AEMO(T) Australian Energy Market Operator (Transitional) Limited
ACN 132 770 104

Level 12
15 William Street
Melbourne 3000

GPO Box 2008
Melbourne VIC 3001

t 03 9648 8501
m 0418 391 982
f 03 9648 8778
www.aemo.com.au

19 June 2009

Mr Ian Woodward
Chairman of the Reliability Panel
Australian Energy Market Commission
PO BOX A2449
SYDNEY SOUTH NSW 1235

By e-mail: submissions@aemc.gov.au

Dear Mr Woodward

Draft Report for the Reliability Panel's Template for Generator Compliance Programs

AEMO appreciates the opportunity to respond to the Reliability Panel's Draft Report for the Template for Generator Compliance Programs. This response is being submitted by the Australian Energy Market Operator (Transitional) Ltd (**AEMOT**) on behalf of Australian Energy Market Operator Limited (**AEMO**). Any reference in this letter and submission to either AEMO or AEMOT should be taken as a reference to the entity that will exist from 1 July 2009, which will be called the Australian Energy Market Operator.

AEMO's primary concern is with the inclusion of draft Principle 8 which comments on Generators' liability regarding compliance breaches in instances where there is reliance on input from the market operator and/or a Network Service Provider (**NSP**) to determine power system related equipment settings. AEMO notes that the inputs it produces rely on the power system modelling information provided by Generators being correct. Therefore, the acceptance of a performance standard relies on the accuracy of the information provided. Where information provided is inaccurate and a compliance breach results, AEMO considers that Generators should be responsible. This is important because this information is used to plan and operate the National Electricity Market, and if a Generator's response differs materially from what is expected, power system security may be compromised.

Given this, AEMO considers that the inclusion of comments regarding liability for a compliance breach in draft Principle 8 are inappropriate because they indicate that Generators would not have any responsibility for compliance breaches in these instances. AEMO considers that Principle 8 should be amended to reflect the reliance of NSPs and the market operator on the accuracy of the power system modelling information provided. That is, a generator should be responsible for reasonable compliance with agreed models. The inclusion of such a principle would reinforce and strengthen the link between predicted and actual performance compliant with the information that they provide. This would increase the role of compliance programs in ensuring information used by planners and the market operator is as close to actuality as possible.

AEMO has also provided comments on the draft template. These comments are set out in Attachment 1.

For further discussion, please contact Louis Tirpcou on (03) 8664 6615.

Yours Sincerely

Matt Zema
Managing Director and Chief Executive Officer
AEMO (Transitional) Ltd

Enc.

ATTACHMENT 1: AEMO COMMENTS ON THE DRAFT TEMPLATE FOR GENERATOR COMPLIANCE

AEMO's comments on the draft template are explained the column on the far right of each table. AEMO has not sought to comment on all performance standards covered in the draft template, however, tables for these performance standards have been included in this attachment for completeness.

Amendments to the wording within the template are indicated by the use of bold typeface and strikethroughs in the relevant sections of the tables.

Reactive Power Capability

(as required under S5.2.5.1 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment
Method 1: At rated power output, adjust the reactive power capability to specified levels	Every 3 years and after plant change	Directly Measurable. Applies to synchronous and conventional plant.	Achieve reactive power requirements of the performance standard
Method 2: Exercise the over and under excitation limits at as close to rated power output as practical	Every 3 years and after plant change	Directly Measurable. Applies to synchronous and conventional plant.	Achieve reactive power requirements of the performance standard
Method 3: Step testing of AVR limiters	Every 3 years and after plant change	Applies to conventional plant	Achieve reactive power requirements of the performance standard
Method 4: (a) Capability will be tested (b) Capability will be monitored using SCADA under normal wind farm operation	Following plant change Annual review of a selection of events	Applies to wind farms plant	Achieve performance standard Consistency with plant characteristics
Method 5: Routine testing of relevant sub-systems	As appropriate to the technology of the relevant sub-system	Applicable to a wide range of generating plant and systems	Consistency with plant characteristics

