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Australian Energy Market Operator

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AEMO's R1 Capability Assessment Guideline

Transgrid welcomes the opportunity to respond to the Australian Energy Market Operator's (**AEMO**) R1 Capability Assessment Guideline (including conditions on registration) (**the Guideline**). The objective of the review is to expand the registration information resource and guidelines (**RIRG**) to cover the new requirements for the capability assessment set out in National Electricity Rules (**NER**). This review follows the AEMC's final rule on *Enhancing investment certainty in the R1 process* which the required contents of the RIRG were extended to include additional material related to the capability assessment process now set out in the NER.

In our role as the transmission planner and operator for NSW and the ACT for over 40 years, Transgrid has developed unique expertise and capability to maintain system security and reliability in the connections process. Our primary responsibility is to ensure the ongoing security and reliability of the system as it transitions to higher renewables penetration and greater connection enquiries.

Transgrid supports AEMO's intent to establish a comprehensive and transparent framework that clearly outlines the process, requirements, and activities necessary for Registration in the National Electrical Market (**NEM**). Early collaboration is essential for managing potential project risks, providing timely technical guidance to facilitate efficient issue resolution, and establishing achievable project milestones.

Transgrid has identified several areas in the Guideline that can be enhanced to improve clarity, consistency, and alignment with current industry practices. Our key concerns include:

- Initial data and information requirement – The R1 checklist should be more comprehensive.
- Approach to GPS non-compliance and plant alterations - Transgrid is concerned that the Guideline understates the Connection Applicant's accountability for meeting agreed performance standard levels and risks undermining the integrity of the 5.3.4A negotiation process.
- Clarity on Role of Capability Assessment within the R1 Framework - The Guideline should also outline other related assessment processes occur concurrently with the R1 Capability Assessment, and form part of the pre-requisites for Registration.

Transgrid looks forward to continuing to work with AEMO to ensure the Guideline are consistent with industry practice. If you require any further information or clarification on this submission, please contact Malithi Gunawardana, Manager Network Connections, at Malithi.Gunawardana@transgrid.com.au.

Yours faithfully

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General Manager of Network Planning

Transgrid Feedback on R1 Capability Assessment Guideline

Overview

Transgrid supports AEMO's intent to establish a comprehensive and transparent framework that clearly outlines the process, requirements, and activities necessary for registration in the National Electrical Market (**NEM**).

Transgrid's feedback is intended to enhance the clarity and consistency of the process outlined in AEMO's Draft R1 Capability Assessment Guideline (the **Guideline**). Specifically, we recommend re-framing the Guideline to better align with established NEM industry practices for demonstrating compliance to agreed Generator Performance Standards (**GPS**) at Registration stage. Additionally, we advocate for early engagement between the Connection Applicant, AEMO and the relevant Network Service Provider (**NSP**) to promote a more collaborative and efficient R1 process. Early collaboration is essential for managing potential project risks, providing timely technical guidance to facilitate efficient issue resolution, and establishing achievable project milestones.

Transgrid has identified several areas where the Guideline could be amendment to improve clarity, consistency, collaboration and alignment with current industry practices. Our key concerns include:

1. Initial data and information requirement

   Initial data and information requirements listed in Appendix A is inadequate to start the R1 capability assessment. Transgrid supports the development of a more comprehensive and detailed R1 checklist to ensure that all necessary inputs are available at the outset of the process.

2. Approach to GPS non-compliance and plant alterations

   Transgrid is concerned that the Guideline understates the Connection Applicant's accountability for meeting agreed performance standard levels and risks undermining the integrity of the 5.3.4A negotiation process. Transgrid believes that meeting or exceeding these agreed performance standards should remain the fundamental obligation of the Connection Applicants, thereby facilitating a more efficient registration assessment process

3. Clarity on Role of Capability Assessment within the R1 Framework

   The Guideline should outline other related assessment processes that occur concurrently with the R1 Capability Assessment, and form part of the pre-requisites for Registration. Greater clarity on this will help stakeholders better understand the full scope of requirements and timelines.

The remaining body of our submission includes following sections:

1. Initial data and information requirement
2. Approach to GPS non-compliance and plant alterations
3. Clarity on role of capability assessment within the R1 framework
4. Feedback on AEMO's consultation questions
5. Specific feedback on the Guideline

1. Initial data and information requirement

According to Section 2.1 of this guideline the R1 capability assessment will be commenced after the initial data and information submission. However, in Transgrid view, the initial data and information requirement in its current form (specified in Appendix A is) is likely to be inadequate to commence the R1 capability assessment. For AEMO (in consultation with the NSP) to conduct the R1 capability assessment, we believe Applicant should provide the following key information, as a minimum:

(a) Changes to the plant since execution of Connection agreement in detail.

(b) Where relevant (based on changes from Connection Application to R1), update of Connection application package with the R1 (detail design) data as evidence to demonstrate GPS compliance.

(c) If any non-compliances to the agreed GPS are observed, evidence to support efforts made to achieve the best possible performance

(d) Inclusion of additional information required for Registration which are not provided/available during Connection application stage (for example: Protection Design Report, detailed harmonic assessment and filter design report etc.)

