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Thursday, 19 June 2025

Ms Anna Collyer
Chair
Australian Energy Market Commission

Lodged online: www.aemc.gov.au

Project Ref: ERC0394

Dear Anna

AEMC Improving the NEM access standards - Package 2

Transgrid welcomes the opportunity to respond to the Australian Energy Market Commission's (**AEMC**) Improving the NEM access standards - Package 2 consultation paper. The consultation paper is in response to three Rule change requests submitted by the Australian Energy Market Operator (**AEMO**) and Rod Hughes Consulting (which submitted two separate rule change requests). These requests relate to the access standards for connection to the National Electricity Market (**NEM**).

Transgrid supports the review of the technical requirements for connections, specifically loads, and appreciates the AEMC's intent to provide clarity through amendments that ensure the standards are fit for purpose to reflect the increasing and evolving connections. We support the intent of the Rule changes requests and several amendments proposed by AEMO and Rod Hughes Consulting. These are highlighted in our attached submission. However, we also have several concerns with the proposed changes. These include:

- **Amendments to the NER to support the projected increase of large loads** – Our concerns include:
    - We do not believe a definition of large loads is necessary in the context of the current rule change proposal.
    - Whilst we support the change to limit short circuit ratio requirements to large inverter-based resources and allowing flexibility to relax short circuit requirements, we believe broader issues need to be addressed in the System Strength Impact Assessment Guidelines for this to be an effective change.
    - We support the proposal to require network users to provide information about load ride-through capability and to allow Network Service Providers **(NSP)** to document the ride-through capability in the performance standards.
    - Regarding the proposal to optimise the protection settings to maximise the ride through performance, we agree with the intent of the proposed rule. However, defining the rule relative to a load facility's "protection system" as defined in the NER may not capture all elements of the plant which may limit ride-through capability.
    - We support the intent of the proposed rule that highlights the under-frequency ramp down of large loads. However, AEMO's proposed drafting simply states that fast ramp down *may* be used to satisfy the requirement to provide automatic interruptible load. The wording of this proposed rule change should incentivise the provision of this capability. Currently the word *may* might not

achieve this. Where the capability to provide fast ramp down (or a proportional response) during under-frequency events exists in a facility, we believe S5.3.10 should include provision to incentivise this to be provided.

- **Proposal to clarify protection system requirements –** The proposed new definitions for protection systems and reclassification of S5.2.5.9(b) could significantly alter protection system design requirements for connecting plant and potentially impose substantial additional costs on projects.
- **Credible contingency definition for disturbance ride through –** Transgrid does not consider the current definition of credible contingencies to be problematic. We believe it is not feasible to provide a definitive list of non-credible contingencies that may be reclassified under abnormal conditions for the entire lifetime of a plant. Emergency control schemes and operational measures will continue to play a critical role in maintaining system security during non-credible contingencies and reclassified events.

  Regarding AEMO's draft rule, which requires plants to remain in continuous uninterrupted operation **(CUO)** for both credible and reclassified non-credible contingencies under the Automatic Access Standard **(AAS)** and Minimum Access Standard **(MAS)**, we recommend:

  - Flexibility for an appropriate negotiated access standards **(NAS)** where a plant cannot ride through a reclassified event, and;
  - Clarification on acceptable mitigation measures.

Our attached submission provides further commentary on the above-mentioned points and our responses to the AEMC questions that are included in the AEMC's consultation paper.

We appreciate the opportunity to provide a submission to the consultation and look forward to continuing to work with the AEMC to continue to ensure that the proposed changes to the NEM access standards do not have unintended consequences. If you or your staff require any further information or clarification on this submission, please contact Zainab Dirani, Policy and Advocacy Manager at zainab.dirani@transgrid.com.au.

Yours faithfully

Kasia Kulbacka

General Manager of Network Planning

Transgrid's response to AEMC's Improving the NEM access standards – Package 2 Consultation paper

1. Overview

Transgrid welcomes the opportunity to respond to the Australian Energy Market Commission's (**AEMC**) Improving the NEM access standards - Package 2 consultation paper. AEMC's consultation paper covers three rule change requests:

1. AEMO's Improving the NEM access standards – Package 2. This request proposals changes to Chapter 5, Schedule, 5.2, 5.3 and 5.3a.
2. Rod Hughes Consulting - Definitions of protection system requirements. This request proposes updating some NER definitions and adding new definitions to improve clarity in Schedule 5.1 and Schedule 5.2
3. Rod Hughes Consulting - Conditions for generator protection systems. This request proposes correcting a drafting inconsistency in the access standards for generator protection systems

Transgrid acknowledges there is an emerging need to amend National Electricity Rules (**NER**) to accommodate for increasing and evolving load connections.

1.1. Amendments to the NER to support the projected increase of large loads

There is a high likelihood of significant new large loads in the NEM in the next 10 years. To accommodate for this, amendments to the NER and supporting guidelines will be required to ensure system security is maintained and performance standards for large loads are appropriate.

We support the intent of this consultation and AEMO's Large Loads Review[1]. Our key views are highlighted below.

- **Defining large loads in the context of this rule change request**
  We believe the definition of *large loads* does not need to be considered beyond what is defined as a *large inverter-based resource* in the System strength impact assessment guidelines (**SSIAG**). As such, guiding principles and timing for AEMO to produce a proposed definition for large load is not required currently; however, providing guiding principles for the overall Large Load Review (which may include defining large load) may have merit.
- **Limiting short circuit ratio requirements for customer loads to IBR, and introducing flexibility to the access standard**
  The proposed rule change to limit short circuit ratio requirements has merit, however, without addressing broader issues associated with the modelling of large loads and the criteria / assessment methodologies specified in the SSIAG, the intent of the proposed rule change may not be achieved.
- **Provision of information on ride-through capability**
  We support the proposal to require network users to provide information about load ride-through capability and to allow Network Service Providers (**NSP**) to document the ride-through capability in the performance standards.
- **Protection settings to maximise ride-through performance**
  While we agree with the intent of the proposed rule, defining the rule relative to a plant's "protection system" as defined in the NER may not capture all elements of the plant which may limit ride-through capability. This issue can be addressed by defining access standards for ride-through performance, however, in the interim, we propose the AEMC consider the proposed rule to ensure it can be applied

[1] See AEMO website - https://aemo.com.au/consultations/current-and-closed-consultations/aemo-review-of-technical-requirements-for-connection

more broadly to any system where conservative settings or actions might result in unnecessarily poor ride-through performance.

