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22 January 2026

Mr Rainer Korte
Chair
Reliability Panel

Lodged online: www.aemc.gov.au/contact-us/lodge-submission

Dear Mr Korte,

2026 Compliance Template Review – Submission to Issues Paper

Transgrid welcomes the opportunity to provide a submission to the Issues Paper for the National Electricity Market (NEM) Reliability Panel's (the **Panel**) 2026 Compliance Template Review (the **Review**). Transgrid supports this review given the growth of new technologies and recent regulatory changes. As the primary Transmission Network Service Provider (**TNSP**) and System Strength Service Provider (**SSSP**) for NSW,

Transgrid is committed to delivering outcomes that promote the long-term interests of consumers. Transgrid operates the high voltage transmission network in New South Wales (**NSW**) and the Australian Capital Territory (**ACT**), which services about 4 million customers. Transgrid supports this review and many of the proposed changes.

Transgrid's attached submission provides responses to consultation questions, including highlighting:

- That the template should be structured by plant type (e.g. synchronous, asynchronous, with sub-categories)
- Suggestions related to the growth of synchronous condensers in the market, including that the frequency of active testing be limited to every five years.
- Transgrid's support for the proposed revised compliance principles (materiality and efficiency of compliance programs, frequency of testing, role of continuous plant monitoring, efficacy of compliance program, reflection of good electricity industry practice).
- Transgrid's generic template developed for a network synchronous condenser for panel's consideration.

If you or your staff require any further information or clarification on this submission, please contact Navid Aghanoori, System Security Analysis Team Lead, at navid.aghanoori@transgrid.com.au.

Yours faithfully

Kasia Kulbacka
GM Network Planning

1. Response to Consultation Questions

Question 1: Effectiveness of the Template in providing guidance for compliance programs

What are stakeholders' experiences of using the Template?

Does the current Template provide useful guidance to help parties with their obligations under the NER?

What opportunities are there to improve the Template to provide better guidance in relation to compliance with NER technical performance standards?

Transgrid's response:

The template provides good high-level guidance for developing the compliance plan; however, there are also opportunities to further improve it. Some of these opportunities are discussed in the subsequent questions.

Question 2: Proposed assessment principles and rationale

Do you agree with the proposed high level assessment criteria?

Are there additional criteria the Panel should consider, or criteria included here that are not relevant?

Transgrid's response:

Transgrid agrees with the high-level assessment criteria. However, in the context of synchronous condensers, it may be worth also considering the benefit of consistency that would be provided by a more prescriptive template, as we expect many more synchronous condensers connect to the NEM in the coming years.

Question 3: Proposed revised compliance principles

Do you agree with the revised compliance principles?

Are there any key concepts that are not currently outlined in the compliance principles, that should be included?

Transgrid's response:

Transgrid agrees with the revised compliance principles.

Question 4: Structure and form of the Template

Do stakeholders support the Panel's proposed approach to revise the Template structure based on plant type to include schedule 5.2, schedule 5.3 and schedule 5.3a plant?

Do stakeholders have any suggestions for how the Template should provide guidance to different plant types?

Do stakeholders propose any alternative approaches to revising the Template structure to accommodate additional plant types and align with the revised NER?

Transgrid's response:

Transgrid supports the template structure being based on the plant types, including synchronous technology and asynchronous technology (including grid-forming technologies). Under synchronous technology, the table could note what clauses are applicable for different plant types (e.g. S5.2.5.11 for synchronous generators only) or have two-sub-category templates for generating units and condensers.

Additionally, the Reliability Panel may need to consider distinguishing between hybrid and non-hybrid technologies, such as solar farms plus battery generating systems, as the non-compliance of one component may be masked by the performance of the other.

Question 5: Testing and monitoring regimes for schedule 5.3 plant and schedule 5.3a plant

In general terms, what kinds of tests and monitoring regimes are included in existing compliance programs for schedule 5.3 plant (certain loads and distribution networks) and schedule 5.3a plant (HVDC links)? Is there a consistent structure for these programs that can be leveraged for the Template?

Are there any existing methodologies in the Template that would be appropriate to apply for new plant types?

