AEMO's visibility and ability to plan for system security needs. It goes on to suggest a MW-based tiers would provide regulatory certainty, align compliance obligations with scale and technical behaviour of the connection, preserve flexibility for local network conditions and ensure compliance costs are commensurate with system security risk.

AusNet supports the purpose and objectives above, and considers they are achieved for distribution-connected IBL above 100 MWs and all transmission-connected IBL. For distribution-connected IBL less than 100 MW, IBL performance requirements only apply if the NSP considers it appropriate having regard to the expected impact of the connection on power quality and security of supply (i.e. DNSP has full technical discretion).[3]

AusNet is concerned this approach may put an individual jurisdiction and potentially interconnected network at risk due to cumulative impacts on the basis that:

- ***AEMO has presented NEM-specific modelling results that demonstrate IBL sites less than 40 MW behave coherently rather than independently, and their aggregate response gives rise to cumulative power system impacts.*** Further, in jurisdictions where IBL are connecting quickly such as NSW, credible load contingency sizes are increasing to 700 MW and could exceed current network limits before 2030.[4]
- ***It is not practical to expect DNSPs to apply IBL performance requirements consistently if subject to individual technical discretion.*** Different NSPs (transmission or distribution) may apply different criteria and/or approaches to determine what performance requirements (if any) needs to be assessed and what represents an aggregate response material to power quality and security of supply. This is because each NSP will be looking at the plant

[3] For IBL at least 30 MW and less than 100 MW (Tier 2), IBL requirements only apply if the NSP considers it appropriate having regard to the expected impact of the connection on power quality and security of supply. For IBL less than 30 MW (Tier 1), disturbance ride through requirements only apply if the NSP considers it appropriate having regard to the same factors as above.
[4] AEMC, *Improving the NEM access standards – Package 2 Draft Determination*, March 2026

from its point of connection, based on the knowledge the NSP holds of its particular network (and any known interfaces with nearby networks).[5]

We are concerned that the technical discretion to apply or disapply IBL requirements within the tiered classification framework may lead to situations where requirements are relaxed in cases where they are needed from a whole-of-system perspective. For example, voltage dip propagation driven by IBL sensitivity to common network disturbance and recovery risks.

- ***It is unclear whether transmission operators or AEMO will have access to tools that improve its visibility or the ability to actively monitor and manage potential aggregate impacts from IBLs to the power system.*** In cases where IBL requirements are relaxed for plant less than 100 MW, it is unclear whether transmission operators or AEMO will have real-time visibility or control of DNSP sub-transmission connected assets to discharge its functions in maintaining power system security.

  This recognises that (1) sub-transmission (66 kV, 132 kV) connected plants are currently not visible to or controllable by transmission operators or AEMO; and (2) IBL performance may not be modelled, recorded and shared with transmission operators or AEMO. The potential consequence is that measures to smooth operational impacts on all customers and to keep the system secure cannot be identified and proposed in the connection process. Instead, operational restrictions may be applied by the system operator to ensure system stability and security as required (see further information in point 3 below).

2. It is implied that connecting IBL less than 100 MW in size is unlikely to hold material system security implications and increases the burden of proof on DNSPs processing connection applications.

The access standards in the draft rule are designed on the basis that "only IBLs over 30 MW in size are likely to materially contribute to instability" and should be subject to a "high degree of modelling, including PSCAD and PSSE studies." This is further reinforced by the tiered classification framework as written in the draft rule (S.5.3.1a). It is drafted in a way that suggests IBLs at least 30 MW but less than 100 MW will be subject to IBL performance requirements on an 'opt-in' basis. (i.e. IBL requirements "only apply" if certain conditions are met).

AusNet is concerned this approach:

- ***Implies that connecting IBLs less than 100 MWs are unlikely to hold material system security implications.*** AEMO and the AEMC, in its draft determination, have appropriately recognised that the aggregate response of smaller IBL connections can match or exceed severity of larger individual connections. AusNet is particularly concerned with simultaneous disconnection of multiple IBLs between 30-100 MW following a disturbance. For example, the disconnection of three 100 MW (or ten 30 MW) data centres in response to a common fault ride through limitation would in aggregate represent a 300 MW loss; this is half the size of Victoria's largest contingency.