- **New access standard for detection and response to instability**

  While we support consideration of instability monitoring requirements for large inverter-based loads, we note:

  - There is a lack of understanding of inverter-based load instability modes and the nature of the risk inverter-based load (**IBL**) poses to system stability.
  - Unlike NER Schedule 5.2 (for example, per S5.2.5.13(d)(1)), there are no separate stability requirements in Schedule 5.3. The requirements are limited to one brief statement in paragraph (e) of AEMO's proposed S5.3.12 draft rule.

  Given the present lack of understanding and specific requirements for IBL instability, we believe that the implementation of specific access standards for the detection of instability and a subsequent hierarchy of actions is premature. We recommend AEMO undertake further investigation on the instability detection requirements for loads as part of AEMO's Large Load Review. At this stage, Transgrid does not support imposing the same, highly prescriptive Automatic Access Standard (**AAS**) requirements for instability detection/protection schemes of IBLs under clause S5.3.12, similar to those applied to generators and integrated resource systems (**IRS**).

- **Under-frequency ramp down of large loads**
  We support the intent of the proposed rule that highlights the under-frequency ramp down of large loads, we have concerns with AEMO's proposed drafting. This is because currently there is no requirement for the "Schedule 5.3 Participant" to provide this capability. The proposed drafting simply states that fast ramp down **may** be used to satisfy the requirement to provide automatic interruptible load in accordance with clause 4.3.5 of the Rules. Where the capability to provide fast ramp down (or a proportional response) during under-frequency events exists in a facility, we believe S5.3.10 should include provision to incentivise this to be provided.

- **Items requiring further attention that are not covered by this rule change proposal or AEMO's ongoing Large Loads Review:**

  While we support most aspects of the present rule change proposal and AEMO's ongoing "Large Loads Review". We understand that AEMO's Large Loads Review is out of scope for this consultation, however we want to make the following points regarding AEMO's Large Loads Review:

  - Nationally and globally available large load models at this stage lacks maturity, and in many cases plant specific OEM models are not readily available. For example, currently available OEM models are not fit for purpose to demonstrate NER requirements, such as clause S5.3.11(b)).
  - Currently under the Rules, the system strength framework is applicable to IBLs and the criteria / assessment methodologies are detailed in the SSIAG. However, the definition of IBL is unclear, and the assessment methodologies was developed mainly considering generators and integrated resource providers and may not be readily suitable for loads. Therefore, we recommend there needs to be greater clarity for loads in SSIAG and how it is assessed.
  - We believe the potential impact of sudden unscheduled changes in demand of data centres needs to be considered. International observations with existing AI data centres indicate that the demand of AI data centres can change rapidly with changes to AI workload. We understand that data centres may not classify as a scheduled load and therefore could significantly change demand at any time. Given

the size of many proposed data centre facilities, this may have a substantial impact on the network and is worth further consideration by AEMO.

We encourage AEMC clarify the unit classification of data centres as part of their consultation to these Rule changes. Given the nature of IT loads, data centres may not fall under the scheduled load category. If they are not classified as scheduled loads, they could significantly alter their demand at any time (especially with AI training workloads). This could lead to an adverse impact on the network.

1.2. Proposal to clarify protection system requirements

The Rod Hughes Consulting rule change request proposes to add or update several NER definitions around protection systems and adjust the wording of some of the relevant clauses. They believe this would improve clarity. The wording changes are outlined in the consultation paper.

Transgrid does not support the proposed new definitions for protection systems and reclassification of S5.2.5.9 (b) currently in AAS under clause S5.2.5.9 to Minimum Access Standard (**MAS**). We believe this change could significantly alter protection system design requirements for connecting plant and potentially impose substantial additional costs on projects.

We support the inclusion of definitions for “Primary protection system” and “Back-up protection system” in the NER, provided they are defined based on the functional requirements. However, we have reservations regarding the proposed definitions by Rod Hughes Consulting in their Rule change proposal. In summary we believe the current drafting is unsuitable for incorporation into the NER.

As discussed in Section 2, an in-depth review is needed if the AEMC intends to apply these new definitions in the NER (including Schedules 5.1, 5.2, 5.3 and 5.3a). These clauses serve different purposes, and applying uniform definitions without careful consideration could lead to unintended consequences. We recommend that the AEMC review all affected clauses and include another stage of reviews before publishing the Draft Determination and Rule.

The Rod Hughes Consulting rule change claims that clause S5.2.5.9(b) is redundant. Whilst we acknowledge that the clause heading of clause S5.2.5.9 is unclear, we do not consider paragraph S5.2.5.9(b) redundant. For example, in relation to inverter-based generator connections, at the Medium Voltage (**MV**) or Low Voltage (**LV**) levels, redundancy via full duplication of the protection system is typically not provided by the connecting proponents. Instead of full duplication, remote back-up protection systems, coordinated through time grading and implemented via upstream devices, is used to clear faults when the primary protection system fails. This design practice has been generally accepted by Transgrid, as MV or LV protection systems typically do not pose a material risk of adverse impacts to the broader network. Currently most generator and integrated resource projects can meet the AAS due to the flexibility afforded by clause S5.2.5.9 (b). The consequences of removing clause S5.2.5.9 (b) from the AAS would require generating systems or integrated resource systems to implement full duplication of protection systems from the downstream LV system up to the Connection Point in order to meet the ‘sufficient redundancy’ requirement under clause S5.2.5.9(a)(2). This will lead to additional costs to connecting proponents and likely result in more proponents submitting applications under the Negotiated Access Standard (**NAS**), placing an additional burden on AEMO, NSPs, and proponents. Given the above reasoning, Transgrid does not support the proposed changes to clause S5.2.5.9 or the reclassification of S5.2.5.9 (b) to the MAS.

To mitigate the risk of unintended consequences, we recommend a comprehensive review of the proposed changes to the Rules. Further reasoning is included in the table contained in section two of this submission.

1.3. Credible contingency definition for disturbance ride through

As outlined in the AEMC's consultation paper, AEMO has proposed that the AEMC amend the NER to clarify and restrict the scope of credible contingency events in relation to the AAS and MAS for disturbance ride through capability of schedule 5.2 plant.

Transgrid does not consider the current definition of credible contingencies to be problematic. We believe that the existing planning and operational frameworks already consider non-credible contingencies and the required measures to maintain system security. In particular, the reclassification process is a critical mechanism that enables NSPs and AEMO to implement necessary operational measures to maintain power system security. Within the planning framework, Transgrid notes that clause S5.1.8 already enables NSPs to consider non-credible contingency events that could endanger power system stability and to implement appropriate mitigation measures such as emergency control schemes

In our view, it is not feasible to provide a definitive list of non-credible contingencies that may be reclassified under abnormal conditions for the entire lifetime of a plant. Reclassification depends on factors such as network configuration, network outages, and abnormal conditions (e.g., severe weather events). Neither AEMO nor NSPs can commit to a complete list at the time of connection, and the practical value of an indicative list without associated certainty is likely to be limited.