Although Appendix A adequately addresses item (a), it does not sufficiently cover items (b), (c) and (d). These items form a significant portion of the data and information required for the R1 capability assessment and were previously covered in AEMO's *Generator Connection R1 submission checklist* and *Connection Application checklist.*

To address these concerns, Transgrid proposes the following:

- Update the existing Generator connection R1 submission checklist to include contents from Appendix A and requirements not yet covered. We believe the current form of the R1 checklist is a better starting point because it is reasonably complete, presented in an itemised format that facilitates easy checking for completeness, and familiar to many stakeholders within the industry.
- Using the R1 checklist list to be the reference point for early engagement between the Applicant, AEMO and the NSP, prior to initial data submission. This would allow all parties to identify applicable studies and information requirements, based on changes to plant since Connection Application stage.

Transgrid acknowledges that the CRI Focus Group for R1 aimed to distinguish between the core subset of data and information required to initiate the capability assessment and the additional data necessary to complete the capability assessment for registration. Therefore, in the Guideline the data and information requirements has been split into Appendix A and Appendix B. However, what constitutes "essential" initial data is often project-specific and depends on availability of data as well target dates for Registration, Energisation and Commissioning. Many projects face compressed timelines, and certain registration activities such as detailed protection design review can take up to 3 months to complete. A better approach would be for this guideline to provide a complete list of requirements for the R1 capability assessment submission with a recommendation for the Applicant to engage with AEMO and the NSP prior to the data and information submission for capability assessment. This would allow for clarification of timing expectations where delays in providing certain items are anticipated. Such an approach would offer flexibility while promoting a collaborative framework for managing project risks.

Additionally, a single comprehensive checklist would reduce uncertainty for Connection Applicants as it informs the standard expectation for a submission for R1 capability assessment. This would support better planning, resource allocation, and project scheduling. According to the Guideline, the time required to prepare such information could result in significant project delays–contradicting the guideline's objective of streamlining the registration process.

It is also recommended that Connection Applicants verify with the relevant NSP whether there have been any material updates to network data since the execution of the Connection Agreement. This includes identifying any changes to external network conditions, such as newly committed generators, alterations to existing plant or newly considered network augmentations, prior to preparing the initial data submission. As per the process outlined in the Guideline, this activity is only undertaken after the initial data and information submission for capability assessment.

2. Approach to GPS non-compliance and plant alterations

Transgrid supports AEMO's consideration of approaches to non-compliances and plant alterations during Registration stage. However, we are concerned that the Guideline may understate the Connection Applicant's accountability for meeting agreed performance standard levels and risks undermining the integrity of the 5.3.4A negotiation process.

The primary objective of the R1 Capability Assessment is to validate plant performance using detailed design data (R1) against the agreed GPS, which forms part of the executed Connection Agreement between the Connection Applicant and the relevant NSP. Transgrid believes that meeting or exceeding these agreed performance standards should remain the fundamental obligation of the Connection Applicants, thereby facilitating a more efficient registration assessment process. Transgrid advocates that the R1 Capability Assessment guideline should emphasise the importance of using best endeavours to ensure compliance with the agreed GPS. Applicants should also be encouraged to considering appropriate design tolerances during Connection Application stage to minimise risk of non-compliances during R1 stage. Transgrid asserts that re-opening GPS negotiations at the R1 stage will adversely affect registration timelines and may contradict the objectives of the R1 guideline, which is designed to promote efficiency in the connection process.

That said, for minor non-compliances identified through the capability assessment, Transgrid supports the use of NER 4.14(p) to amend the performance standards. However, if a material non-compliance is identified through the capability assessment, Transgrid strongly recommends that the Applicant's first course of action should be identifying options available[1] to rectify the non-compliance, with an aim to improve performance as close as possible to the agreed standard. If all reasonable efforts are exhausted, considering the commercial and technical feasibility of complying with the agreed standards, the use of NER 4.14(p) to amend the performance standards can be considered.

It is worth noting that as part of the NER 4.14(p) requirements, AEMO, in consultation with the relevant NSP, may need to conduct additional studies to confirm the impact on system security and quality of supply to other users to ensure that the performance standard is set at a level that have no adverse impacts. These additional assessments and associated performance standard negotiations will have implications for cost and project timelines. Given these implications, the guideline should place strong emphasis on encouraging Applicants to meet performance standards while recognising the complexity and effort involved in GPS re-negotiations.

Transgrid agrees that any alterations to the proposed plant following execution of the Connection Agreement will require re-assessment of impacted performance standards as per NER 5.3.9.

3. Clarity on Role of Capability Assessment within the R1 Framework

Transgrid understands that the R1 Capability Assessment process described in this guideline is intended to outline the procedures, information requirements, and activities necessary for AEMO, in consultation with the relevant NSP, to determine whether a Generator or IRP can meet or exceed the agreed performance standards.

[1] Control system setting tuning, plant model changes, hardware of firmware changes etc.

However, in practice, other related assessment processes occur concurrently with the R1 Capability Assessment, and form part of the pre-requisites for Registration. The AEMC also recognises this in its final determination for the 'Enhancing Investment Certainty in the R1 Process' Rule Change.