  In addition, comments made earlier in this submission highlight that a 100 MW threshold is more appropriate for larger power systems (e.g. PJM Interconnection), where loss of 100 MW loads has much less impact on the power system than in smaller markets such as the NEM.

- ***May be used as an avenue to reduce data centres size just below thresholds to avoid additional requirements.*** For example, under the classification framework, connections that are 99.9 MWs or 29.9 MW could avoid performance and modelling requirements despite carrying the same system security risk as a plant above the tiered threshold.

- ***Increases the burden of proof on DNSPs processing connection applications.*** If the starting point is that connections below 100 MWs are less material, we would expect DNSPs to face significant pressure to bring connection-specific evidence to justify applying IBL standards (e.g. detailed modelling). While we accept the need to align compliance obligations with scale and technical behaviour of the connection, in practice we see the tiering framework increasing workload on connection engineers to justify IBL requirements for known cumulative impacts of power-electronic behaviour.

3. Benefits of timely connection approval and proportionate compliance costs are likely to be eroded over time by unforeseen operational limitations and sub-optimal modelling affecting assessment of future connecting IBL.

The AEMC has explored making registration with AEMO compulsory for large IBLs that are 30 MW or more and be automatically subject to access standards specified in Schedule 5.3. One of the major reasons for not pursuing this approach was the view that it could be overly onerous.

AusNet is concerned the benefits of relaxing IBL requirements (e.g. more timely connection approval and proportionate compliance costs) are not being considered against system risks. Overtime, we would expect this approach to have several negative consequences that may erode and potentially outweigh these benefits. Notably:

[5] Wide-area assessments conducted by NSPs consider how a proposed connection interacts with the surrounding network, including other 'committed or existing generators, loads and transmission elements. However, this modelling is primarily looking at risks relevant to the connection point only. It does not consider power system stability risks from the coherent and cumulative behaviour of IBL across the system.

- ***Unforeseen operational limitations.*** As mentioned earlier, AEMO does not have visibility or control over sub-transmission connected plant. As IBLs (not subject to IBL Schedule 5.3. standards) become a greater proportion of our overall system load and risks grow, system operators including AEMO may have to rely on operational limitations to ensure system stability and security. This may include:
  - Applying caps on total number of inverters connected in parts of the network to align with technical limits of the power system during system normal and planned outage conditions to ensure pre and post contingency stability.
  - Issuing lack of reserve notices to manage reserve shortfalls, which in some circumstances may require non-priority load to turn off compounding the supply-demand shortfall during an event.
  - Building new constraint equations, or updating requirements for generator systems to be online in the distribution system (recognising these solutions are not typically developed for distribution).
- ***Sub-optimal (or absence of) models that delay assessment of future nearby connections.*** The tiered classification framework introduces risk that an IBL connection is approved without being subject to IBL performance requirements or sufficient modelling assessment. This situation would affect the ability of the NSP to assess subsequent connections in the same part of the network. NSPs cannot monitor, assess or enforce desired behaviour without these models.

  Without adequate assessment of the first connection (e.g. models, performance records), the NSP may be unable to demonstrate whether the risks from connecting a second plant impact security of supply (i.e. full impact assessment). This could delay the assessment of the second applicant while information is sought, and more comprehensive studies are undertaken.

AusNet's alternative tiered classification framework offers greater regulatory certainty and consistency across the NEM in response to power system instability impacts of IBL.

The draft rule proposed the following tiered classification framework to determine when Schedule 5.3 access standards apply to IBL seeking connection to distribution networks (see Figure 1).

As established earlier, the Schedule 5.3 access standards would apply to Tier 1 and Tier 2 connections at the discretion of DNSPs, having regard to the expected impact of the connection on the quality and security of network services to other network users. For Tier 3 connections, the Schedule 5.3 access standards would automatically apply in their entirety, subject to the specific requirements in each access standard.