That said, if such a list deemed necessary, Transgrid proposes that AEMO and the NSPs maintain a dynamic list of non-credible contingencies likely be re-classified as credible under certain conditions. This list could be developed and maintained through the Power System Security Working Group **(PSSWG)** and incorporated into AEMO's *Power System Security Guidelines* (SO_OP_3715). A relevant subset of this list could be provided to Applicants at the time of their Connection Application. However, such a list would not be exhaustive, and emergency control schemes and operational measures will remain essential for managing system security in the event of reclassification.

Transgrid also notes that the draft rule requires plant to remain in continuous uninterrupted operation **(CUO)** for both credible and reclassified non-credible contingencies under the AAS and MAS. While Transgrid supports CUO for credible contingencies under the MAS, we recommend flexibility for an appropriate NAS where a plant cannot ride through a reclassified event. The NER should clarify acceptable mitigation measures, including emergency control schemes and/or agreed operational responses such as output constraints or temporary disconnection to manage system security.

2. Transgrid's response to AEMC's questions

The following table contains Transgrid's responses to the AEMC's questions.

AEMC Questions	Transgrid response
Question 1: Defining large loads in the context of this rule change request. In the context of this rule change request and AEMO's ongoing consideration of the definition for large loads through its Large Loads Review:	
1. Are stakeholders supportive of AEMO's ongoing process to address the system security implications and performance standards for large loads, including how large loads ought to be defined in the NER?	We agree that amendments to the NER and supporting guidelines are required to address system security implications and performance standards for large loads. In general, we support the intent of the present rule change proposal and AEMO's ongoing "Large Loads Review", however, we believe that there are issues not presently captured in the rule change proposal or the Large Loads Review. We would recommend that AEMO's Large Load Review be extended to consider: 1. The current state of large load modelling (globally and in Australia), availability of plant specific models and an interim modelling approach to address existing assessment requirements (e.g. per NER clause S5.3.11(b)) for situations where the presently available models are not fit for purpose. 2. Application of the system strength framework to large inverter-based loads and the criteria / assessment methodologies detailed in the system strength impact assessment guidelines. Regarding how large loads ought to be defined in the NER, we note that there was a wide range of views on this matter when raised with stakeholders at AEMO's first workshop of the Large Loads Review on 26 February 2025. Based on stakeholder responses during the workshop, explicit definition of a large load may be challenging and will likely require extensive consultation. Please see further discussion below and in our response to Question 2 on this matter
2. To what extent do stakeholders think that the Commission should consider the definition of 'large loads' in the context of this rule change?	In the context of this rule change proposal, the definition of "large loads" does not need to be considered beyond what is defined as "large inverter-based resource" for the application of short circuit ratio requirements (proposed changes to S5.3.11) and detection and response to unstable operation requirements (proposed new clause S5.3.12). The system strength impact assessment guidelines specify criteria for "large inverter-based resource" and given the present structure of the system strength framework, this is the appropriate

AEMC Questions	Transgrid response
	place to define this. We do however believe that the criteria / assessment methodologies detailed in the system strength impact assessment guidelines need to be reviewed.
3. If it is considered, should large loads be defined based on the relevant access standard, or should a large load be more holistically defined in the NER?	This should be considered as part of AEMO's ongoing Large Loads Review and is not required[2] in the context of this rule change.
4. Alternatively, should we consider whether to apply guiding principles and timing for AEMO to produce a proposed definition, which is currently being considered in AEMO's Large Loads Review?	The proposed rule change does not rely on a definition for large load[3] and AEMO are yet to put forward a rule change proposal based on the outcomes of the Large Loads Review. However, guiding principles for the overall Large Load Review (which may include defining large load) and timing for AEMO to complete the review may be beneficial.
Question 2: Amending the NER to address the influx of large loads	
1. Do stakeholders have any reflections or data and information they wish to share with the AEMC regarding the prospective growth of large loads connecting to the NEM, including from international experience?	Transgrid have received a significant number of connection enquiries (summarised below) for large load connections in recent years. We presently have data centre connections up to a total of 1.0 GW at the pre-application stage. As noted on page 18 of the consultation report, only a portion of the connection enquiries received will progress to a connection application and ultimately construction and commissioning, however, we agree that this indicates that there is likely to be significant growth in the number and size of load connections. Summary of data centre connection enquires received by Transgrid since 2021 is shown below:

[2] Provided the proposal is not altered to include specific access standards for ride-through capability or other technical requirements that would rely on a definition for large load.

[3] Other than large inverter based resource, which is defined in the system strength impact assessment guideline.

<table>
<tr><th>AEMC Questions</th><th>Transgrid response</th></tr>
<tr><td></td><td>
<table>
<tr><th>Year</th><th>Number</th><th>Total Capacity (MW)</th></tr>
<tr><td>2021</td><td>1</td><td>600</td></tr>
<tr><td>2022</td><td>4</td><td>675</td></tr>
<tr><td>2023</td><td>0</td><td>0</td></tr>
<tr><td>2024</td><td>11</td><td>5895</td></tr>
<tr><td>2025</td><td>3</td><td>3150</td></tr>
</table>

Transgrid has also received a connection enquiry of large Hydrogen electrolyser connection with a maximum demand of 1.5 GW.</td></tr>
<tr><td>2. Do stakeholders agree with AEMO that the expected growth of large loads may present a risk to power system security?</td><td>Yes. Furthermore, this appears to be the consensus of international task forces organised by NERC and ESIG on large load connections.</td></tr>
<tr><td colspan="2">Question 3: HVDC links to procure system strength services from third parties. In relation to AEMO’s proposal to amend NER clause S5.3a.7 to allow all HVDC links to procure system strength services to meet the short circuit ratio requirement of 3.0:</td></tr>
<tr><td>1. Do stakeholders agree that the NER should be amended to allow HVDC link owners to procure system strength services from third parties? Is the current inability to do so a material problem, or will it become a material problem?</td><td>Transgrid supports this.

To date this has not been identified as a material problem, but Transgrid understands that future HVDC link owners will face this challenge.