These other assessment processes may include, but are not limited to:

- System strength reassessment
- Detailed harmonic assessments
- Assessment of network impacts and development of network constraints (e.g., development of new constraints or determining changes to existing network limits)
- Assessment and development of remedial action schemes and special protection schemes
- Protection design review
- SCADA signal review and completion of end-to-end testing
- Transformer energisation studies
- Capacitor/Filter switching transient studies
- Small signal stability assessments
- Review and approval of Commissioning test plan[2]

PSCAD Wide Area Network (WAN) assessment is a vital tool for AEMO and the NSP to evaluate system strength impacts, including potential controller interactions. Based on Transgrid's experience, majority of the projects require some level of PSCAD WAN Assessment, due to various factors. These include changes to plant parameter settings or Balance of Plant equipment parameters, plant alterations[3] and/or network changes such as newly committed generation, newly considered network augmentations or disconnection of generators not previously considered as part of the Connection Application system strength assessment. In addition, PSCAD WAN assessments are typically used by the NSPs to support development of network constraints, special protection schemes and remedial action schemes necessary to facilitate Connections. Additionally, based on controller interactions and/or stability issues identified, further detailed assessments such as small signal stability analysis using tools such as Small Signal Analysis Tool (SSAT) may also be required to verify system stability impacts due to the Connection.

While *Section 3.2.1* and *Appendix B.4* of the Guideline briefly indicates the need for PSCAD WAN assessments to be undertaken by the NSP and/or AEMO, Transgrid recommends including further details on these additional assessments in the Guideline. Further clarification is also required regarding the role of Capability Assessment within the entire R1 process to emphasise that, while it is a key component, it constitutes only part of the pre-requisites for Registration.

Given the criticality of these assessments and the time required to complete, providing Applicants with full visibility of activities and time requirements for these assessments can help manage project risks effectively. This transparency will enable accurate project scheduling and ensures sufficient time for NSPs and AEMO to complete the required assessments, thereby preventing negative impacts on project milestones.

[2] While provision of Commissioning test plan is not strictly a pre-requisite for Registration, it is required at least 3 months prior to Commissioning (for a transmission connection) and should be approved or close to approval, as projects typically commence commissioning within a week of Registration being effective.

[3] Noting that plant alterations will be assessed as per NER 5.3.9.

4. Feedback on AEMO's consultation questions

Capability assessment process

1. *Is the proposed capability assessment process where the data and information requirements are divided into two main parts appropriate? If not, why not?*

   Transgrid does not consider the proposed approach to be the most efficient and effective. While the concept of submitting a subset of data to initiate the R1 capability assessment may help commence work earlier, staggered or piecemeal submission of information risks introducing delays to the overall process. Based on Transgrid experience, most Applicants operate under tight timeframes for achieving registration. Therefore, submitting a complete package–where feasible and based on availability of information–from the outset remains the most efficient approach.

   If flexibility is required, the Guideline should encourage early engagement with AEMO and the NSP. This would allow the Applicants to discuss the potential deferral of specific items and align expectations.

   Early engagement benefits all parties by:

   - Clarifying process requirements and timelines;
   - Allowing AEMO and the NSP to understand data availability and project milestones;
   - Helping Applicants use the latest network information and plan submissions to avoid rework;
   - Identifying opportunities to reuse or reduce the scope of studies, provided there are no material changes in performance.

   In summary, while flexibility is valuable, a structured and complete initial submission–supported by early stakeholder engagement–is more likely to ensure timely and efficient capability assessments.

2. *Would a more prescriptive capability assessment process better meet the requirements of the NER and be more consistent with the NEO? If so, why and what would a more prescriptive process entail?*

   We believe there are pros and cons to a more prescriptive process. Historically, the R1 process has not been well defined in the National Electricity Rules (NER), particularly prior to the recent Rule change. We support the development of a more clearly articulated process that outlines:

   - The general obligations and expectations for R1 submissions from Applicants;
   - The criteria and considerations AEMO and NSPs will apply when conducting the R1 capability assessment.

   A well-defined process would better align with the National Electricity Objective (NEO) by promoting transparency, predictability, and efficiency in the connection process. It would also help ensure consistent treatment of Applicants and reduce the risk of delays caused by unclear requirements.

   However, it is important to note that an overly prescriptive process may inadvertently limit the use of engineering judgment. Flexibility is often required to account for project-specific circumstances, the unique needs of the connecting location, and jurisdictional differences (for example, transmission vs. distribution). A rigid framework could lead to suboptimal outcomes in cases where tailored solutions are more appropriate.

   We also believe that more guidance on the technical requirements for assessing access standards would promote efficiency in the process. Although this is currently outside the scope of the Guideline, such guidance would improve the quality of submissions, enhance the tuning and performance of plant connected to the system leading to reduced assessment and approval times,

   This could be achieved by updating AEMO's Access standard Assessment Guide – Jan 2019 to reflect the latest NER requirements, industry practices and considering integration of new and emerging technologies.

3. *Is it sufficient that the data and information submission focuses on changes since the connection agreement was executed? Should other matters inform the contents of the initial data and information submission?*

   While consideration of changes to the plant is a key driver, we do not believe that focusing solely on these changes in the initial submission will result in an efficient or effective assessment process. For further detail, please see Section 1 – Initial data and information requirement.

   Importantly, the Guideline currently does not mention the need for the Applicant to consult with the relevant NSP (and AEMO) prior to preparing their initial R1 submission. This consultation is critical to obtain latest Network information which should be considered for R1 studies. Relevant network-related input may include newly committed generators, network augmentation, fault level information, updated line ratings, network constraints etc. These input should be considered in determining whether certain studies need to be updated for R1 submission.