Figure 1: <u>AEMC proposed</u> classification tiering structure for distribution connections under Schedule 5.3 of the NER

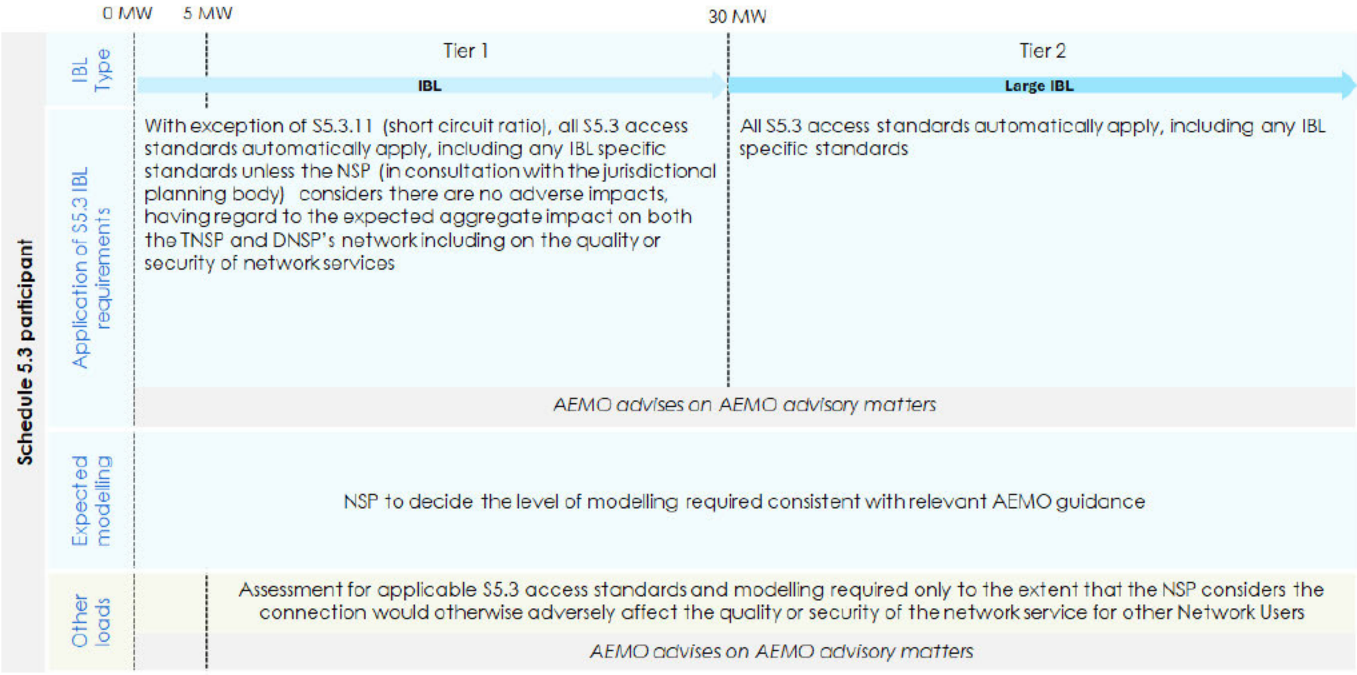
Schedule 5.3 participant	0 MW – 5 MW – 30 MW	30 MW – >100 MW	>100 MW
IBL Type	Tier 1 (IBL)	Tier 2 (Large IBL)	Tier 3 (Large IBL)
Application of S5.3 IBL requirements	S5.3.11 and S5.3.14 do not apply Clauses S5.3.12 and S5.3.13 only apply to the Schedule 5.3 Participant in respect of schedule 5.3 plant that includes any inverter based resource to the extent that the NSP considers appropriate, having regard to the expected aggregate impact of all Tier 1 connections on its network on the quality and security of network services to other Network Users	Clauses S5.3.11, S5.3.12, S5.3.13 and S5.3.14 only apply to the Schedule 5.3 Participant in respect of schedule 5.3 plant that includes any inverter based resource to the extent that the NSP considers appropriate, having regard to the expected impact of the connection on the quality and security of network services to other Network Users	All S5.3 access standards automatically apply, including any IBL specific standards
	AEMO advises on AEMO advisory matters		
Expected modelling	Low-level modelling or protection studies.	Low-to-moderate-level modelling or protection studies	High degree of modelling, including PSCAD and PSSE studies
Other loads	Assessment for applicable S5.3 access standards and modelling required only to the extent that the NSP considers the connection would otherwise adversely affect the quality or security of the network service for other Network Users		
	AEMO advises on AEMO advisory matters		