However, in general, Transgrid believes that system strength contracts between IBRs/HVDC link owners and other third parties can make the system strength support arrangement more complex, including in the operational timeframe, compared to having a single entity.</td></tr>
<tr><td>2. Do stakeholders consider the proposed rule should replicate the corresponding NER clause S5.2.5.15 for generating systems and IRS to promote consistency?</td><td>Having a consistent approach similar to generating systems and IRS promotes consistency.</td></tr>
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AEMC Questions	Transgrid response
3. Do stakeholders consider that procurement should be subject to agreement between the HVDC link owner, NSP, system strength service provider, and AEMO? Do stakeholders have any views as to how involvement from AEMO in such an agreement would operate?	Procurement should be subject to agreement between the HVDC link owner, NSP, system strength service provider, and AEMO. Transgrid sees the involvement of NSPs, SSSPs and AEMO would be required to validate that there is sufficient/appropriate procurement to achieve stable voltage waveforms and that appropriate arrangements are in place so that in the operational timeframe, sufficient stable voltage waveform support is available even if the 3rd party 'solution' trips or is offline for maintenance or other purposes.
4. Are there alternative solutions stakeholders consider would be more effective?	Considering the complexities involved (including operationally), Transgrid believes that IBR/HVDC link owners procuring system strength support from a third party should not be considered as the primary option. However, it may be considered if other options, including additional investment by the Schedule 5.3a participant or an arrangement with the NSP/SSSP, are not viable.
5. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule? If so, please describe your concerns and any related suggestions and reasoning.	Generating systems and IRS have a single point of connection at the interface point to the connecting network. However, HVDC link includes two interface points with the connecting network and the system strength at the two interface points may be significantly different. Transgrid suggests taking this into consideration when applying the current approach for generating systems and IRS to HVDC. Transgrid suggests clarifying whether the expectation is for both interface points to meet the minimum short circuit ratio of 3.
Question 4: Limiting short circuit ratio requirements for customer loads to IBR, and introducing flexibility to the access standard	
In relation to AEMO's proposal to limit the application of short circuit ratio requirements under clause S5.3.11 to large inverter-based resources that is IBL:	
1. Do stakeholders consider it an issue that the short circuit ratio requirements under clause S5.3.11 apply to all IBR plant without any size threshold?	Transgrid supports the proposed change to limit the application of short circuit ratio requirements to large inverter-based resource. While we agree that the SSIAG is the appropriate place to define criteria for large inverter-based resource, we believe the criteria (presently set at 5 MW or 5 MVA)

AEMC Questions	Transgrid response
a) Should it only apply to large inverter-based resources as defined in AEMO's SSIAG? b) Is the definition of a large inverter-based resource in the SSIAG sufficient for the purposes of this proposal?	should be reviewed. Please also see the response to item 3 of this part of Question 4 below for further discussion on limitations with other criteria defined in the SSIAG.
2. Are there alternative solutions stakeholders consider would be more effective?	Given that the present rule change proposal does not include changes to the system strength framework or the SSIAG, we see no alternative solutions.
3. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule? If so, please describe your concerns and any related suggestions and reasoning.	In general, we have no concerns with the change to limit the application of short circuit ratio requirements to large inverter-based resource. We do however have concerns with the relevant criteria and compliance assessment methodologies specified in the SSIAG. Regarding the present drafting of the proposed rule for S5.3.11, the main areas of concern are: 1. The SSIAG does not specify criteria for inverter-based load beyond what is presently included in the rules definition, resulting in ambiguity as to what is classified as inverter-based load. In particular, the SSIAG is silent on what is "potentially susceptible to inverter control instability". 2. The practicality and appropriateness of the SSIAG methodology for demonstrating withstand SCR for large loads. Please see further comment on this below in item 3 of the second part of Question 4.
In relation to AEMO's proposal to amend the NER to introduce flexibility in clause S5.3.11 to allow the NSP and AEMO discretion to agree to a minimum short circuit ratio requirement above the minimum requirement of 3.0:	
1. Do stakeholders agree there should be flexibility to agree to higher short circuit ratio requirements? Could there be unintended consequences?	In general, we agree that flexibility to specify a higher short circuit ratio requirement may be appropriate in some circumstances. We understand that AEMO's reasoning for this recommendation came from discussions with OEMs who identified that some IBL technologies (e.g. thyristor-based converters) may not be able to operate at an SCR of 3.0. Where the proposed IBL

AEMC Questions	Transgrid response
	connection point is strong relative to the size of the plant, relaxing this requirement may be appropriate to accommodate these technology types.
2. Are there alternative solutions stakeholders consider would be more effective?	Given that the present rule change proposal does not include changes to the system strength framework or the SSIAG, we see no alternative solutions. Please see our response to item 3 below for further comment on this.
3. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule? If so, please describe your concerns and any related suggestions and reasoning.	While we agree that flexibility to specify a higher short circuit ratio may be appropriate in some circumstances, without addressing the broader issues associated with the SSIAG methodology for demonstrating withstand SCR, this may not achieve a great deal. Many customers presently do not have suitable PSCAD models to address the SSIAG requirements. Furthermore, there are concerns regarding the appropriateness of the methodology for demonstrating withstand SCR for large loads and we understand that this will be reviewed by AEMO. In the interim, where a customer proposes a higher SCR, the requirement that this be *"assessed in accordance with the methodology prescribed in the system strength impact assessment guidelines"* means that demonstrating compliance may not be possible.
Question 5: New definitions for protection systems - In relation to Rod Hughes Consulting's Definitions of protection system requirements rule change request:	
1. Do stakeholders agree that the requirements for generator protection systems are currently unclear? If so, what are the impacts of this lack of clarity? a) Similarly, do stakeholders consider the requirements for loads' and HVDC links' protection systems are currently unclear?	In response to (1): • The clause heading "*S5.2.5.9 Protections System that impact on Security*" is not clear, it implies that the application of this NER clause is only applicable for protections which impact power system security. As a result, connecting parties may provide protection systems which result in downstream faults which are not cleared when primary protection or CB fails, as this clause heading suggests it only covers protection system which impact power system security. This is a concern for both clause S5.2.5.9 and clause S5.3.3 (Protection systems and settings) which is applicable to loads does not include similar heading.