Power Factor when not generating

(clause and versions of the Rules: N/A)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment
Method 1: Direct measurement and calculation of power factor when not generating	Every 3 years and following plant change	Only applies where there is a circuit breaker, allowing auxiliary supply to be drawn through the main connection point	Actual capability directly demonstrated

Quality of Electricity Generated

(as required under S5.2.5.2 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment
Method 1: (a) Direct measurements using power quality meters to derive: i. voltage fluctuation levels ii. Voltage balance iii. harmonics, flicker and negative phase sequence voltage prior to synchronization	Following plant change		Data analysis can demonstrate compliance is met. Consistency with plant characteristics.
(b) Routine testing of any relevant sub-systems	As appropriate to the technology of the relevant sub-system	Important when power quality at the connection point is dependent on ancillary plant of power electronic control systems	
Method 2: (a) Capability will be Monitored through use of Power Quality Monitors	Routine monitoring Specific review annually and following plant change		Not raising alarms. Consistency with plant characteristics (no deterioration).
(b) Testing of any relevant sub-systems	As appropriate to the technology of the relevant sub-system	Important when power quality at the connection point is dependent on ancillary plant of power electronic control systems	Consistency with plant characteristics

Response to Frequency Disturbances

(as required under S5.2.5.3 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Investigating unit trips that occur during significant frequency disturbances (b) Routine testing of relevant sub-systems including: i. testing of control system response to disturbances by the injection of simulated frequency / speed control signals ii. Routine tests of electrical/mechanical over speed devices	On every event As appropriate to the technology of the relevant sub-system			This performance standard requires continuous uninterrupted operation. AEMO therefore suggests that the particular monitoring components included in Methods 2, 3 and 4 mean that these methods are necessarily suitable for this performance standard. These methodologies actually test how a machine responds to a frequency disturbance rather than proving that it will operate continuously through a frequency excursion. AEMO considers that these methods are better suited to the testing and monitoring of S5.2.5.11 – Frequency Control. If the Panel decides to retain these methods, AEMO would suggest that Method 3 should require routine testing of relevant subsystems.
Method 2: (a) Investigating system performance using high speed data recorders (b) Routine testing of relevant sub-systems including: i. testing of control system response to disturbances by the injection of simulated frequency / speed control signals ii. Routine tests of electrical/mechanical over speed devices	On major events and minimum annual review As appropriate to the technology of the relevant sub-system	Appropriate to use where high speed monitors are available and models have been used in establishing compliance	Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available**	
Method 3: (a) Verify the modelled performance of turbines (say 1-2%) (b) Verify the performance at the connection point by testing response to an introduced disturbance (c) Continuous monitoring (high speed) of performance at the connection point	Following plant change Type testing and verification every 10 years	Only applicable to small asynchronous generators with digital controls that are aggregated Each unit is not material and performance slippage is unlikely Appropriate to use where high speed monitors are available and models have been used in establishing compliance	Operation over the frequency range specified and agreed in the Generator Performance Standard	

Method 4: (a) Performance of relevant sub-systems will be monitored using the following systems under normal machine operation: digital protection relays; other data-logging equipment as required (b) Routine testing and validation of relevant sub-system performance including: i. electrical protection; and ii. turbine protection	On major events and minimum annual review As appropriate to the technology of the relevant sub-system		Achieve performance standard	