Source: AEMC (drawing on draft rule and determination)

To address the concerns raised in the previous section AusNet has, in consultation with its transmission and distribution business units, developed the following alternative tiered classification framework for the AEMC's consideration.

The alternative framework consolidates Tiers 2 and 3 IBL to automatically apply all Schedule 5.3 standards to IBL 30 MW and above. For Tier 1 IBL, the connecting NSP is required to consult with the jurisdictional planning body.[6] IBL performance standards are automatically applied to Tier 1 IBL unless there are no adverse impacts on both the TNSP and DNSPs network. For the avoidance of doubt, the connecting NSP retains responsibility for approving the connection in all circumstances. No changes are made to the applicability of non-IBL performance requirements.

Figure 2: <u>Alternative</u> classification tiering structure for distribution connections under Schedule 5.3 of the NER



Source: AusNet (amended from AEMC draft rule and determination)

The key changes from the tiered classification framework outlined in the draft rule and our rationale are as follows:

Key changes	Rationale
For plant 30 MW or greater, IBL performance standards automatically apply	• AEMO has presented evidence that demonstrates sites less than 40 MW behave coherently and their aggregate response gives rise to cumulative power system impacts in the NEM. • Smaller IBL are connecting very quickly in NSW (and Victoria), raising credible load contingency sizes to levels that could exceed current network limits in the near-to-medium term. • It is not practical to expect DNSPs to apply IBL performance requirements consistently if subject to individual technical discretion. Requirements may be relaxed in circumstances when they are needed from a whole-of-system perspective. • AEMO does not have visibility or control over distribution-connected plant. If IBL are not subject to IBL Schedule 5.3 standards, over time, AEMO may have to rely on operational limitations that erode benefits of relaxing connection requirements.
For plant less than 30 MW, IBL performance standards automatically *apply* unless there are no adverse impacts The exception being S5.3.11, which does not apply	• The case has not been made that minimum requirements should be 'opt in' rather than 'opt out', particularly given NEM-specific evidence that the cumulative impacts of smaller IBL connections can match or exceed severity of larger individual connections. • Retains connecting NSP's flexibility to ensure compliance costs are commensurate with system security risk.

[6] The jurisdiction planning body is defined in the NER as the entity nominated by the relevant Minister as having transmission system planning responsibility in that participating jurisdiction.

Connecting NSP must consult with jurisdictional planning body (JPB) This obligation is flexible to any arrangements agreed between the JPB and connecting NSP. For example, the requirement to consult could be met by the connecting NSP sharing connection information about IBL performance that is modelled and recorded to inform the JPB and its wider planning activities.	• Enables prudent planning by improving the JPB's visibility of potential risks from distribution-connected IBL and, if required, ability to address system risks for all customers proactively, rather than reactively. • JPB is the only party that can resolve power system instability impacts from cumulative data centre load connecting at both the distribution and transmission level. This includes making calls about where generation can come from and resolving transmission and system limitations binding connected network users. • JPB is the only party that directly interfaces with all DNSPs in their region. It is best placed to seek inputs from DNSPs (e.g. request information about distribution constraints, volume of IBL connected without IBL requirements, and needs on their respective networks) and coordinate system planning.
Must have regard to 'aggregate impact' on TNSP and DNSP's network (rather than just connecting NSPs network)	• Only assessing the adverse impacts from all connections on the connecting NSP's network will not solve for system stability risks to the wider interconnected system. • Retains connecting NSP's role to approve connection, and flexibility to ensure compliance costs are commensurate with system security risk.
Modelling requirements are determined by NSP based on updated AEMO guidance No guidance is provided by the AEMC	• AEMO's Power System Model Guideline is the correct instrument to offer guidance to NSPs on what models and studies are required to demonstrate performance. • The level of modelling effort cannot be fairly reflected within the AEMC's tiered classification framework and may confuse or contradict best practice. Expectations must: o Balance time and cost for developers o Capabilities of parties involved in the day-to-day connection process to produce and validate models o Power system risks from NSPs not having access to a particular modelling result.