Are there any specific testing or monitoring methodologies that are unique to a specific plant type that the Panel should consider including in the Template?

Transgrid's response:

While there are few relevant compliances within the template for 5.3 and 5.3a plants, such as protection system and power factor correction, that could be adapted, Transgrid believes that the existing content may not be adequate for future large loads, such as data centres.

Question 6: Appropriateness of existing testing and monitoring regimes

Despite the extensive changes to the technical requirements in Schedule 5.2, which existing testing and monitoring regimes in the Template are likely to remain suitable for new plant?

Transgrid's response:

Many of the testing and monitoring elements in the existing template are relevant to generators and synchronous condensers. For example, most of the S5.2.5 tests, such as reactive power capability, ride through requirement and the dynamic response to faults are still directly applicable to synchronous condensers.

Are there any specific details about existing testing or monitoring regimes in the Template that should be amended to account for the rule changes listed above? For example, should the suggested frequency of testing of particular methodologies be amended for more effective compliance programs?

Transgrid's response:

Some of the tests that currently refer to synchronous technology imply that they also apply to synchronous condensers, which cannot be the case, such as Reactive Power Capability at maximum active power. Another example is demonstrating compliance of the power quality under S5.2.5.2 by measuring the POC power quantities. Refer to response to Question 8 for our views on frequency of testing.

Question 7: Suggestions for new testing or monitoring regimes

Are stakeholders aware of any new testing or monitoring regimes that could contribute to making more effective compliance programs for performance standards made under the amended access standards?

Transgrid's response:

There are ongoing discussions regarding e large load connections such as data centres and also specific tests for Grid Forming Batteries which may provide system security services such as system strength. However, these are not finalised and might not be consistent between different jurisdictions.

Are there any commonly used regimes that are not currently listed in the Template?

Transgrid's response:

With regards to commissioning of inverter-based resources (IBRs), in addition to standard Generator Performance Standards (GPS) compliance testing, there are other tests, such as validation of the stability detection for S5.2.5.10 (specifically for detecting sub-synchronous oscillations), that are done during the commissioning of the protection relays and that are not currently covered in the template. Additionally, there are tests such as validation tests of communication failure mechanisms done during hold point testing which are also not covered in the compliance template.

Question 8: Reflecting changes in technology and cost in the Template

Does the current Template appropriately consider all technology types? If not, how can the Template be amended to better reflect newer technologies?

Have the costs of the compliance methods listed in the Template changed significantly?

What changes, if any, could be made to the Template to reflect updated information on the costs of testing and compliance regimes?

Transgrid's response:

Considering the number of synchronous condensers that are expected to connect to the network as NSP's assets, Transgrid suggests:

- *The frequency of active testing to be limited to every five years.*
- *Remove the requirement where the performance needs to be checked for every event. For example, S5.2.5.10 requires the performance of the relay to be checked for every event. This could lead to significant amount of monitoring and data analysis efforts. Transgrid find the investigation after major events or Trip events to be appropriate and practical.*
- *In the context of synchronous condensers, other than the commissioning tests following a 5.3.9 process, Transgrid suggests limiting any tests that would require the OEMs attendance physically on site. For example, performing S5.2.5.13 limiter tests (e.g. OEL, UEL) or transfer function validation, usually would need the OEM representative on site which would mean mobilising resources from other continents to Australia. This would be a costly and time-consuming process without adding meaningful value to system security. Some of these tests would also require taking the synchronous condenser out of service which itself would be a risk to system security and adds complication to the operational aspect of the network including market impacts.*
- *NSPs should mostly demonstrate compliance by ongoing data collection and real-time analysis of key compliances which are related to system security.*
- *AEMC to consider adding some level of modelling overlays as a part of compliance evidence for the generators as the real measurement that shows the compliance performance of the generator may be a collective performance of other nearby generators or network devices. The modelling overlays of the event can assist illustrating the compliance of the generator independent of the nearby plants.*

Transgrid would also like to share a draft of a generic synchronous condenser compliance plan prepared based on the existing template. This proposed table, which is presented below as an example, has been prepared taking into account that there will be more than twenty synchronous condensers across Transgrid's network in the next decade (i.e. practicality of practicing this exercise for all of these devices with reasonable allocated time and resources on them).