   Additionally, we recommend that the Guideline provide greater clarity on items that are necessary for Registration but may lie outside the scope of AEMO's R1 capability assessment. For further detail, please refer to Section 3 – Clarity on Role of Capability Assessment within the R1 Framework.

4. *Are the proposed initial information and data requirements in Appendix A appropriate?*

   We believe that the proposed requirements in Appendix A provide a good basis for understanding changes to the plant between the Connection Applicant stage and the R1 stage. However, it does not contain sufficient information for initiating and completing the R1 capability assessment. For further detail, please refer to Section 1 – Initial data and information requirement.

5. *Is the proposed Request Form suitable to support the submission of the initial information and data?*

   Please refer to Section 1 – Initial data and information requirement and response to question 4.

6. *Appendix B identifies a range of additional information and data requirements that may be required to support the capability assessment, and the reason(s) they may be required. Are there additional information and data items that should be included in Appendix B, or that should be removed from Appendix B? Why?*

   We prefer the inclusion of a comprehensive list of information or studies that may be requested by AEMO and the NSP, as this promotes transparency and helps Applicants better prepare for the R1 capability assessment. This approach is preferable to the more limited and less defined method currently proposed in the Guideline.

   We believe that certain items specified in Appendix B should be considered part of the initial data and information. Relying on a staggered approach to information provision, particularly where those information can impact the demonstration of GPS compliance, can introduce risks and may lead to unnecessary delays.

   Please refer to Section 1 – Initial data and information requirement for further details.

Materiality of non-compliance

7. *Is the proposed list of example conditions to guide the approach to address non-compliance with performance standards in Appendix C appropriate? What alternatives do you suggest?*

   Please refer to Section 2 - Approach to GPS non-compliance and plant alterations and Table 1 (under Appendix C section) for detailed responses.

   Appendix C references the relevant NER System standards (S5.1a) that may be impacted by the non-compliance with corresponding GPS access standard and suggests the system standards to be the criteria for considering amendments to the GPS (outlined in Section 4.4 of the Guideline). While this is a valid consideration, we believe that there are additional factors such as local network constraints, the cumulative

impact of multiple non-compliances in a region etc., that may need to be considered when determining whether an amendment is appropriate.

8. *Is it appropriate that AEMO's interpretation of what constitutes an adverse impact includes an assessment of materiality? What alternatives do you suggest?*

   Transgrid suggests that adverse impacts should also consider plant performances that pose a risk for the relevant NSP to meet system standards.

   For further detail, please refer Transgrid comments in Table 1 (under Appendix C section)

Conditions on registration

9. *Are the proposed circumstances when conditions on registration could apply appropriate? If not, what alternatives do you suggest?*

   Please refer Table 1 (Under Section 5.2)

10. *Is the list of terms and conditions that could be applied on registration appropriate? Are there terms and conditions that should be removed, or that should be included? Why?*

    The list of terms and conditions outlined in Section 5.2 generally provides a comprehensive and appropriate set of scenarios under which conditions may be applied at registration.

    However, our main concern is the lack of reference to consultation with the connecting NSP. It is strongly recommended that AEMO consult with the NSP both:

    - At the time of introducing conditions during registration, and
    - At the time of assessment to confirm whether the condition has been satisfied within the timeframe specified.

    As currently worded, the Guideline could be interpreted as giving AEMO sole authority to impose and close out conditions, without requiring input from the NSP. This could lead to misalignment or delays, particularly for non AEMO-advisory matters, NSP-specific requirements or network impacts are involved.

    Additionally, we note that some items in the list–particularly those related to quality of supply, such as conditions related to harmonics–require further clarification. Please refer to Table 1 for further details.

5. Specific feedback on the Guideline

The Table below outlines Transgrid's specific feedback on the relevant sections of the Guideline.

Table 1 Specific feedback on the relevant sections of the Guideline

Guideline section	Recommendation level (low, med, high)	Transgrid's response
Section 2 - Capability Assessment process	Medium	It is recommended to have separate sub-sections for each process activity in Figure 1 to provide better clarity on the purpose, requirement and responsibility. While the process flow chart identifies the parties involved (AEMO, NSP, or Applicant), it would be clearer if it explicitly detailed the activities, deliverables, and responsibilities. For example, specifying the data and information requirements applicable to Connection Applicant at each stage with reference to the relevant appendices, as well as outlining AEMO's and NSP's roles and deliverables at each stage.
Section 2.1	Medium	This section states that within five business days of receiving the Capability Assessment Request Form and initial data as per Appendix A, AEMO will confirm the commencement of the capability assessment. However, in Figure 1, it is indicated that the capability assessment will be carried out after the submission of additional data and information requirements identified during the kick-off and scoping discussion. Transgrid suggest fixing this inconsistency. If the intent is to commence the capability assessment with the initial data and information submission, the data and submission requirements must be more comprehensive. Please refer Section 1 of Transgrid's response for further details on initial data and information requirement.
Section 2.2	High	Transgrid supports the R1 capability assessment process illustrated in Figure 1, as it provides a clear overview of the R1 process. However, in section 2.2.2 of the guideline, it is stated that "A Connection Applicant may elect not to seek a kick-off meeting and initial scoping discussion". Various parts of the guideline (for example, Section 3.2) implies that the kick-off meeting and scoping of the capability assessment are essential steps. We suggest rectifying this discrepancy either by removing the direct path from the narrative in Section 2 or by reflecting an optional path in the process diagram in Figure 1. If there's a direct path for commencing the capability assessment, the applicable data and information submission requirements are also unclear. If the kick off meeting and scoping discussion is optional, then it is more important to have a complete, comprehensive and itemised checklist which specifies the submission requirements for R1 capability assessment, as also noted in Section 1 of this document. Please refer Section 1 of Transgrid's response for further details on initial data and information requirement.
Section 2.3	high	Some of the items referred to as "additional information" in this section, in practice, forms the standard information required for plants to demonstrate compliance with the agreed GPS. While limited number of projects may base their Connection Application Package on the final as-built design, the typical process involves the Connection Application package being developed from a concept design. The detailed design is usually finalised only after the 5.3.4A letter is issued, the connection agreement is signed, and an EPC contractor is engaged. This means that, in majority of the projects, many items listed under "Additional data and information" will be necessary either to demonstrate GPS compliance or to satisfy standard NSP requirements (for example, harmonic assessments/filter design reports, protection design reports, stability monitoring requirements, SCADA list etc.). Therefore, as also noted previously,