AEMC Questions	Transgrid response
	• Regarding the phrase “must have sufficient redundancy” in the current NER, our interpretation is that it requires duplication of primary protection systems. However, the provision in clause S5.2.5.9(b) has allowed use of back-up protection system, particularly in MV and LV systems, where full duplication is not cost-effective. This approach has been accepted due to the relatively low risk of material adverse impact such systems have on overall power system security. In response to (1)(a): • No.
2. Do stakeholders support the proposal to update and add new NER definitions for types of protection systems? a) Do stakeholders have feedback on the proposed new definitions themselves?	Transgrid has concerns that several of the proposed definitions could significantly alter protection system design requirements and introduce substantial additional costs. Detailed feedback is provided in Appendix A. While we support defining 'Primary Protection System' and 'Back-up Protection System' in the NER based on functional requirements, we do not support the current definitions proposed by Rod Hughes Consulting, as outlined in Appendix A. If the AEMC intends to apply these definitions across the NER, including Schedules 5.1, 5.2, 5.3 (loads), and 5.3a (HVDC links), careful consideration is essential, as these clauses serve different purposes and may be affected in unintended ways. Transgrid recommends that the AEMC draft the relevant clauses using the proposed definitions and release them for further industry consultation to assess potential impacts.
3. Do stakeholders have any concerns or suggestions in relation to this element of Rod Hughes Consulting’s proposed rule? If so, please describe your concerns and any related suggestions and reasoning.	As above What has been proposed are more incremental or piecemeal in nature (in updating definitions) which are unlikely to deliver meaningful improvements. A comprehensive review of the rules is recommended to avoid unintended consequences.
Question 6: Conditions for generator protection systems - These questions relate to Rod Hughes Consulting’s Conditions for generator protection systems rule change request	

AEMC Questions	Transgrid response
1. Regarding the proposal to remove paragraph (b) of clause S5.2.5.9: a) Do stakeholders agree that paragraph (b) is redundant and/or misleading, or do stakeholders have a different interpretation? b) Do stakeholders support Rod Hughes Consulting's proposal to remove paragraph (b)?	a) Transgrid does not believe clause S5.2.5.9(b) to be misleading or redundant. b) Transgrid does not support the proposal from Rod Hughes Consulting to remove paragraph (b) from AAS. The rationale for Transgrid response is detailed below. **Current practice in designing protection systems** Generally, inverter-based generator or integrated resource system connections consist of a 33 kV bus with several collector feeders. Each collector feeder connects multiple production units (typically 3–8 MW each), with each unit equipped with a dedicated Ring Main Unit (RMU) that includes a circuit breaker and a single protection device. Redundancy in the form of duplicated protection is not required at the RMU level. Instead of duplication of the primary protection system, backup protection is provided at the collector feeder level, coordinated with the RMU protection through time grading. In many cases, RMUs do not have an auxiliary DC supply; their protections are self-powered from current transformers (CTs) and operate without communication links. As a result, conventional circuit breaker failure (CBF) protection is not applicable, and the remote backup protection at the feeder level effectively fulfils the CBF function for these RMUs. Protections on collector feeders are generally non-redundant, with backup protection provided by upstream devices such as busbar protection, also coordinated through time grading. **Removal of clause S5.2.5.9(b) from AAS** Above design practice is allowed under the current NER AAS as per the existing clause S5.2.5.9(b) and most projects can meet the current NER AAS. The design approach described above has been the accepted for the majority of the projects as MV or LV protection systems typically do not have a material adverse impact on the network. Removing paragraph (b) from AAS would result in requiring full duplication of protection systems from the downstream LV level up to the connection point to meet the AAS requirement for clause

AEMC Questions	Transgrid response
	S5.2.5.9(a)(2), significantly increasing project costs. It may also force Connection Applicants into the negotiated access standard (NAS) process unnecessarily, creating additional burdens for AEMO, NSPs, and Applicants. Transgrid believes the AAS should remain achievable at a reasonable cost while maintaining system security. Clause S5.2.5.9(b) currently provides the necessary flexibility for applying engineering judgment within the AAS framework.
2. Regarding the proposal to add a new provision in the minimum access standard: a) Do stakeholders agree that the minimum access standard may create risks to power system security because it does not require additional redundancy in protection systems? b) Do stakeholders support Rod Hughes Consulting's proposal to give AEMO and the NSP discretion to increase redundancy requirements in the minimum access standard if required to prevent adverse impacts on power system security?	a) No, Transgrid does not believe the current MAS clause S5.2.5.9(c)(2) poses a risk to power system security. Under S5.1.9(a)(2) NSPs are unlikely to set protection zones longer than 10 seconds. b) Transgrid does not support Rod Hughes Consulting proposal as drafted; however, we recommend that the MAS mandate provision of backup protection, where redundancy (duplication) is not provided. A suggested provision for the inclusion in MAS is: "All faults must be detected and cleared by protection systems considering a single failure."
3. Do stakeholders have any concerns or suggestions in relation to this element of Rod Hughes Consulting's proposed rule? If so, please describe your concerns and any related suggestions and reasoning.	Transgrid recommends the following additions to the MAS: • **Provision of Backup protection systems** where duplication is not feasible. • **Requirement that all faults be cleared considering a single failure** – either in protection systems or the circuit breaker required to clear the fault We are concerned that the proposed rule changes could lead to widespread use of the NAS process, requiring AEMO approval and increasing costs and inefficiencies. Regarding the comments by Rod Hughes Consulting on the use of the term "in protection zones that include the connection point" in S5.2.5.9 (a), Transgrid interprets this requirement as applying to the entire generating system or integrated resource system and not just limited to the protection zone at the connection point.

AEMC Questions	Transgrid response
Question 7: Provision of information on ride-through capability - In relation to AEMO's proposed changes to enable NSPs to request information on loads' ride through capability:	
1. Do stakeholders agree that NSPs and AEMO lack visibility of loads' ride-through capability and that this creates a challenge for system security?	Yes, and this is not just an Australian issue, international task forces (e.g. organised by NERC and ESIG) looking at large load connections have highlighted that system operators and transmission owners globally lack visibility of load ride-through capability and acknowledge the potential risk to system security.
2. Do stakeholders support AEMO's proposed rule to require network users to provide information about connecting load's ride-through capability to the NSP on request?	Yes, the first and most important step is to understand load ride-through capability, so that this knowledge might inform planning and operations to ensure system security.
3. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule?	No concerns.
Question 8: Protection settings to maximise ride-through performance - In relation to AEMO's proposed changes to amend clause S5.3.3(c) of the NER to encourage protection settings that maximise loads' ride-through capability:	
1. Do stakeholders agree that the current arrangements allow conservative load protection settings that may unnecessarily reduce loads' ride-through capability?	Yes, where there are no performance standards for ride-through capability, the protection designer is likely to apply conservative settings rather than undertaking further investigation to optimise protection settings to provide better ride-through capability while still providing adequate plant protection.
2. Do stakeholders support AEMO's proposed rule requiring cooperation between the NSP and the network user in the design of protection systems and settings to maximise ride-through capability?	Yes.
3. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule?	While we agree with the intent of the proposed rule, defining the rule relative to a plant's "protection system" (per Box 3 of the consultation report) as defined in the NER may not capture all elements of the plant that might limit ride-through capability.