Response to Voltage Disturbances

(as required under S5.2.5.4 in versions 13-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Investigating unit trips that occur during significant voltage disturbances (b) Routine testing of relevant sub-systems including: i. AVR systems ii. Auxiliary power systems iii. Protection relays	Event by event analysis As appropriate to the technology of the relevant sub-system		Consistency with plant characteristics	Method 2: This performance standard only requires continuous uninterrupted operation of the generating system or unit. Part (a) of this method tests how the system responds to a voltage disturbance rather than proving that it will operate continuously through a voltage excursion. AEMO considers that it more appropriate for part (a) to be utilised in the development of testing and monitoring methodologies for S5.2.5.13 - Voltage and Reactive Power Control. AEMO suggests an amendment to the 'Basis for compliance assessment' section (as indicated).
Method 2: (a) Continuous high speed monitoring (b) Routine testing of relevant sub-systems including: i. AVR systems ii. Auxiliary power systems iii. Protection relays	On major events and minimum annual review As appropriate to the technology of the relevant sub-system	Appropriate to use where high speed monitors are available and models have been used in establishing compliance Where possible, testing of auxiliary power systems should include simulated disturbance testing	Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if models are not available**	
Method 3: (a) With the generator out of service, test the ability of nominated 415 V drives to sustain a specified voltage interruption	Every 4 years	Applies only to 415 V drives	Successful ride through of system voltage disturbances, as per the agreed performance standard	

(b) In-service monitoring and investigation of any occurrence of a unit trip which may have been associated with a system voltage disturbance	Analysis of all events	This type of monitoring will be acceptable only if high speed monitoring is not available		

Generating Unit response to disturbances following contingency events

(as required under S5.2.5.5 in versions 13-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Direct testing by instigating a network trip. (b) Continuous monitoring using high speed recorders (c) Routine monitoring and testing of relevant sub-systems	Following plant changes On major events and minimum annual review As appropriate to the technology of the relevant sub-system	Preferred method where possible and where risks can be managed Appropriate to use where high speed monitors are available and models have been used in establishing compliance	Actual results will confirm compliance with standard. Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if models are not available**.	Method 1: AEMO seeks clarification on whether direct testing by instigating a network trip needs to be undertaken to be able to use this methodology or whether this would be optional. AEMO also suggests an amendment to the 'Basis for compliance assessment' section (as indicated).
Method 2: (a) Investigate unit trips during major system events (b) Routine monitoring and testing of relevant sub-systems including suitable testing to confirm circuit breaker operating times	On every event As appropriate to the technology of the relevant sub-system		Achieve performances standards	

Quality of Electricity Generated and Continuous Uninterrupted Operation

(as required under S5.2.5.6 in versions 13-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Investigating unit trips to ensure the cause of the trip is not caused by ~~**voltage unbalanced conditions**~~ **power-quality protection (harmonics or voltage**	Following each event			Method 1: AEMO suggests an amendment to part (a) (as indicated).

unbalance) (b) Routine monitoring and testing of any relevant sub-systems	As appropriate to the technology of the relevant sub-system			Method 2: AEMO suggests an amendment to the 'Basis for compliance assessment' section (as indicated).
Method 2: Monitoring in-service performance using high speed data recorders	Review performance annually	Appropriate to use where high speed monitors are available and models have been used in establishing compliance	Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available.**	

Partial Load Rejection

(as required under S5.2.5.4 in versions 1-12 of the Rules, and S5.2.5.7 in versions 13-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment
Method 1: (a) Measure response of the generator to system over-frequency and analyse the unit performance (b) Investigation of unit trips	On every event	Directly measurable	Achieve performance standards
Method 2: (a) Routine testing of relevant sub-systems including: i. Analytical simulation of generator, auxiliary systems and critical protections ii. Secondary injection testing of critical protection systems (b) Assess any unit trip for relationship to load rejection event	As appropriate to the technology of the relevant sub-system On every event	Type Test permissible where multiple units are involved	Simulation demonstrates ride through of load rejection event specified in Performance Standard Operation over the conditions specified and agreed in the Generator Performance Standard
Method 3: (a) Response to partial load rejection to be assessed by in service performance (b) Test for correct operation of turbine overspeed trips	Every 4 years	Overspeed protection checked off-line after major overhauls	That plant remained in service when required to do so That turbine trip operates to within acceptable tolerance of nominal trip setting for overspeed protection