Guideline section	Recommendation level (low, med, high)	Transgrid's response
		Transgrid suggests having a more comprehensive R1 submission checklist similar to AEMO's current R1 submission checklist.
Section 2.3	Medium	During Registration process, in parallel to AEMO's capability assessments, typically there are other assessments to be conducted by the NSPs and there are certain NSP requirements to be met by the Connection Applicant. Examples of other assessments that needs to be completed at R1 stage- (a) Studies required to update existing network constraints (i.e., limit equations) or develop new constraints – This would require additional PSSE or PSCAD wide area studies (b) Small signal assessments (c) Transformer energisation studies Examples of NSP specific requirements (specific to Transgrid) (a) Power Factory model requirements for protection and harmonic assessments (b) Specific submission requirements for protection design review Transgrid recommends including in this section that there may be additional studies and NSP-specific information requirements necessary to complete during the R1 stage. Otherwise, this results in uncertainty for Connection Applicants, who are unaware of these additional requirements also will lead to extended delays in R1 approvals. Please refer Section 3 of Transgrid's response for further details additional information and assessment requirements.
Section 3 – Data and information requirements for capability assessment	High	Please refer to comments on the general process and recommendations provided in Section 1 of Transgrid's response.
Section 3.1	Medium	This section states that the "initial data and information requirements focus on changes since the execution of the connection agreement," which can be interpreted as focusing solely on internal changes to the generating system. However, external changes—particularly changes to the surrounding network—should also be considered in the assessments conducted as part of the initial submission package. This is particularly crucial for projects that have a substantial time gap between the 5.3.4A phase and the R1 submission for capability assessment. As suggested in Section 1, the Connection Applicant can have an early engagement with AEMO/NSP before the data and information submission for R1 capability assessment. Given the potential uncertainty in the timing of the Connection Agreement's execution, we recommend the wording in Section 3.1 from "since the execution of the connection agreement" to "since the issuance of the 5.3.4A letter." This broader timeframe would better account for relevant developments and ensure that both internal and external factors are considered in the assessment. More detailed comments regarding the "initial data and information required to commence the scoping assessment" are provided under the Appendix A of this Table.

Guideline section	Recommendation level (low, med, high)	Transgrid's response
Section 3.1.1	Medium	Transgrid acknowledges the practicality of using design data in the absence of OEM FAT data to the commence R1 capability assessment. However, we suggest the following to be considered: (a) The Guideline should clearly outline what steps Applicants must take to assess the potential impact of using design data instead of FAT data. This should include: o Identifying key parameters where deviations between design and actual performance may occur; o Conducting sensitivity assessments to evaluate the impact of these deviations on compliance with performance standards in consultation with AEMO/NSP. (b) For certain critical plant components (for example, main transformer FAT reports), conditional registration may only be considered after receiving the FAT data and completing the agreed sensitivity studies. If the outcome of these studies indicate a material risk of non-compliance, conditional registration may not be granted until the impact of the non-compliance is assessed and the path for rectification is agreed between all parties.
Section 3.2.1	Medium	This section would benefit from greater clarity regarding its intent–specifically, whether it is intended to: - Provide guidance to Applicants on their obligations, or - Offer transparency to the industry about AEMO's process for capability assessment. If the purpose is to specify requirements for Applicants, the language should be revised. Currently, the section lacks clarity on who is responsible for conducting the required studies. Our understanding is that the capability assessment refers to AEMO's review of the R1 information and studies submitted by the Applicant. Therefore, we believe the following points should be clearly articulated: (a) The Applicant is responsible for providing all necessary evidence, including simulation studies, to demonstrate compliance with the Generator Performance Standards (GPS), particularly where: o There are changes to the plant or models; or o Aspects of performance have not been previously assessed. (b) Supporting documentation may also be required to substantiate the impact of changes. This could include technical notes from the OEM; updated models and Functional Block Diagrams; other relevant technical evidence. (c) The Applicant should also engage with the NSP to obtain the latest network information prior to preparing the R1 studies. The wording in this Section also currently implies that system strength impact assessments (Full Assessments or Stability assessments) may only need to be repeated when there are "significant changes to models or the plant design." In practice, however, these assessments are often required to be repeated due to changes to the plant as well as evolving external network conditions (e.g. newly committed generators, network augmentations, updated network constraints. This nuance should be reflected in the Guideline to ensure Applicants are aware of the likely need to refresh these studies, even in the absence of major internal changes.