Appendix: Example template for Transgrid synchronous condenser compliance

Transgrid would also like to share a draft of a generic synchronous condenser compliance plan prepared based on the existing template. This proposed table, which is presented below as an example, has been prepared taking into account that there will be more than twenty synchronous condensers across Transgrid's network in the next decade (i.e. practicality of practicing this exercise for all of these devices with reasonable allocated time and resources on them).

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
1	**S5.2.5.1:** Reactive Power Capability	Compliance Test	Reactive Power Capability Test: Use voltage reference change and transformer tap changer to show the original reactive power capability	After plant change (when relevant)	Manage the testing process following 5.3.9 process after the change	Able to meet the required minimum amount of reactive power specified in the performance standard when operating in both the under-excited and over-excited region for at least one dispatch interval (5 minutes) without exceeding network voltage limits
2	**S5.3.5 (or S5.2.5.1):** Power Factor Requirements	Monitoring	Measure auxiliary load active power and reactive power consumption Monitor the active power and reactive power consumption at the connection point	Review every 5 years and after plant change	Use SCADA or other measurement platforms to develop and maintain the evidence of the compliance.	Measured active power and reactive power consumption when the plant is not connected is within the maximum active power and reactive power consumption as per the performance standard

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
3	**S5.2.5.2:** Quality of Electricity Generated	Monitoring	Continuous monitoring of power quality metrics using power quality monitors	Review every 5 years and after plant change	If there is shutdown period data available, compare the harmonic background with and without syncon. If not, this requirement will be skipped to the next round of review.	Power quality assessment meets the agreed performance standard in S5.2.5.2
4		Routine maintenance	Routine testing and/or calibration of relevant sub-systems: Only transformer and the machine are relevant.	As per Transgrid's standard maintenance schedule.	Include in maintenance program.	Usual maintenance on Transformer and the machine.
5	**S5.2.5.3:** Response to Frequency Disturbances	Monitoring	Investigate plant trips that occur during significant frequency disturbances	On every event	Continuous monitoring when units operational,	Disconnection of the plant from the network occurred as expected for the disturbance observed

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
					investigate and report exceptions to NP	
6		Compliance Test	Signal Injection Test: Simulated frequency and/or speed signals are injected to the plant isolated from the network but connected with measurement equipment to verify the plant's protection settings and operation of the protection systems to over-frequency and under-frequency disturbances	After plant change		Protection operation to simulated over-frequency and under-frequency magnitudes and time duration consistent with applied settings and expected ride-through capability under S5.2.5.3

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
7		Routine Maintenance	Routine testing and/or calibration of relevant sub-systems including: protection systems (including testing by secondary injection and circuit breaker operating times) -auxiliary power systems -protection relays	As per Transgrid's standard maintenance schedule.	Include in maintenance program. Where signal injection is impractical, the CUO of syncon is assessed for multiple events reported in AEMO's quarterly NEM frequency events.	This would be done based on Transgrid's usual maintenance procedure or at least every three years.
8	**S5.2.5.4:** Response to Voltage Disturbances	Monitoring	Monitor and Investigate (when raised) syncon trips that occur during significant voltage disturbances	On every event	Continuous monitoring when units operational, investigate and report exceptions to NP	Disconnection of the plant from the network occurred as expected for the disturbance observed

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
					Investigate and report internally and externally (if required).	
9		Routine Maintenance	Routine testing and/or calibration of relevant sub-systems including: AVR systems (including limiters) protection systems (including testing by secondary injection and circuit breaker operating times) -auxiliary power systems -protection relays	As per Transgrid's standard maintenance schedule.	Include in maintenance program. Where signal injection is impractical, multiple major events are considered to illustrate the evidence of CUO in the events.	

