Chapter 6

Connection application submission

The quality, completeness and consistency of your submission directly influence assessment timeframes. Missing, incomplete or inconsistent information may result in requests for further information and repeated review cycles, increasing both assessment timeframes and costs. This section covers areas where submissions frequently have information gaps.

What you need to do

- Provide the Connection Application submission in the *Attachment 4 - Connection Application Folder Structure*.
- Complete the *Submission Checklist* as part of your submission to confirm that all critical information required for acceptance is included.
- Check that your submission follows the guidance below on components of the Connection Application where submissions often fall short.

Generator Performance Standards (GPS)

- Check that your proposed negotiated performance standard:
  - is set at a level that will not adversely affect power system security, quality of supply for other Network Users, or achievement of the system standards
  - meets the requirements for a Negotiated Access Standard for the relevant technical requirement under Schedule 5.2 (NER clause 5.3.4A sets out the requirements that must be met)
  - is as close as practicable to the Automatic Access Standard (AAS), bearing in mind the importance of protecting plant from damage, power system conditions at your connecting location and the technical and commercial feasibility of meeting the AAS.

Connections Study Report (CSR)

- Check that your CSR provides a clear and comprehensive assessment of the proposed plant performance, explains why the proposed performance standard is appropriate for the connecting location and demonstrates how compliance with the applicable requirements of the NER will be achieved.

Your CSR should:

- Provide sufficient technical justification to demonstrate that the plant has been optimally tuned for the connecting location, and that further improvements in performance are not reasonably achievable, considering, where relevant:
  - network strength and system operating conditions
  - the performance and dynamic behaviour of nearby generating systems and network-connected equipment
  - plant technology and control system architecture
  - manufacturer design constraints and equipment capability limits
  - stability, control coordination and protection requirements
  - compliance with other GPS clauses
  - operational reliability and power system security considerations.
- Provide clear evidence of the plant tuning methodology and associated outcomes, either in a dedicated tuning report or within the CSR, including:
  - a clear description of the tuning approach and modelling assumptions, control parameter selection, assessment methodology and resulting plant performance.
  - simulation results with plots

- comparative assessments demonstrating the performance achieved under the recommended tuning options.
- sensitivity studies assessing the impact of changes in critical parameters that materially influence the plant performance, such as controller gains, limits, and other key settings.

- Check that the evidence provides a sufficient basis for concluding that the proposed plant settings and the associated performance outcome represent the optimal achievable performance of the connecting plant for the connecting location. The evidence should take into account performance, stability, robustness and compliance across the credible operating scenarios and technical requirements considered in the GPS assessment.

System Strength Election Form

- Submit a completed and signed System Strength Election Form to Transgrid as per the template provided in *Attachment 4 - Connection Application Folder Structure*.

Models

- Provide:
  - site-specific PSS®E and PSCAD models for the proposed plant in accordance with the requirements set out in Section 4.
  - a DIgSILENT PowerFactory model to support harmonics, fault current, and protection assessments as outlined in Section 4.7.

Model Change Log

- Provide a model change log with each revised model submission, identifying all modifications to the PSS®E and PSCAD models since the previous version. This includes changes to:
  - plant parameters
  - control systems
  - protection settings
  - model structure
  - assumptions
  - bug fixes
- Provide an assessment of any impacts on previously submitted study results and conclusions.

Parameter Mapping Sheets

- Provide a parameter mapping sheet for the submitted PSS®E and PSCAD model, listing each model parameter and demonstrating alignment between the:
  - submitted models
  - OEM documentation
  - equipment settings
  - performance standards
  - study assumptions.

- Where a direct mapping between the two platforms is not feasible, provide a brief explanation of the discrepancy.

Project Tracker

- Use the Project Tracker template in *Attachment 4 - Connection Application Folder Structure*
- Pre-fill the *VCS Checklist* and *DMAT Checklist* tabs of the project tracker.

Power Quality Report & Model

- Submit a Power Quality Report and an associated model in DIgSILENT PowerFactory used for the assessment. See Section 4.7 for more details.

Voltage Control Strategy (VCS)

- Submit a VCS document describing how voltage and reactive power will be controlled to achieve compliance with the applicable performance standards and network requirements.
- See Section 3.1 and *Attachment 7 - VCS Report Requirements - TransGrid Guide* in the Data Response.

Functional Block Diagrams

- Either submit these as part of your CSR or
- Ask your OEMs to share functional block diagrams directly with Transgrid.

PSS®E & PSCAD RUGs

- Submit PSS®E and PSCAD RUGs for the PSS®E and PSCAD models provided as part of the connection application.
- See Sections 4.4 and 4.6 for detailed guidance.

PSS®E and PSCAD DMAT

- At a minimum, complete all mandatory tests specified in the latest version of AEMO's *DMAT Guideline*.
- Clearly identify any omitted tests and explain the reason for their omission.
- Where a bespoke model has been developed, undertake the full suite of tests outlined in the DMAT Guideline to provide a more comprehensive validation of model performance and robustness.

Note: AEMO and/or Transgrid may request additional tests depending on their assessment of the submitted DMAT results.