Guideline section	Recommendation level (low, med, high)	Transgrid's response
Section 4 – General	Medium	This section is titled "Assessment Approach"; however, it primarily focuses on capability assessment approaches for some specific scenarios involving plant alterations, non-compliances or where R1 data may not have been utilised for the assessment. Transgrid notes that clarifying AEMO's standard R1 capability assessment approach for projects would be more beneficial. Specifically, it would be beneficial to clarify items, such as how AEMO intends to consult with the relevant NSP regarding the Capability Assessment, with a particular focus on NSP's role in assessing of non-AEMO advisory matters within the scope of capability assessment. In general, Transgrid also notes that a significant portion of the inefficiency in the current connection process can be attributed to incomplete or incorrect assessments by the Applicant, which are subsequently identified during AEMO and NSP's review, necessitating updates or repeats of the assessment. It is strongly recommended to provide guidance on the technical assessment through a revised version of AEMO's Access Standard Assessment Guide – January 2019[4], aligning with current NER requirements and considering relevant new technologies, to enhance the efficiency of the connection process.
Section 4.1	Medium	Transgrid agrees that there can be delays in obtaining the OEM FAT data, which can lead to delays in R1 submissions and associated approvals. Therefore, Transgrid supports allowing flexibility to progress with the capability assessment before the FAT data is available. However, this section does not outline the approach that can be followed by the Applicant in such instances when providing initial information and data to AEMO and the NSP. Instead, it indicates that AEMO and the NSP may require sensitivity analysis to determine the likelihood of a non-compliance and its potential impact. This section should also highlight the expectations from on the Applicant in such instances. If certain R1 data is not available for the capability assessment, the Applicant should obtain the expected parameter ranges from the OEM and perform sensitivity assessments to assess potential impacts on GPS compliance. These sensitivity assessments should be provided to AEMO and the NSP as part of the initial information to verify potential impacts. Please refer to comments above in Table 1 under Section 3.1.1.
Section 4.2	Low	Some descriptions in this section overlaps with AEMO's NER 5.3.9 Process Guide. Therefore, we suggest providing reference to the 5.3.9 Process Guide for the approach applicable to plant alterations that occurs in parallel to Registration assessments.
Section 4.3 - Assessing adverse impact on power system security supply and quality of supply	High	As noted in this section, if AEMO (and NSP) have to conduct additional studies to confirm whether the altered performance at R1 stage would impact of system security, it will have implications on cost and project timelines. We suggest also noting this in this section. The primary responsibility for maintaining the quality of supply in the network lies with the NSP. Generator/IRS technical standards related to power quality in the NER are not AEMO advisory matters. Each network within the NEM faces unique challenges and have unique characteristics, making a single set of guidelines to determine the adverse impact on power quality at a connection location impractical. Transgrid suggests highlighting Quality of Supply as an item to be consulted with the relevant NSP based on the connecting location as it directly affects obligations that NSPs have to maintain QoS in accordance with the relevant system standards.

[4] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Network_Connections/Access-Standard-Assessment-Guide-20190131.pdf

Guideline section	Recommendation level (low, med, high)	Transgrid's response
		We also noted that some of the content included in the Guideline related to Quality of Supply may actually lead to incorrect conclusions. For example, statements such as "An emission level above an allocation by itself is not likely to cause an adverse impact…" could be misinterpreted as non-compliances to power quality emission limits in the GPS are generally accepted.
Section 4.4 – Treatment of non-compliances	High	Please refer to Section 2 - Approach to GPS non-compliance and plant alterations for further details. Transgrid suggests highlighting that any amendment of an agreed GPS at R1 stage will need to follow either NER 4.14(p) or NER 5.3.9 (noting that it's currently referenced in footnote 30).
Section 5	Medium	While we acknowledge that, under the NER, AEMO holds the primary responsibility for issuing conditional registration, it is strongly recommended that AEMO consult with the relevant NSP both: - At the time of introducing the terms and conditions of registration, and - At the time of assessment to confirm whether the condition has been satisfied within the timeframe specified. This consultation is particularly important for non-AEMO advisory matters and for issues that may have potential implications for the NSP's obligations in planning and operating the network. Transgrid recommends that this practice be explicitly stated in the Guideline to provide greater transparency for Applicants and to reflect established collaborative processes.
Section 5.2	Medium	Transgrid notes that certain power quality-related items described in this section–particularly bullet points 10 and 11–have the potential to cause confusion. Specifically, the harmonic and flicker emissions of generating plants are not assessed against planning levels, but rather against the emission limits allocated by the NSP. NSPs typically provide: - Automatic Access Standards (AAS); and, - Minimum Access Standards (MAS) for harmonic and flicker emissions. The combined harmonic voltage at the Connection Point, which includes background harmonic levels, is what is assessed against the planning levels–not the plant's emissions alone. Transgrid supports allowing generators to operate up to the planning levels as an interim measure during commissioning, particularly in cases where delays in installing harmonic filters would otherwise stall project progress. For example, if the measured combined harmonic voltage at the Connection Point remains below 95% of planning levels, commissioning may proceed. However, if the plant is non-compliant with the agreed harmonic emission limits in the GPS, a non-compliance notice must be submitted as per the NER requirements. The generator must then rectify the non-compliance within a specified timeframe using appropriate mitigation strategies. At the time of Registration, conditional registration can be issued to generators that are unable to demonstrate GPS compliance based on modelling assessment of the proposed mitigation strategies. However, the condition should be prescriptive on the resolution plan and include a clear timeframe for implementation be based on the measured harmonic emissions. The current wording in the Guideline suggests that adjusting the plant's harmonic or flicker emission limits may be considered a standard solution to address non-compliance. While this may be appropriate under certain circumstances–such as when