Protection from Power System Disturbances

(as required under S5.2.5.8 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Continuous monitoring using high speed recorders (b) Routine testing of relevant sub-systems including applicable protection relays (c) Investigate unit electrical protection trips	As appropriate to the technology of the relevant sub-system On every event	Appropriate to use where high speed monitors are available and models have been used in establishing compliance	Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available** That protection system operated in accordance with design and the Performance Standard	Methods 1, 2, and 3 for this performance standard follow similar principles AEMO suggests that the Panel look to consolidate these to avoid minor wording discrepancies especially around the routine testing requirements. Alternative Method: AEMO suggests an alternative method for monitoring this performance standard to be considered by the Panel (see Alternative Method as indicated). This method aims to consolidate (and therefore replace) Methods 1, 2 and 3. Method 1: If the Panel is to retain this method, the AEMO suggests an amendment to the 'Basis for compliance assessment' section (as indicated). Method 3: If the Panel also decides to retain this method, then
Method 2: (a) Routine testing of relevant sub-systems including: i. Injection of simulated signals (secondary injection) to demonstrate correct operation of the protection ii. Repair or recalibrate protection relays as required (b) Investigate unit trips	As appropriate to the technology of the relevant sub-system On every event		Plant performance complies with the clearance times in the Generator Performance Standard	
Method 3: (a) Performance is monitored, in-service, ~~where data is available~~	At each major overhaul; and/or every 5 years by routine functional testing of unit electrical protection systems and verification of database registered protection settings to occur annually	Applicable for wind farms. Changes to turbine control parameters will be controlled such that the performance of the generating system and generating units is not compromised in relation to the generator performance standard. **Appropriate to use where data is available.**	Performance is confirmed by the generating system remaining synchronised during power system disturbance conditions where required under a Provision of the Rules Performance will be assessed against the performance standard requirements following a unit trip as a result of a relevant system event in which the unit should have remained synchronised	

(b) Routine testing of relevant sub-systems including protection system relays, between the generating unit terminals but within the generating system shall be tested by secondary injection	As appropriate to the technology of the relevant sub-system			AEMO considers that it would not viable to select the method if the relevant data is not available. AEMO therefore suggests an amendment to the wording (as indicated).
Alternative Method: **(a) Routine testing of relevant sub-systems including (but not limited to):** **i. Injection of simulated signals (secondary injection) to demonstrate correct operation of the protection** **ii. Repair or recalibrate protection relays as required** **and either:** **(b) Investigate any unit trips for units above 30 MW; OR** **(c) Continuous monitoring using high speed recorders**				

Protection systems that Impacts on Power System Security

(as required under S5.2.5.9 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Routine testing of protection systems including: i. CB opening times; ii. Protection relay injection testing. (b) Confirmation from fault recorder records of actual performance	As appropriate to the technology of the protection system Every trip event	Directly Measurable	Achieve performance standard	Methods 1, 2, and 3 for this performance standard follow similar principles AEMO suggests that the Panel look to consolidate these to avoid minor wording discrepancies especially around the routine testing requirements. Alternative Method: AEMO suggests an alternative method for monitoring this performance standard to be considered
Method 2: (a) Routine testing of relevant sub-systems including: i. protection system testing by secondary injection ii. Redundancy of primary protection systems iii. Timing of trip signal issued by the breaker fail protection	As appropriate to the technology of the relevant sub-system		That all protection relays operate satisfactorily and to within design tolerance of setting value	

system (b) Assessment of protection system performance in the event of protection system operation.	On every event		That protection system is operated in accordance with design and the Performance Standard	by the Panel (see Alternative Method as indicated). This method aims to consolidate (and therefore replace) Methods 1, 2 and 3. Method 3: If the Panel also decides to retain this method, then AEMO believes that it should not be utilised if the on the on-line data is not available. AEMO therefore suggests an amendment to the wording (as indicated).
Method 3: (a) Performance is monitored, in-service, where data is available. ~~If appropriate data is not currently available, additional on-line data logging facilities to be considered~~ (b) Relevant testing of any relevant sub-systems including protection system relays shall be tested by secondary injection (c) Verification of database registered protection settings to occur in conjunction with injection testing	At each major overhaul; and/or every 5 years by routine functional testing of unit electrical protection systems and verification of database registered protection settings to occur annually As appropriate to the technology of the relevant sub-system	Changes to turbine control parameters will be controlled such that the performance of the generating system and generating units is not compromised in relation to the GPS	Performance is confirmed by assessing operation of protection systems against the requirements of the standard when a generating unit trips as a result of fault occurring between the generating unit stator and the connection point Performance will be assessed against the performance standard requirements following a unit trip as a result of a relevant system event in which the unit should have remained synchronised	
Alternative Method: **(a) Routine testing of relevant sub-systems including:** **i. Injection of simulated signals (secondary injection) to demonstrate correct operation of the protection** **ii. CB opening times;** **iii. Redundancy of primary protection systems** **iv. Timing of trip signal issued by the**				