AEMC Questions	Transgrid response
If so, please describe your concerns and any related suggestions and reasoning.	For example, the proposed rule will capture performance impacted by standard under voltage protection relay settings (ANSI 59) but may not capture performance impacted by other control systems where these systems do not fall within what is presently defined as a “protection system” in the NER. The defined use of a “protection system” in the rules is: “used to protect a *Registered Participant's facilities* from **damage** due to…” Data centre UPS control systems may disconnect IT load during voltage disturbances to maintain power quality under circumstances where no damage would occur to the “Registered Participant's facilities”. One might argue that these UPS control systems are not “protection systems” and therefore the proposed rule does not apply. Furthermore, the present rule change proposal may involve updates to the NER definitions pertaining to protection systems. While this issue may ultimately be addressed by defining access standards for ride-through performance, in the interim we suggest that the AEMC give further consideration to the proposed rule to ensure it can be applied more broadly to any system where conservative settings or actions might result in unnecessarily poor ride-through performance.
Question 9: New access standard for detection and response to instability - In relation to AEMO’s proposed new access standard for detection and response to instability that would apply to large inverter-based loads:	
1. Do stakeholders agree that there is an emerging need for large inverter-based loads to play a role in managing instability in the NEM?	Yes, in principle, inverter-based loads, depending on their size and the control modes available within the technology could contribute to network instability. Considering the developments in the inverter-based technologies, similar to the inverter-based generators, IBLs could potentially contribute to oscillations in the network in voltage and active/reactive power. However, at this stage, from Transgrid network perspective, there is not much evidence to support this, as many large-scale data centres are still in early stages of the connection process.
2. Do stakeholders support AEMO’s proposed new access standard for instability detection and response by loads as set out in Box 4?	a) Transgrid supports specifying the instability monitoring requirements for large inverter-based loads and if AEMO/NSP considers that the Schedule 5.3 plant could reasonably contribute to instability.

AEMC Questions	Transgrid response
a) Which parts of the proposal do stakeholders support, or oppose? b) Do stakeholders agree with the materiality thresholds for application of the automatic access standard and minimum access standard (see Table 4.2)?	However, it is important to clearly define the stability requirements applicable for Schedule 5.3 plants in the Rules. Currently, there is no requirement or criteria included in Rules for Schedule 5.3 plants to operate stably, although it is a requirement under Schedule 5.2. The requirements are limited to one brief statement in paragraph (e) of AEMO's proposed draft rule for S5.3.12. Therefore, we believe defining the stability requirements applicable to loads is important, before mandating prescriptive instability detection requirements for IBLs. We recommend AEMC investigating how stability requirements for IBLs can be incorporated into Schedule 5.3. Also, considering that at this stage industry lacks experience on this topic, we recommend AEMO further investigating the instability detection requirements for loads as part of AEMO's large load review. At this stage, Transgrid does not support imposing the same, highly prescriptive AAS requirements for instability detection/protection schemes of IBLs under clause S5.3.12, similar to those applied to generators and IRSs. b) The size threshold to apply the proposed new access standard require further consideration. Knowledge on the control modes which are typically included in the IBLs and the magnitude of oscillations which could be counted as critical (high impact) to certain locations in the network may need to be additional inputs for this clause and its applicability to certain projects. Materiality thresholds need to be decided with connecting location, impact on connection point voltage change and impact on other connected generators and loads nearby. These assessments may need to be made on a case-by-case basis, considering the specific impact on the power system.
3. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule? If so, please describe your concerns and any related suggestions and reasoning.	Similar to concerns raised regarding inverter-based generators, the requirement for disconnection capability in IBLs, as outlined in the proposed AAS, warrants careful consideration. Specifically, the associated protection functions must not be overly sensitive, as this could lead to false trips and unnecessary disconnection of plant. Furthermore, expectations around the actions to be taken following the detection of instability at the point of connection for IBLs may require further analysis. This is particularly important given the unique characteristics of load components, which differ significantly from those of generators. The feasibility and mechanisms for disconnecting IBLs should be evaluated in light of these differences

AEMC Questions	Transgrid response
Question 10: Under-frequency ramp down of large loads - In relation to AEMO's proposed changes to amend the NER to facilitate the ability for loads to ramp down:	
1. Do stakeholders agree some loads may be more flexible with the ability to ramp down their load in an emergency rather than disconnecting in blocks?	Yes, we agree. Further to the analysis presented in AEMO's review to support this[4], pilot studies conducted in Europe indicate that data centre UPS may be capable of providing fast frequency response. While AEMO noted that hydrogen electrolyser ramp rates might not be fast enough to use as an alternative to load shedding[5], based on the available public information on the European data centre trials, data centre UPS may be capable of a response to frequency disturbances in a similar manner and timeframe to that of BESS.
2. Do stakeholders agree that the NER should be amended to allow for the provision of interruptible load by way of fast ramp down?	We do agree that fast ramp down capability, in addition to the capability to disconnect load blocks during an under-frequency event, will increase flexibility to manage under-frequency events. However, we do have concerns with AEMO's proposed drafting of the rule. Please see our response to the next question.
3. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule? If so, please describe your concerns and any related suggestions and reasoning.	We have concerns with AEMO's proposed drafting, as there is no requirement for the "Schedule 5.3 Participant" to provide this capability, even where it is feasible. AEMO's proposed drafting simply states that fast ramp down ***may*** be used to satisfy the requirement to provide automatic interruptible load in accordance with clause 4.3.5 of the Rules. Publicly available information on European data centre fast frequency response trials indicates that data centre UPS may be capable of a proportional response to frequency disturbances similar to that provided by BESS and contemplated under clause S5.2.5.11 for "schedule 5.2 plant". Given the number and size of proposed data centre connections in NSW[6], disconnection of load in blocks may become impractical. Where the capability to provide fast ramp down (or even better, a

[4] Which was based on discussions with hydrogen industry OEMs.
[5] Hence the approach taken to retain the requirement to have the capability to disconnect load blocks.
[6] Since 2021, Transgrid has received ~19 data centre connection enquiries for over 10 GW of demand. We have customers advancing connection applications for facilities with a maximum demand in the order of ~600 MW and connection enquiries for facilities exceeding 1 GW.