Guideline section	Recommendation level (low, med, high)	Transgrid's response
		the non-compliance is minor, or the measured background harmonic level for that specific harmonic order is substantially lower–it should not be presented as a standard or default approach. This could undermine the integrity of the emission limit framework and lead to inconsistent outcomes. As noted in our earlier comments on Section 5, it is strongly recommended that the Guideline explicitly state the typical process of AEMO consulting with the NSP when setting or closing out registration conditions–particularly for quality of supply matters. Since the primary responsibility for maintaining quality of supply lies with the NSP, it is essential that the NSP be satisfied with any conditions related to harmonic or flicker emissions. Currently, the wording in Section 5.2 implies that AEMO is the sole decision-maker in agreeing to registration terms and conditions as well as closing them out, following rectification. This should be revised to reflect the collaborative nature of the process. To improve clarity, Transgrid suggests including a practical example on this.
Appendix A – Initial data and Information requirements	High	As noted in Section 1 of this submission, Appendix A in its current form omits several critical items that are essential to initiate the R1 capability assessment. As such, it is not fit for purpose in its current state. In particular, where alterations to the plant result in proposed changes to the agreed GPS, the submission should be accompanied by updated GPS compliance assessments for the impacted clauses. While Row 2 of Table 1 refers to a marked-up version of the GPS, it does not specify any requirement to submit the updated compliance assessments that support the proposed changes. As highlighted throughout this submission, GPS compliance assessments—typically included in the Connection Studies Report—are a crucial input for commencing the R1 capability assessment. Without these, AEMO and the NSP cannot adequately assess the implications of the proposed changes on system performance and compliance. For further detail, please refer to Section 1 of this document.
	Medium	For the row titled "Performance standards not previously assessed," it would be helpful to explicitly list the required compliance assessments in this section. While most performance standards are typically assessed at the Connection Application stage using preliminary design (S, D) data, certain performance standards can only be assessed with greater certainty when detailed design data (R1) becomes available. For example, S5.2.5.2 and S5.2.8 are typically re-assessed at R1 stage due their dependence on plant detailed design data. These re-assessments should be more appropriately categorised under either the first row of Appendix A, "Resolution of conditions in 5.3.4A letter," or the second row, "Plant alterations and performance standard changes," rather than being grouped under "Performance standards not previously assessed". Additionally, certain standards such as S5.2.5.9 that are not typically assessed in full detail at the Connection Application stage will require more comprehensive assessment during the Protection Design review at the R1 stage. These are more appropriate to be classified under "Performance standards not previously assessed".
	Low	For the rows referring to "Dynamic model(s)", it is suggested using the more general term "model(s)" instead. Some of the outstanding changes in these rows relate to transformer impedance, which is not limited to OEM model or Dynamic model changes.

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	Medium	Under "Dynamic model changes" requirements, suggest adding a *model parameter and setting comparison* between 5.3.4A parameters and settings and R1 parameters and settings. This includes comparison of reticulation, transformer impedances, dynamic controller settings, etc.
	Medium	If there are material changes to the plant models from 5.3.4A stage, updated Dynamic Model Acceptance Testing Report (full or partial) may also be required to ensure that the updated models meet the requirements in the Power System Model Guidelines. This should be included in Appendix A, as it is essential to start the R1 capability assessment.
Appendix B – Additional Data and Information Requirements	High	As suggested in Section 1 of this document, Transgrid recommends the development of a single comprehensive R1 checklist similar to AEMO's current R1 checklist. As previously suggested, items that are unlikely to have a material impact on the R1 capability assessment or items that may not be available at the commencement of the capability assessment, as agreed by all parties to be additional information to be provided in subsequent submissions. All critical elements should be included in the initial submission to ensure efficient assessment process. Several items currently listed in Appendix B as additional information are, in fact, essential input to commence the R1 capability assessment and should be included in the Initial data requirement. For example: - Models and user guides listed in Row 1 of Appendix B should be part of the initial submission. In most projects, updates to models from the Connection Application stage are expected and must be reviewed early. - Harmonic filter design (Row 3) should also be included initially, as any changes to harmonic filter design or size can impact multiple performance standards. The following key data and information—currently missing from the Appendices—should be included in the initial data and information submission: (a) GPS Compliance Assessments (in the form of a revised Connection Study Report) These are essential for demonstrating GPS compliance. Depending on changes since the 5.3.4A stage and the potential impacts to the agreed performance standards, the scope of reassessment may vary. This can be clarified during an early engagement with AEMO and the NSP. Table 2 of the Guideline currently implies that submission of updated models and user guides is sufficient, and Appendix B2 suggests compliance assessments are optional. This should be rectified, as evidence of compliance assessments are a key input to the capability assessment. (b) Dynamic Model Acceptance Testing (DMAT) Based on materiality of changes from the 5.3.4A to the Registration stage, partial or full repetition of DMAT may be required. This requirement is currently not captured in either Appendices. (c) Updated Harmonic Assessment Report Table 2 only references the harmonic filter design report. However, in most projects, changes at the detailed design stage necessitate a repeat of the harmonic assessment using updated data—before filter design is finalised. This should be clarified in Table 2. If harmonic filter inclusion affects other performance standards, reassessment should