breaker fail protection system and either: **(b) confirmation from fault recorder records or protection relay records; OR** **(c) Continuous monitoring using high speed recorders**				

Asynchronous operation of synchronous generating units / Protection to Trip Plant for unstable operation

(as required under S5.2.5.10 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Routine testing of relevant sub-systems including protection system testing by secondary injection (b) Assessment of protection system performance in the event of protection system operation or of asynchronous operation	As appropriate to the technology of the relevant sub-system On every event		That all protection relays operate satisfactorily and to within design tolerance of setting value That protection system is operated in accordance with design and the Performance Standard	

Frequency Control

(as required under S5.2.5.11 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: Monitor in-service performance using high speed frequency data		Appropriate to use where high speed monitors are available and models have been used in establishing compliance	~~**Achieve performance standard or confirm modelled performance to actual**~~ Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available**	As suggested earlier, AEMO considers that the monitoring methods used in Methods 2, 3 and 4 from S5.2.5.3 – Frequency Disturbance may be incorporated into the testing and monitoring methodology for this standard. Methods 1 and 2: AEMO suggests an amendment to the 'Basis for compliance assessment'
Method 2: Assessment of governor system performance during events involving significant variation to system frequency	On every event	Assessment takes into account inertial response, overall governor droop setting etc	That governor system response is within the tolerance specified by the Performance Standards	

Method 3: (a) Analytical simulation of turbine and governor systems (b) Assess generator response to disturbances using high speed recording data	Type Test permissible where multiple units are involved Ongoing		~~**Achieve performance standard or confirm modelled performance to actual**~~ Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available**	section (as indicated).
Method 4: (a) Step response test of the governor to test damping and droop characteristics (b) Routine Calibration Tests	Every 4 years Every 4 years		Plant performance complies with the Generator Performance Standard	

Stability / Impact on Network Capability

(as required under S5.2.5.12 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Monitor in-service performance for relevant performance characteristics not otherwise tested	Following plant changes	Generator can only be held responsible for ensuring the performance of their generating system as it contributes to meeting this standard	Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available**	Inline with AEMO's response to Principle 8 in the main section of this submission, AEMO considers that a Generator should be held responsible for overall compliance to its own model. Method 1: AEMO suggests an amendment to the 'Basis for compliance assessment' section (as indicated).
(b) Routine monitoring and testing of relevant sub-systems including suitable testing to confirm power system stabilizer performance (if relevant)	As appropriate to the technology of the relevant sub-system			

Excitation control system / Voltage and Reactive Power Control

(as required under S5.2.5.13 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Monitoring in-service performance (b) Standard AVR testing – Step response	Every 4 years		Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available**	AEMO would like clarification on the differences between Methods 2 and 3. Alternative Method: AEMO has developed an alternative method for monitoring this performance standard to be considered by the Panel (see Alternative Method as indicated). This method has been developed as a replacement for Methods 2 and 3. Methods 1, 2, 3 and 4: If the panel decides to retain each of these methods, then AEMO suggests an amendment to the 'Basis for compliance assessment' section for each of these Methods (as indicated).
Method 2: (a) AVR step response tests (b) AVR step response test of OEL and UEL operation (c) AVR and PSS transfer function measurements over required frequency range	Every 4 years		Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available**	
Method 3: (a) Transfer function measurements (b) Step response tests with the unit unsynchronised and at full load (c) Assess the stability of limiter operation (d) Monitoring in-service performance	Every 4 years		Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available**	
Method 4: Performance of relevant sub-systems will be monitored using the following systems: digital protection relays; other data-logging equipment as required	As appropriate to the technology of the relevant sub-system	Applicable for Wind Farms. Changes to turbine control parameters will be controlled such that the performance of the generating system and generating units is not compromised in relation to the GPS.	Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available**	
Alternative Method: **(a) Step response tests with the unit unsynchronised and at full load** **(b) Assess the stability of limiter operation** **And either** **(c) Monitoring in-service performance; OR** **(d) Transfer function measurements**			Consistency of operation with plant models used to establish initial compliance **if the models are available; OR consistency with past performance only if the models are not available**	