AusNet would welcome further discussions with the AEMC about the merits of its alternative tiered classification framework, including how it would better achieve its objectives and be practically applied.

4. Fit-for-purpose access standards

The scope of performance requirements identified in the draft rule reflect known IBL integration needs in the NEM.

AusNet supports technical performance and modelling requirements for connection being updated to better reflect and respond to the behaviour of data centres' power-electronic components and their different workloads.

The following table comes from our soon to be released *Integrating Data Centre White Paper*, which takes an evidence-based approach to identifying the scope of 'potential performance concepts' policymakers should consider to safely integrate transmission and distribution-connected IBLs. It draws on Bespoke Energy's recent experience supporting NEM data centre connection applications and modelling control systems – addressing the most pressing power system impacts from IBL whilst aligning with known capabilities of data centres and their OEMs today.

The scope of performance requirements identified in the draft rule broadly aligns with our *Integrating Data Centre White Paper*. The main area of difference is the absence of requirements to manage large, fast operating ramp-ups or ramp-downs in data centre loads, as explored further below.

Table 1: Scope of potential performance concepts to safely integrate transmission and distribution-connected inverter-based loads

Performance requirement	Descriptions
Fault ride through disturbances	• Must ride through credible network faults at the point of connection for a time equal or greater than the primary protection clearance time at the associated point of connection voltage • Avoid protection systems that operate in response to multiple successive faults
Post fault behaviour	• Reconnection of IBL to commence within a defined timeframe following a return to voltage to normal range • Active and reactive power must recover to pre-fault levels within defined time limits
Frequency stability	• Operate continuously between 49-51Hz (i.e. within normal operating band) • Withstand rate of change of frequency (**RoCoF**) events (e.g. +/-2 to 4 Hz subject to study) without tripping • Frequency dependent controls must not induce additional oscillations
Voltage stability and reactive power	• Remain connected within defined steady-state voltage range • Provide reactive support or operate at near-unity power factor • Ride through rapid phase angle shifts
Active Power Ramping	• Active power ramp-up / ramp-down limited to agreed MW/s • Start up, shutdown and step-load changes must be managed to prevent voltage flickers • Data centres with UPSs are to be capable of reducing rapid active power changes and have this functionality enabled
Power quality	• Data centre facility must be designed, operated and controlled such that its connection to the power system does not adversely impact power quality for other Network Users • Voltage fluctuation: the data centre must manage normal, operations, start-up, shutdown, load steps, UPS transfers and fault recovery to limit voltage fluctuation at the connection point. Step changes in active and reactive power must be controlled to avoid excessive voltage deviations • Voltage unbalance: the data centre must not cause or contribute to voltage unbalance at the connection point beyond agreed planning and operational limits • Voltage and current harmonic distortion must comply with AS/NZS 61000 limits or site-specific harmonic limits determined through connection studies • Electromagnetic Interference (**EMI**): the data centre facility must not generate conducted or radiated EMI
Oscillation mitigation	• Control system must be tuned to avoid forced oscillation and harmonic amplification • Active participation in oscillatory events must be monitored and the NSP informed (warning)
System strength requirements	• Must meet minimum short circuit ratio (**SCR**) threshold or implement mitigation solution.

The final rule should consider a requirement to manage fast operational ramping of data centres, which left unaddressed can increase duty on FCAS and reactive power margins.

Rapid changes in data centre power demand (ramping behaviour) can have material impacts on grid operations. Large inverter-based loads can ramp demand bidirectionally by hundreds of megawatts in seconds which impacts the grid even when the site is operating normally, and especially when multiple large loads are geographically concentrated.[7]

Demand variability and ramp rates can vary for each data centre facility, and the aggregate impact of multiple sites are not necessarily coordinated with system stability needs. This large, fast acting-variable behaviour can introduce complexity for system operators in maintaining frequency stability and increase duty on FCAS markets. Unless regulation FCAS and/or contingency FCAS volumes are raised in the NEM, we may have inadequate frequency response capability to manage the variability of IBLs when connected at scale.