PSS®E and PSCAD Benchmarking

- Include a Model Benchmarking report with analysis on any misalignments observed between the PSS®E and PSCAD results.
- At minimum, submit PSS®E and PSCAD benchmarking results for the minimum set of mandatory tests specified in the DMAT Guideline.
- The benchmarking results must include:
  - relevant quantities measured at both the Connection Point and plant terminals for the PSS®E and PSCAD models
  - error bands applied to the PSCAD model response
  - an explanation for any material differences between the two model responses, where relevant.

Transgrid

Assessment of the Connection Application

6.1 Overview of assessment process

Figure 7-1 provides an overview of the Connection Application assessment and approval process.

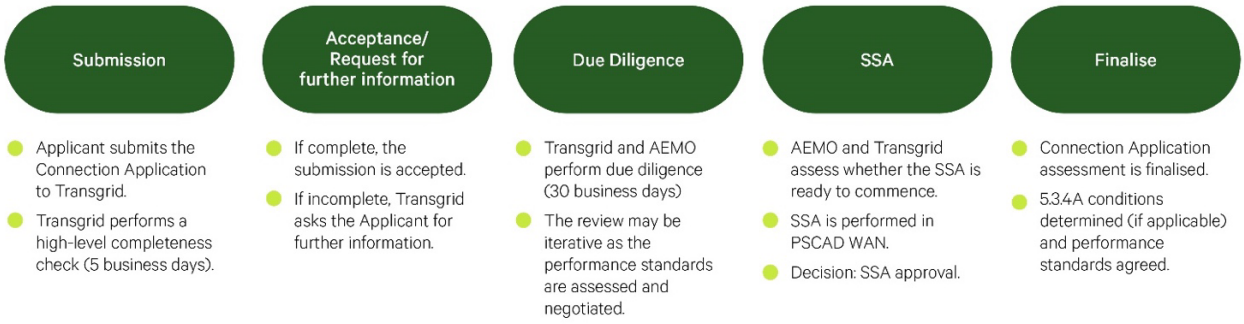


Figure 7-1 Transgrid Assessment Process

6.2 Indicative Timeframes

Table 7-1 summarises the indicative timeframes associated with the Connection Application assessment process.

Table 7-1 Connection Application Assessment Timeframes23

Activity	Indicative Timeframes
Notice periods - prior to submitting a Connection Application	• You must provide at least 4 weeks' notice before submitting a new Connection Application, to support resource planning. • This notice period also applies to any subsequent full submissions.
Completeness check	• Within 5 business days of receipt, Transgrid will undertake a completeness check and advise whether the submission has been accepted for review or whether further information is required.
Due diligence review of Connection Application submission	• Following acceptance of the submission, Transgrid will undertake its detailed due diligence review and provide a joint Transgrid/AEMO response within 30 business days. • If deficiencies are identified in the submission, further submission(s) and review rounds may be required.
Harmonic report assessment	• Transgrid will provide the outcome of the harmonic assessment within four months of the submission of the harmonic report submission. • As outlined in Section 2.6, you must submit the harmonic assessment report in advance, as early as possible before the Connection Application submission.

23 Note: the overall Connection Application approval timeframe will depend on submission quality, completeness and your response times. Multiple review rounds may be required based on the quality of the submission and identified deficiencies/issues.

Activity	Indicative Timeframes
System Strength Assessment (SSA)	• Following acceptance of the relevant PSCAD model, the SSA is expected to take approximately 8 weeks for an individual assessment and 12-14 weeks for a batch assessment, as outlined in Section 7.4.2.

6.3 Assessment of the Connection Application

6.3.1 Completeness review

On receiving a connection application submission, Transgrid undertakes an initial high-level desktop review. Within five business days, Transgrid will tell you whether the submission can be accepted for due diligence or if you need to provide additional information. Typical deficiencies identified during this review include critical missing information (see Section 6), model set up issues or other material gaps.

6.3.2 Due diligence assessment

During this detailed assessment, Transgrid and AEMO will use your submitted models and RUGs to assess whether the plant can demonstrate the proposed performance standards for each applicable technical requirement.

You will receive joint feedback within 30 business days, including a project tracker identifying documentation or plant performance elements that require further assessment, clarification or resolution. Transgrid and AEMO will also provide comments and suggested updates on the GPS document.

Address the items identified in the Project Tracker and GPS document before submitting a revised Connection Application to Transgrid. Transgrid and AEMO will review each revised submission until all critical issues for acceptance of performance standards under 5.3.4A, including critical issues relating to plant models, have been adequately addressed.

Where agreed with Transgrid and AEMO, you may resolve non-critical matters at a later stage, within a set timeframe.

6.3.3 Negotiation of performance standards

Transgrid will assess your proposed negotiated performance standard based on whether it satisfies NER clause 5.3.4A and Schedule 5.2. In consultation with AEMO, Transgrid will consider the technical evidence in your CSR, power system conditions at the Connection Point, plant capability and design constraints, the need to protect plant from damage, and the technical and commercial feasibility of achieving a higher standard.