Guideline section	Recommendation level (low, med, high)	Transgrid's response
		be submitted accordingly. Since multiple plant design changes typically occur at this stage, the most efficient approach is to provide updated compliance assessments for all impacted clauses considering all plant changes. Additional comments on Appendix B: (a) AEMO's current R1 checklist requires the Commissioning Test Plan to be submitted three months prior to plant commissioning. This requirement is not reflected in the Guideline. While we acknowledge that this is a requirement under the NER, it is still helpful to include this in the R1 checklist, as preparation and review of the test plan typically progresses in parallel with the capability assessment. (b) The Guideline does not mention the need to submit updated Power System Design and Setting Data Sheets (PSDS) at the Registration stage. Please confirm whether this is an oversight or an intentional change.
	High	We strongly recommend that the Guideline explicitly direct Applicants to consult with AEMO and the NSP prior to preparing the Initial Data and Information submission. This early engagement is critical to avoid delays in the R1 process, particularly as some of the required studies and information may involve significant preparation time. Several items that are currently not included in Appendix B, may be required depending on project-specific factors and network conditions. These include small signal model, transformer energisation studies, capacitor/filter switching studies, assessments supporting night mode operation etc. For further detail, please refer to Section 3 – Clarity on Role of Capability Assessment within the R1 Framework.
	Medium	Transgrid notes that the section in Table 2 regarding the harmonic filter design report states that, if the filter design impacts other performance standards, the report must include supporting evidence to demonstrate compliance with those impacted clauses. We do not believe this approach is practical, nor does it improve the efficiency of the R1 process. The correct and more effective approach is to: - Holistically assess all changes to the plant since the execution of the Connection Agreement; - Identify all impacted performance standard clauses; and - Submit an updated Connection Study Report to demonstrate compliance with the Generator Performance Standards (GPS), as noted in our previous comments. In practice, harmonic assessments are typically conducted by specialist consultants who may not have the expertise to assess compliance with other GPS clauses. Expecting them to do so introduces inefficiencies and risks inconsistencies in the assessment process. The same concern applies to the description of the protection design report, which similarly suggests that it should cover assessments for other impacted clauses. This approach could result in the same clause being assessed in multiple locations from different perspectives, leading to duplication, confusion, and inefficiency. We recommend that the Guideline instead direct Applicants to consolidate all compliance assessments into a single, updated document (for example in the form of a Connection Study Report), supported by specialist reports (e.g. harmonic filter design

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		and assessment report or protection design and assessment report) as inputs, rather than as standalone compliance documents.
Appendix B.4 – Simulations to support the capability assessment	Low	Appendix B.4 does not appear to add much additional guidance upon section 3.2.1 of the Guideline. Unless there is an intent to provide more guidance on specific compliance studies requirements here, we suggest removing this.
Appendix C	Medium	The primary responsibility for maintaining quality of supply within the network lies with the relevant NSP. For example, under the National Electricity Rules (NER), it is the NSP's obligation to ensure that harmonic voltage distortion levels remain below the compatibility levels. To meet this obligation, NSPs typically establish planning levels that are set below the compatibility thresholds. These planning levels provide a buffer to manage cumulative impacts from multiple sources of distortion. As noted in the examples provided in the Guideline, permitting generators to cause harmonic voltage distortion up to compatibility levels, or even up to planning levels, could: - Jeopardise the NSP's ability to meet its regulatory obligations; and - Potentially disadvantage other generators seeking to connect in the same region by consuming a disproportionate share of the harmonic allocation. Furthermore, there are often notable discrepancies between modelled outcomes and actual site measurements of harmonic voltage distortion. These differences highlight the need to maintain sufficient margins when making decisions at the registration stage based on study results. We recommend that the Guideline reflect these considerations and reinforce the importance of: - Preserving adequate headroom in harmonic allocations; - Recognising the NSP's role and obligations in managing quality of supply; - Avoiding practices that could lead to inequitable treatment of future connections. For further context, please refer to Transgrid's comments on Sections 4.3 and 5.2 in this submission
	Medium	Given the limitations and maturity level of the S5.2.5.10 instability monitoring devices currently available in the market, typically Transgrid allows implementation of the instability monitoring device during commissioning (typically tied to an appropriate hold point testing milestone). However, in Appendix C not having facilities to detect instability is listed as an example that reflect adverse network impact. Could AEMO please clarify the basis for this? Does this mean that not having instability monitoring device implemented at the time of registration is unacceptable and a conditional registration on this matter is not a way forward? Transgrid suggests updating the column heading of column 4 to "Examples of *scenarios* that AEMO considers would reflect an adverse impact" instead of "Examples of *conditions* that AEMO considers would reflect an adverse impact" as the word "condition" could lead to confusion.