During system normal operation, seconds-scale AI clusters widen short-term frequency deviations and also increase the duty on frequency control and reserve provision. This recognises regulation frequency response capability is tuned for many small, uncorrelated variations, not step-changes of hundreds of megawatts.

Rapid load ramping may also have implications for management of reactive power to maintain stable voltage levels on the relevant network. Specifically:

1. **Whether there will be sufficient quantum of dynamic VAR support available to reflect load growth driven by data centres and other demand drivers.** In Victoria, VAR support comes from existing synchronous generators, capacitor banks and a small fleet of SVCs. Much of the former is expected to retire reducing reactive power margins. This shortfall will need to be replaced at the same time demand for VAR support is expected to increase.
2. **Whether the rate of change in data centre load will increase the need for technologies capable of providing fast acting VAR support (e.g. SVCs, STATCOMs).** Existing VAR technologies such as capacitor banks may not be able to respond and be switched in by network operators quickly enough to stabilise voltage.

Technological advancements mean this is a rapidly evolving space and we anticipate that ramping behaviour will become less peaky over time. However, power system operators and planners are required to make power system integrity decisions based on current and worst-case data and experiences, meaning that managing load performance to minimise adverse system impacts must be prioritised.

In many jurisdictions, technical requirements do not specify maximum permissible ramp rates (up/down) or limits on the rate-of-change of power, leaving operators exposed to sharp changes.

We suggest the final rule considers a requirement introducing active power ramp-up / ramp-down limits to agreed MW/s to reduce duty on FCAS markets and fast acting VAR support. The AEMC could also consider whether a change to the market could be allowed that enabled data centres to procure FCAS to cover their impact.

AusNet's has areas of targeted feedback on the proposed performance standards.

AusNet has considered the draft performance requirements in detail and identified some areas of targeted feedback:

Performance requirement	
Multi-fault ride through (S5.3.3)	**We support the proposed clause for multi-fault ride through as a general requirement to address disturbance counter logic (rather than automatic standard).** International experience demonstrates some data centres use disturbance counters or similar logic within their UPS systems. This logic is typically intended as a last-resort safeguard, on the assumption that repeated dips indicate an unstable or permanently faulted upstream supply. It can trigger mass coincident disconnection from the grid and transfers to back up after ordinary faults. Left unaddressed, this would appear to the system as a sudden contingency (as previously experienced in the NEM). NSPs across the NEM have experience addressing similar issues for wind farms. A key learning has been the difficultly to clearly define 'multiple disturbance' scenarios that plant should ride through under an automatic access standard (**AAS**). For example, simply stating a plant should be able to ride through "15 faults within 10 minutes" is confusing and may only be one of many possible scenarios. For this reason, we support the current approach to set multi-fault ride through as a general requirement.

[7] NERC Large Loads Task Force (2025), *Characteristics and Risks of Emerging Large Loads*, July 2025