AEMC Questions	Transgrid response
	proportional response) during under-frequency events exists, we believe S5.3.10 should include provision to incentivise this to be provided. One option to address this concern would be to include minimum and automatic access standards in clause S5.3.10 similar to the proposed drafting below. **"S5.3.10 Load shedding facilities** a. This clause S5.3.10 applies to *Schedule 5.3 Participants* ~~*Network Users* who are *Market Customers* and~~ who have expected peak demands in excess of 10MW. **Automatic access standard** b. The *automatic access standard* is a *schedule 5.3 plant* must provide automatic *interruptible load* in accordance with clause 4.3.5 of the *Rules*~~.~~, which must be capable of: 1. being *disconnected*; and 2. fast reduction. **Minimum access standard** c. The *minimum access standard* is a *schedule 5.3 plant* must provide automatic *interruptible load* in accordance with clause 4.3.5 of the *Rules*, which must be capable of being *disconnected.* **General requirements** d. The *performance standards* must record the nature of the *load shedding* capability provided as *interruptible load* under this clause S5.3.10, including any quantities of *active power* available for fast reduction and the corresponding rates of reduction. " e. *Load shedding procedures* may be applied by *AEMO*, or *EFCS settings schedules* may be determined, in accordance with the provisions of clause 4.3.2 of the *Rules* for the shedding of all *loads* including *sensitive loads*."
Question 11: Clarification of credible contingency definition for disturbance ride-through - In relation to AEMO's proposed changes to amend clause S5.2.5.5 of the NER to clarify the scope of contingency events that a schedule 5.2 plant must be able to ride through:	

AEMC Questions	Transgrid response
1. Do stakeholders agree that the current definition for the types of credible contingencies in relation to disturbance ride-through requirements for schedule 5.2 plant is unbounded/implied to be unbounded and that this presents an issue?	No. Transgrid considers the process of reclassifying contingency events under abnormal conditions to be a critical mechanism that enables NSPs and AEMO to implement necessary **operational measures** to maintain power system security. This includes operational measures such as disconnecting plant or applying limits to plant output or inter-/intra-regional power flows. Within the planning framework, Transgrid notes that clause S5.1.8 already enables NSPs to consider non-credible contingency events that could endanger power system stability and to implement appropriate mitigation measures such as emergency control schemes.
2. Do stakeholders agree that arrangements poorly define the types of credible contingencies in relation to disturbance ride-through requirements for schedule 5.2 plant?	Transgrid considers that the primary challenge for Applicants is not necessarily the current definition of credible contingency events or the absence of a list of non-credible contingencies that could be reclassified as credible. While the proposed clarification may theoretically enhance transparency, there are practical limitations in both producing a definitive list and its effectiveness in improving system security. In practice, the benefit of providing an indicative list without any associated certainty or commitment is likely to be limited.
3. Do stakeholders support AEMO's proposed rule to clarify the types of contingency events that a schedule 5.2 plant must be able to ride through?	While Transgrid acknowledges that the proposed rule change may give the appearance of enhanced transparency, in practice, neither NSPs nor AEMO can provide a firm commitment to such a list at the time of offer to connect, as it is not possible to foresee all future network changes or events over the plant's operational life with sufficient certainty. Therefore, Transgrid believes that providing only an indicative list may not fully deliver the level of investment certainty that this rule change is intended to provide. On this basis, Transgrid considers the proposed rule to be unnecessary.

AEMC Questions	Transgrid response
4. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule? If so, please describe your concerns and any related suggestions and reasoning.	Transgrid notes potential areas of concern regarding the clarity and likely effectiveness of AEMO's proposed amendment in achieving the intended investment certainty. These concerns primarily relate to the following aspects of the proposed amendment. 1. **Longevity and Practicality of Reclassified Contingency Lists** Clause S5.2.5.5(t1)(2) of the mark-up draft Rule (included in AEMO's rule change proposal) indicates that AEMO will specify the list of non-credible contingencies likely to be reclassified as credible. In our view, it is not feasible to provide a definitive list of non-credible contingencies that may be reclassified under abnormal conditions for the entire lifetime of a plant. Reclassification depends on factors such as network configuration, network outages, and abnormal conditions (e.g., severe weather events). Neither NSPs nor AEMO can commit to such a list at the time of connection offer, as it is not possible to predict all future abnormal conditions, network changes or events with sufficient certainty. That said, if such a list deemed necessary, Transgrid proposes that AEMO and the NSPs maintain a dynamic list of non-credible contingencies likely be re-classified as credible under certain conditions. This list could be developed and maintained through the Power System Security Working Group (PSSWG) and incorporated into AEMO's *Power System Security Guidelines* (SO_OP_3715). A relevant subset of this list could be provided to Applicants at the time of their Connection Application. However, we emphasise that such a list would not be exhaustive. It would not capture all possible non-credible events that may be reclassified in the future. Therefore, emergency control schemes under clause S5.1.8 to manage non-credible contingencies, along with appropriate operational measures in the event of reclassification, will continue to be necessary to manage system security. 2. **Flexibility in Access Standards** Transgrid notes that the mark-up draft Rule (included in AEMO's rule change proposal), requires the plant to remain in continuous uninterrupted operation (CUO) for credible

AEMC Questions	Transgrid response
	contingency events and non-credible contingency events expected to be reclassified, under both the AAS (clause S5.2.5.5(c)(1)) and MAS (clause S5.2.5.5(k)(1)). Transgrid supports CUO for credible contingencies under the MAS. However, we recommend flexibility for an appropriate NAS where a plant cannot ride through a reclassified event. The NER should clarify acceptable mitigation measures, such as: • Emergency control schemes, • Agreed operational responses (e.g., output constraints or temporary disconnection). 3. **Ride-Through Requirements for Protected Events** Neither the current NER nor the proposed amendments clarify whether ride-though requirements apply for plants under *protected events*. Transgrid seeks clarification from the AEMC regarding the applicable performance obligations for plants for such events. **4. Multiple Fault Ride Through Requirement for Generators and IRS** Transgrid considers that the most effective approach to managing plant ride-through capability for multiple disturbance events–including non-credible events that may be reclassified as credible–is through the multiple fault ride-through (MFRT) requirement under clause S5.2.5.5. Where a reclassified event falls within the scope of the agreed MFRT performance standard, the plant would be expected to ride through the event. The AEMC's final Rule for MFRT (under both AAS of S5.2.5.5(d)(10) and MAS of S5.2.5.5(l)(10)), implies that if the multiple disturbance event results in the three phase fault level at the Connection Point being lower than the minimum fault level specified for plant tuning by the NSP, then the plant does not need to remain connected to the power system. Transgrid believes that the Rules should encourage, rather than exempt, plant ride-through capability under multiple fault scenarios wherever technically feasible. Maintaining plant connection during such events helps prevent cascading failures and supports broader system security.