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
10	**S5.2.5.5:** Disturbance Ride-Through Capability	Monitoring	Monitor and Investigate syncon trips that occur during or immediately following major fault disturbances in the network	On every event	Continuous monitoring when units operational, investigate and report exceptions to NP Investigate and report internally and externally (if required).	Disconnection of the plant from the network occurred as expected for the disturbance observed
11		Routine Maintenance	Routine testing and/or calibration of relevant sub-systems including: protection systems (including testing by secondary injection and circuit breaker operating times)	As per Transgrid's standard maintenance schedule.	Include in maintenance program. Where signal injection is impractical, the CUO of syncon is assessed against multiple reported events.	

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
			auxiliary power systems (if applicable) protection relays			
12	**S5.2.5.5A:** Responses to Disturbances following Contingency Events	Monitoring	Continuous monitoring using high speed recorders of active power, reactive power, voltage and current at the connection point and the agreed location for the purpose of S5.2.5.5A(s)(2) Assess the performance of the plant during and post-disturbance, especially with respect to: During fault: its reactive current absorption or supply to the	Review every 5 years for at least one major disturbance where the synchronous condenser system maintained continuous uninterrupted operation	Investigate and report internally and externally (if required).	Plant performance during and post-disturbance meets the performance standard under S52.5.5A in terms of: its amount of reactive current contribution during the disturbance its ability to regulate voltage to within the continuous voltage range under S5.2.5.4 its adequately damped and stable active power, reactive power and voltage response

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
			voltage magnitude change ob served at the agreed location or connection point Post-fault: its voltage regulation and/or reactive power control to ensure that the voltage is within the continuous voltage range under S5.2.5.4 its active power, reactive power and voltage being adequately damped			
13		Monitoring	Monitor and investigate syncon trips that occur during normal	On every event	Continuous monitoring when units operational,	Disconnection of the plant from the network occurred as expected for the levels of voltage fluctuations, harmonic voltage

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
	S5.2.5.6: Response to Abnormal Voltage Quality		operation and determine whether trip is caused by power quality protection (voltage fluctuations, harmonics voltage distortion or voltage unbalance)		investigate and report exceptions to NP Investigate and report internally and externally (if required).	distortion or voltage unbalance observed at the connection point
14		Routine Maintenance	Routine testing and/or calibration of relevant sub-systems including: protection systems (including circuit breaker operating times) -auxiliary power systems -protection relays	As per Transgrid's standard maintenance schedule.	Include in maintenance program.	

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
15	**S5.2.5.8:** Protection from Power System Disturbances	Monitoring	Review protection system performance in the event of protection system operation and to disturbances in the network	On every event	Continuous monitoring when units operational, investigate and report exceptions to NP	Protection systems operated as expected as per the protection settings and as allowed in the performance standard under S5.2.5.8
16		Routine Maintenance	Routine testing and/or calibration of relevant sub-systems including: protection systems (including testing by secondary injection and circuit breaker operating times) -auxiliary power systems	As per Transgrid's standard maintenance schedule.	Include in maintenance program. Where signal injection is impractical, the response from syncon could be used against multiple network disturbances showing either the disconnection or	

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
			-protection relays		connection as per design. Develop and manage RTI's	
17	**S5.2.5.9:** Protection Systems that Impact on Power System Security	Monitoring	Confirmation from fault recorder (or PMUs) recording of the actual syncon's performance.	On every event	Continuous monitoring when units operational, investigate and report exceptions to NP	Protection systems operated as expected as per the protection settings and as allowed in the performance standard under S5.2.5.9.
18		Routine Maintenance	Routine testing and/or calibration of relevant sub-systems including: -protection systems	As per Transgrid's standard maintenance schedule.	Include in maintenance program. Develop and manage RTI's	

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
			-auxiliary power systems (if applicable)			
19	**S5.2.5.10:** Detection and Response to Unstable Operation	Monitoring	Review protection system operation and performance in the event of pole-slipping or unstable operation of the plant	On every event	Continuous monitoring when units operational, investigate and report exceptions to NP	Protection systems operated as expected as per the protection settings when unstable operation of the plant was detected in line with S5.2.5.10
20		Routine Maintenance	Routine testing and/or calibration of relevant sub-systems including: -protection relays	As per Transgrid's standard maintenance schedule.	Include in maintenance program. Develop and manage RTI's	Every 7 years, the protection relay to be checked whether the impedance ranges are still valid.