System Strength (S5.3.11)	**Supports flexibility to negotiate SCR requirements, but suggests thought is given to who will bear costs from IBL exempt from the requirement.** We support the draft rule proposing a minimum short circuit ratio (SCR) of 3.0 or a reasonable higher value (i.e. lower plant performance) agreed with the NSP and AEMO. We agree this provides flexibility to balance plant capability on a case-by-case basis. To manage weak local network conditions, it may be appropriate to allow a reasonably 'lower value.' We note that Tier 1 connections will be exempt from system strength obligations under the draft rule, as will Tier 2 connections subject to NSP views on expected impact. Given IBL plant is traditionally grid following, we encourage the AEMC to consider who will bear the costs of remediating these IBL and if this is appropriate. For example, over the next decade the aggregate volume of IBL consuming but not paying for system strength will grow and may require remediation at a system level.
Frequency ride through (S5.3.12)	**We support the introduction of frequency ride through requirements.** Large-scale, near-instantaneous data centre disconnections (i.e. mass transfers to backup) create a positive contingency (where generation exceeds load) so frequency rises quickly and regulation/primary frequency controls must arrest and return it to the normal operating band. Our view is that frequency instability risks are best managed by prioritising the underlying drivers, such as the proposed ride through requirements (and underfrequency load-shedding requirements in S5.3.10). AusNet is not aware of any barriers to adopting S5.3.12. Our understanding is that data centres have demonstrated capability of ride through a wide range of frequency deviations, including in power systems where the nominal frequency is 50 Hz or ~60 Hz.
Voltage ride through (S5.3.13)	**We support the proposed clauses requiring data centres not to disconnect following a voltage disturbance, noting the MAS is appropriate for most (but not all) connections.** International experience demonstrates many data centres may disconnect from the grid during even minor grid fluctuations due to restrictive voltage and frequency protection settings. Due to similar control philosophies across data centres, transfers to backup or staged shutdowns tend to occur coherently rather than independently, increasing the risk of wider system instability. AusNet supports introducing voltage ride through requirements to address potential adverse impacts on system security and avoid customer outages. IBL should not be permitted to disconnect in any circumstance as is currently the case for loads under the NER. We have reviewed the specific timeframes the proposed automatic and minimum access standard require data centres to hold on following a disturbance. This includes considering whether these timeframes are suitable for the different protection and breaker clearance timeframes across AusNet's networks. We have concluded that the minimum access standard (**MAS**) requirement for data centres to hold on for at least 140 ms is appropriate for most circumstances because: • At most points of connection of our distribution network (66, 22 kV) and all points of connection on our transmission network (220 kV and above) faults clear within 100 ms. • International experience suggests data centres are already meeting performance requirements to hold on for a minimum of 150 ms during a voltage disturbance. We have also found an AAS of 240 ms (for voltage drop below 70% of nominal voltage) is required to provide flexibility for DNSPs to respond to fringe cases. For example, where a data centre seeks to connect at the end of a very long line in a weak part of the distribution system. In these types of network condition, there is a risk primary protection fails and the data centre would be expected to hold on until a circuit breaker can clear the fault. AusNet suggests additional guidance may be useful to acknowledge the MAS is likely to be appropriate in "most circumstances", and avoid additional cost and uncertainty for IBL subject to voltage ride-through requirements.

Active power recovery (S5.3.13)	**We encourage the AEMC to consider how the proposed active power requirements could better mitigate IBL reconnection risks following a disturbance clearance.** AusNet agrees that staying connected is not sufficient to manage ride through risk as the load could reduce its active power without disconnecting, and that this necessitates active recovery requirements. We are however interested in further testing whether the performance standard requiring IBL to return to within 90-110% of its pre-disturbance active power level within 500 ms under the AAS and 1 second under the MAS appropriately reflects the needs of the power system. While we agree the ability for IBL to recover quickly is important to voltage stability, it is not the only risk. There are scenarios where data centres may reconnect too quickly (and others too slowly) following a disturbance. Where a data centre has islanded on UPS/generators, an uncoordinated or very fast reconnection can create secondary frequency and voltage swings. For example, a data centre that comes back too quickly following a disturbance can cause the recovering grid voltage to drop below 70% of nominal voltage again and re-trip connected plant. This is a key difference from inverter-based resource connections where a generator in the same situation injects power, returning voltage to pre-disturbance levels. We encourage the AEMC to consider whether the rule could be designed to offer staged reconnection of IBL, with defined dwell times between groups of load and explicit ramp-rate limits at the connection point. This approach mitigates uncertain reconnection risks and supports stable system balancing. There are also other potential solutions that could mitigate this risk and may be necessary if all data centres are encouraged to reconnect within 500 ms. For example, it may be that the most efficient pathway to resolve reconnection risks is to require a connection applicant to install fast acting VAR support technologies on a case-by-case basis depending on the point of connection. In any case, we see value in technical studies being conducted to make sure we have a load reconnection performance standard that is compatible with the frequency and voltage recovery capabilities of the NEM.