Active Power Control

(as required under S5.2.5.14 in versions 13-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: One off installation	Assess when changes are made			Alternative Method: AEMO has developed an alternative method for monitoring this performance standard to be considered by the Panel (see Alternative Method as indicated).
Alternative Method: **Monitor non-compliance with dispatch from market systems**				

Remote Monitoring

(as required under S5.2.6.1 in versions 1-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment
Method 1: (a) Calibration of Transducers (b) Verification of the accuracy of transmitted data	Following plant change and every 5 years		Confirmation at each end of the communications system by both parties
Method 2: (a) SCADA monitored values and farm panel metering will be routinely checked (b) The calibration of transducers and Wind Farm panel metering will be checked	Every 5 years At each major outage or once every 5 years	Applicable for Wind Farms	

Communications Equipment

(as required under S5.2.6.3 in versions 1-12 of the Rules, and S5.2.6.2 in versions 13-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment
Method 1: One off installation	Assess when changes are made		Direct comparison with rules requirements

Power Station Auxiliary Transformers / Supplies

(as required under S5.2.8 in versions 1-12 of the Rules, and S5.2.7 in versions 13-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Metering of active and reactive power at the auxiliary supply connection point	Every 4 years	Only applicable when auxiliary supplies are taken from some other point different to generator connection point. Access Standards must be established under clause S5.3.5.	Power factor, **quality of supply and protection and control requirements** within allowable range **/ specification**	Method 1: AEMO suggests an amendment to the 'Basis for compliance assessment' section (as indicated).
(b) Testing of any relevant sub-systems including capacitor banks and circuit breakers	As appropriate to the technology of the relevant sub-system		Performance to specification	
Method 2: Performance will be monitored as part of condition monitoring and maintenance routines		This standard only applies to generating systems that takes auxiliary supplies from a separate supply. Unit auxiliary supplies on wind farms are taken from within connection point when units are online. Very small wind farm station service auxiliary load requirements are considered negligible under NEM CMP requirements.		

Fault Level / Current

(as required under S5.2.9 in versions 1-12 of the Rules, and S5.2.8 in versions 13-26 of the Rules)

Suitable testing and monitoring methodology	Frequency	Notes	Basis for compliance assessment	AEMO Comments
Method 1: (a) Monitoring in-service performance during faults near the connection point (b) Review and recalculation of fault levels	Review following any event Following plant		Calculation confirms current fault current contribution	Method 3: AEMO suggests an amendment to the 'Basis

(c) Routine testing of any relevant sub-systems	change As appropriate to the technology of the relevant sub-system			for compliance assessment' section (as indicated).
Method 2: (a) Modelling and simulation of plant characteristics to make sure the plant is capable of meeting agreed standards (b) Monitoring of generator contribution on fault event	Following plant change Review following any event		Calculation confirms current fault current contribution	
Method 3: (a) Performance of relevant sub-systems will be monitored using the following systems: digital protection relays; other data-logging equipment as required (b) Where recorded data is available, comparison to be made of measured fault currents and computer simulations (c) Review and recalculation of fault levels	As appropriate to the technology of the relevant sub-system Following a fault Following plant change		Achieve performance standard Consistency of operation with plant models used to establish initial compliance **if the models are available**; OR consistency with past performance **only if the models are not available**	