Transgrid may reject the proposed standard or require further studies, further optimisation of plant tuning, plant modifications or an improved performance where the:

- Proposed performance level would adversely affect power system security, system standards or quality of supply for other Network Users

- Supporting evidence does not demonstrate that the proposal represents the best reasonably achievable performance for the plant at the proposed connection location.

6.4 System Strength Assessment (SSA)

Under NER 5.3.4B, Transgrid is required to undertake a SSA to assess the general system strength impact of a proposed connection.

The NER defines a general system strength impact as:

In relation to a new connection or an alteration to a generating system, integrated resource system or other connected plant, the amount equal to its adverse system strength impact as well as any additional amount by which it reduces the available fault level at the connection point for the new connection or connected plant, assessed in accordance with the system impact assessment guidelines.

- Depending on your election under NER 5.3.4B, Transgrid may undertake either a System Strength Full Assessment or a System Strength Stability Assessment. A Full Assessment will:
- Identify any adverse impacts on the network or other Network Users arising from connecting the plant
- Assess the effectiveness of any proposed System Strength Remediation Scheme (SSRS).
- Your SSA may be carried out as an individual project or as part of a batch assessment to identify potential adverse interactions between concurrently progressing projects. Batch assessments support timely commencement of SSA activities, enable more efficient use of specialist resources and allow multiple projects to progress in parallel, improving overall assessment timeframes.

6.4.1 Pre-requisites

Provide a robust PSCAD model of the plant that supports the proposed performance standards. The SSA will only commence once Transgrid and AEMO:

- Have accepted your PSCAD model, with no further model or parameter changes expected before the 5.3.4A approval process (changes may be required to address an issue identified through the SSA)
- Are satisfied that the proposed key performance standards are acceptable and the corresponding PSCAD model performance supports those performance standards.

Note: parameter changes or model updates made after Transgrid has started the SSA will likely require re-assessment, extending the time required to complete the SSA.

6.4.2 Assessment methodology and evaluation criteria

Adverse system strength impacts will be identified through a wide area network assessment using an appropriate power system model in PSCAD, in accordance with AEMO's *System Strength Impact Assessment Guidelines*.

- Evaluation criteria include that:
- The plant can successfully ride through large disturbances associated with network contingencies
- The connection does not adversely affect transient, voltage or oscillatory stability of the power system

- The connection does not degrade damping of any critical oscillatory modes, including following small or large disturbances
- No adverse effects to nearby generating systems, other network users, network-connected equipment or dynamic plant
- No unacceptable control interactions or power quality interactions are observed, including interactions that may occur without a network disturbance
- Any proposed SSRS is effective.

6.4.3 Assessment outcome

Transgrid will consult with AEMO on the outcomes of the SSA and any proposed SSRS.

If adverse impacts are identified, Transgrid will work with you to identify potential solutions. All issues must generally be resolved before the 5.3.4A letter is issued, although the letter may include conditions where specific issues may be resolved prior to Registration.

If the wide area network assessments identify new or changed network or plant dispatch limits, further detailed limit assessments will be required before Registration. This may result in Transgrid providing AEMO with new or revised limit advice to update the relevant constraint equations prior to Registration.

Note: under the open access framework, limit advice may continue to be refined as the network evolves, including to account for newly committed generation and network augmentations. This may result in AEMO revising constraint equations over time, which may affect your plant.

6.5 Approval of Performance Standards

Once Transgrid and AEMO are satisfied that due diligence issues have been adequately addressed, the proposed NAS are acceptable and the SSA is complete, Transgrid will confirm the final proposed performance standards with you.

Transgrid will then formally endorse the GPS to AEMO and seek AEMO's response under NER 5.3.4A and, where applicable, under NER 5.3.4B.

Following AEMO's response, Transgrid will formally accept the performance standards. Any outstanding matters will be documented in the project tracker and, where applicable, included as conditions in AEMO's 5.3.4A response and/or Transgrid's acceptance letter.

6.6 Validity of Assessment

AEMO's 5.3.4A response is valid for a period of 12 months from the date of issue, provided the assessed information does not change. If you do not enter into a Connection Agreement within that period, contact Transgrid for further advice.

6.6.1 Inability to meet performance standards due to changes

Changes to the proposed connection may impact your plant's ability to meet the agreed performance standards, potentially requiring an alteration assessment. Changes to the network – including newly committed projects – may present similar challenges. You may need to retune or coordinate plant control system settings, modify or add ancillary plant, or other measures to meet or negotiate appropriate performance standards.

6.6.2 Circumstances requiring a system strength re-assessment

If any other projects in the same area of impact for system strength become 'committed' before the proposed connection, Transgrid is required to repeat the full System Strength Assessment and consult with AEMO. Changes to the proposed connection may also require a repeat of the System Strength Assessment. You must remediate any adverse system strength impacts identified during the re-assessment before the Network Connection Agreement can be executed.

To help identify reassessment requirements early, consult with Transgrid at least 8-10 weeks before the expected execution of the Network Connection Agreement or any 5.3.4A extension requests. The scope of the re-assessment will be limited and determined based on the extent of the relevant changes.