AEMC Questions	Transgrid response
Question 12: Testing and commissioning	
1. Do stakeholders support AEMO's proposed amendments to clause 5.7.3 to refer to schedule 5 plant in respect of AEMO's ability to request compliance tests for registered plant?	Transgrid supports AEMO's proposal.
2. Do stakeholders support AEMO's proposed changes to clauses 5.7.2 and 5.7.3 to extend the rights for testing of power system plant to apply to non-registered schedule 5 plant?	Yes
3. Do stakeholders support AEMO's proposed changes to the NER to extend the requirement for coordinating commissioning procedures for non-registered schedule 5 plants with a maximum capacity equal to or greater than 30MW of 30MVA?	Yes
4. Should the Commission consider extending enforceability and compliance requirements under rules 4.14 and 4.15 to all 'schedule 5 participants', which includes non-registered participants?	Yes
5. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule? If so, please describe your concerns and any related suggestions and reasoning.	No further concerns.
Question 13: Extension of time for complex issues in future access standards reviews - In relation to AEMO's proposal to amend clause 5.2.6A of the NER to allow flexibility for extending the time limit for completing each review:	
1. Do stakeholders agree that the requirement to complete each review within 12 months of the approach paper being published is too inflexible or may inhibit proper analysis and consultation?	Transgrid believes that the 12 months limit on reviews is inflexible. With our experience with prior reviews, such as the initial AEMO review that resulted in AEMO's Package 1 and package 2 rule

AEMC Questions	Transgrid response
	changes, we believe the 12 month time limit does inhibit the necessary analysis and consultation needed to develop fit-for-purpose rule change proposals.
2. Do stakeholders consider that AEMO should be responsible for setting a new date for publication of the final report? Is there an alternative approach that would better address the issue?	We believe AEMO should be responsible for setting a new date for any extension of time. AEMO through proactive stakeholder engagement would be best placed to determine the amount of time required as each change and sections of reviews would differ in level of complexity and difficulty.
3. Do stakeholders agree that AEMO should publish a notice when an extension is needed, outlining the reasons as they may relate to complexity/difficulty, or a material change in circumstances?	We agree that AEMO should publish a notice when an extension is needed, outlining the reasons as they may relate to complexity/difficulty, or a material change in circumstances. We strongly believe in proactive engagement with all stakeholders at every stage of any review undertaken by each of the major market bodies including AEMO and the AEMC. This would include keeping stakeholders and industry experts updated with timeframes and reasonings at each stage of the review.
4. Do stakeholders have any concerns or suggestions in relation to this element of AEMO's proposed rule? If so, please describe your concerns and any related suggestions and reasoning?	We do not have any concerns with the proposed amendments to NER clause 5.2.6A
Question 14: Assessment framework	
Do you agree with the proposed assessment criteria? Are there additional criteria that the Commission should consider or criteria included here that are not relevant?	While Transgrid broadly agrees with the assessment criteria and rationale, we emphasise the importance of setting technical requirements that incentivise equipment manufacturers to enhance plant design in line with system needs, without making those technical requirements prohibitive to new connections. Transgrid considers this to fall under the assessment criterion of "Innovation and flexibility". Transgrid notes that the Automatic and Minimum Access Standard Frameworks can be used to encourage technological advancement while maintaining the flexibility required to accommodate limitations in certain technologies.

Appendix A – Transgrid comments on protection system definitions proposed by Rod Hughes Consulting

Term	Status	Proposed definition	Transgrid comments
back-up protection system	new definition	A *protection system* that operates in consequence of a *main protection system* having failed to clear the fault in its expected time. The back-up protection system will have time and/or measurand grading to the *main protection system*. A back-up protection system may be itself a *main protection system* for other fault scenarios. A back-up protection system is not an independent alternative main protection system as it may share common modes of failure to the main protection system (e.g. auxiliary supply) and/or may not be as sensitive and/or as fast as the main protection system so as to clear all faults in a similar time frame as expected to be cleared by the main protection system. Examples of back-up protection systems include breaker fail protection systems as well as other main protection systems located at other points in the power system with different time and/or measurand settings.	Transgrid disagrees with the use of the term “may share common mode of failure” and allowing back-up protection to have common modes of failure as the primary protection. In practice, the back-up protection is generally accepted as a form of redundancy (i.e instead of full duplication of the primary protection systems), particularly for MV/LV protection systems, hence should not have any common mode of failure with the primary protection system.
breaker fail protection system	updated definition	A *protection system* that, upon detecting failure of its monitored circuit breaker to clear the fault following operation of the *breaker fail protection system’s* respective *independent alternative main protection system*, operates to directly open other required circuit breakers to clear the fault independently of any other *protection function* operation.	The proposed new definition focuses on the design implementation of circuit breaker failure (CBF) protection. The current NER definition of breaker fail protection is more open and encompasses the provision of dedicated circuit breaker failure (CBF) systems or remote backup protection schemes. The new definition appears more restrictive and does not a allow the use of remote backup systems for CBF. The Application of new definition will require the addition of other forms of protection to meet requirements. We believe it is beneficial to retain flexibility in the current definition to meet the CBF requirement.
control function	new definition	A function associated with the normal operation in absence of a power system fault that may be required to manage, monitor or control the power system performance and/or correct an abnormal condition of the power system.	This definition does not appear to be referenced in the proposed definitions or the proposed changes to the NER.
independent alternative main protection system	new definition	A *main protection system* that operates with similar measurand value sensitivity and speed of operation as another *main protection system* such that it is generally expected that both would be able to operate in approximately the same time for the same fault. Specifically there must be no credible mode of failure or out-of- service condition of any of the respective *protection elements* such as to prevent correct operation of both systems for a particular fault.	The term Independent Alternate Main Protection refers to "credible mode of failure," which is subjective and open to interpretation. The more common phrase for this purpose is “common mode of failure”.
main protection system	New definition (replacing primary protection system)	A *protection system* that is the intended and preferred system to clear a fault in order to minimise the number of required circuit breakers to clear the fault as close as possible to the fault.	Definition of the main protection system omits inclusion of the new proposed term *Protection elements*, specifically the inclusion of communication facilities where the protection system depends upon. Also, instead of “as close as possible to the fault”, suggest using “in protection zone”.
protection element	New definition	Any of the facilities, equipment, physical and virtual connections of the protection system including: CT cores, VT windings, Trip coils, devices providing protection functions, Auxiliary/tripping d.c.batteries, Battery chargers, Auxiliary a.c. auxiliary supply, Wiring, Communication systems.	Use of this term will cause issue where protection elements have been used for defining redundancy. Like Auxiliary AC supply connection is not redundant during operation. Communication system between the substations (Tele protections) should be kept separate.
protection function	New definition	A function that is intended to operate on the basis of a fault or other excessive operating condition of the power system.	-