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
			-PMU (that might be shared between multiple units connected to the same bus).			
21	**S5.2.5.12**: Impact on Network Capability	Monitoring	Monitor plant performance and assess impact to the relevant intra-regional or inter-regional modes of oscillations.	After plant change	Continuous monitoring when units operational, investigate and report exceptions to NP	Plant does not reduce any inter-regional or intra-regional power transfer capability and meets the performance standard under S5.2.5.12.
22	**S5.2.5.13:** Voltage and Reactive Power Control	Monitoring	Monitor the measured voltage at the regulated location and the target setpoint and assess whether the voltage regulation error is within the acceptable	Every 5 years or After plant change	Continuous monitoring when units operational, investigate and report exceptions to NP	Plant performance meets the performance standard under S5.2.5.13

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
			margin as per the performance standard			
23		Compliance Test	Voltage Reference (Voltage Disturbance) Step Test.	Every 5 years or after plant change	-Process 5.3.9 and testing after the plant change. -Investigate any non-compliance raised through regular maintenance. Develop and manage RTI's	Plant performance meets the performance standard for voltage reference step tests with the plant not operating into its limiters under S5.2.5.13

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
					Include in maintenance program. Apply a 5% step through SCADA response and illustrate the response still meet the GPS Where applying 5% step change is not practical, use one of the shunt device operation data to illustrate the GPS compliance.	

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
24		Compliance Test	-Voltage Reference Step Limiter Test (Synchronised). -Field Voltage Ceiling Test (Synchronised). -Voltage Reference Step Test (Unsynchronised). -Open Circuit Characteristic Test (Unsynchronised): -Frequency Sweep (Transfer Function) Test (Offline):	After plant change	-Process 5.3.9 and testing after the plant change. -Investigate any non-compliance that may be raised through regular maintenance.	Plant performance meets the performance standard for voltage reference step tests with the plant operating into its limiters under S5.2.5.13

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
25	S5.2.6.1 and 4.11.1: Remote Monitoring	Compliance Test	For remotely monitored/controlled quantities as per the Master SCADA Input Output configured data points, confirm that the AEMO Control Centre receives and displays the same values as displayed by the SCADA system.	Every 5 years and after plant change	Include in maintenance program. Continuous monitoring when units operational, investigate and report exceptions to NP	Confirmation of the SCADA monitored values at each end of the communication by AEMO and Transgrid
		Compliance Test	Verification of the accuracy of the measured and transmitted data	Every 5 years and after plant change	Include in maintenance program. Continuous monitoring when units operational,	Confirmation of accuracy of transmitted data

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
					investigate and report exceptions to NP	
		Routine Maintenance	Routine testing and/or calibration of relevant sub-systems including: -transducers -auxiliary power systems -power backup or UPS systems	As relevant	Include in maintenance program.	
26	**S5.2.6.2 and 4.111.3:** Communications Equipment	Compliance Test	Confirm the availability of communication links, including any backup links	Every year (annually) and after plant change	Include in maintenance program.	Confirmation of availability of communication links

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
			with AEMO. If Transgrid's SCADA has alarm set for this, then action would be limited to those conditions that Alarms are raised.		Continuous monitoring when units operational, investigate and report exceptions to NP	
		Routine Maintenance	Routine testing and/or calibration of relevant sub-systems including: -auxiliary power systems -power backup or UPS systems	As appropriate to the technology of the relevant sub-system	Include in maintenance program	
27	**S5.2.8:** Fault Current	Monitoring	Monitor the fault current contribution from the plant to fault disturbances	On every major event or every five years.		Measured fault current contributions to faults are consistent with the calculated fault currents from power system simulations and in line with S5.2.8

EXAMPLE: Transgrid compliance template for synchronous condensers						
Test Ref.	Performance Standard	Type of Test	Description of Test	Frequency of test	Action	Compliance Assessment
			Assess the measured fault current contributions to the expected calculated fault currents obtained from power system simulations			