Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Reactive Power Capability (as required under S5.2.5.1 in versions 1- 47 of the Rules, the initial Code, and all amended versions of the Code)[3]	Method 1 (of 5): (a) At rated power output, adjust the reactive power at the connection point to specified levels.	Every 3 years and after plant change.	Directly Measurable Applies to synchronous and conventional plant, and entire windfarms.	Be capable of a~~A~~chievinge reactive power requirements of the performance standard.
	(b) Investigate and report any known plant condition that arises that is known to restrict the capability.	Any observed defect on the plant or relevant sub-system.	Monitored by plant owners and operators and controlled by AEMO.	As above.
	Method 2 (of 5): (a) 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.	Be capable of achieving~~Achieve~~ reactive power requirements of the performance standard.
	(b) Investigate and report any known plant condition that arises that is known to restrict the capability.	Any observed defect on the plant or relevant sub-system.	Monitored by plant owners and operators and controlled by AEMO.	As above.

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Comment [BS1]: The reactive power standard is about "capability" of achieving a particular operating point. The suggested wording change clarifies what the assessment really is meant to be confirming. Although the test at the particular operating point is a good test, participants should also report situations when they are aware they DO NOT have the capability.

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[1] Where there is more than one method provided, only one method is required to be used.
[2] See section 2.6 of the template for more information on the factors to be considered when determining the actual frequency.
[3] This provision was amended in the Code on 9 August 2001 and on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Reactive Power Capability (as required under S5.2.5.1 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code)[4]	Method 3 (of 5): (a) Step testing of AVR limiters.	Every 3 years and after plant change.	Applies to conventional plant.	Be capable of achieving~~Achieve~~ reactive power requirements of the performance standard.
	(b) Investigate and report any known plant condition that arises that is known to restrict the capability.	Any observed defect on the plant or relevant sub-system.	Monitored by plant owners and operators and controlled by AEMO.	As above.
	Method 4 (of 5): (a) Capability will be tested by component; and	Following plant change.	Applies to wind farms plant.	Be capable of achieving ~~Achieve~~ performance standard.
	(b) Capability will be monitored using SCADA under normal wind farm operation.	Annual review of a selection of events.		Consistency with plant characteristics.
	(c) Investigate and report any known plant condition that arises that is known to restrict the capability.	Any observed defect on the plant or relevant sub-system.	Monitored by plant owners and operators and controlled by AEMO.	As above.
	Method 5 (of 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.

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[4] This provision was amended in the Code on 9 August 2001 and on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Reactive Power Capability - Power Factor Requirements (as required under S5.3.5 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code)	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.	Power factor within allowable range / specification. ~~Actual capability directly demonstrated.~~
Quality of Electricity Generated (as required under S5.3.5.2 in versions 1-347 of the Rules, the initial Code, and all amended versions of the Code)[5]	Method 1 (of 2): (a) Direct measurements using power quality meters to derive: i. voltage fluctuation levels; ii. voltage balance, and iii. harmonics, flicker and negative phase sequence voltage ~~prior to synchronization~~; and	Following plant change.	Performance of generator and its contribution to power quality needs to be separated from the contribution of others.	Achieve performance standard or demonstrate consistency with plant characteristics used in determining original compliance.

Comment [BS2]: The assessment is similar to that performed for S5.2.7 on page 42

Comment [BS3]: Some generators are required to demonstrate this standard after synchronization so this phrase should be removed and added to the Notes column.

[5] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Quality of Electricity Generated (as required under S5.3.5.2 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code)[6]	(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.	As above.
	Method 2 (of 2): (a) Monitoring in-service performance through use of Power Quality Monitors; and	Routine monitoring. Specific review every three years and following plant change.		Monitors set against the performance standard are not raising alarms. Consistency with plant characteristics (no deterioration).
	(b) Testing and/or calibration 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.

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[6] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Response to Frequency Disturbances (as required under S5.2.5.3 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code)[7]	Method 1 (of 4): (a) Investigating plant trips that occur during significant frequency disturbances; and	On every event.		Achieve performance standard.
	(b) Routine testing and/or calibration of relevant sub-systems including: i. testing of control system response to disturbances by the injection of simulated frequency / speed control signals; and ii. Routine tests of electrical/mechanical over speed devices.	As appropriate to the technology of the relevant sub-system.		As above.

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[7] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
	Method 2 (of 4): (a) Investigating system performance using high speed data recorders; and	Every event where the plant trips and disturbances where the frequency moves out of the *operational frequency tolerance band*.	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.
Response to Frequency Disturbances (as required under S5.2.5.3 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [8]	(b) Routine testing and/or calibration of relevant sub-systems including: i. testing of control system response to disturbances by the injection of simulated frequency / speed control signals; and ii. Routine tests of electrical/mechanical over speed devices.	As appropriate to the technology of the relevant sub-system.		As above.
	Method 3 (of 4): (a) Verify the modelled performance of a sample of turbines;	Following plant change.	Only applicable to small asynchronous generators with digital	Operation over the frequency range specified and agreed in the Generator Performance

[8] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
			controls that are aggregated.	Standard.
Response to Frequency Disturbances (as required under S5.2.5.3 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [9]	(b) Verify the performance at the connection point by testing response to an introduced disturbance;	Type testing and verification at least every 10 years.	Each unit is not material and performance slippage is unlikely.	As above.
	(c) Continuous monitoring (high speed) of performance at the connection point; and		Appropriate to use where high speed monitors are available and models have been used in establishing compliance.	As above.
	(d) Routine testing and/or calibration of relevant sub-systems including: i. testing of control system response to disturbances	As appropriate to the technology of the relevant sub-system.		As above.

[9] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
	by the injection of simulated frequency / speed control signals; and ii. Routine tests of electrical/mechanical over speed devices.			
Response to Frequency Disturbances (as required under S5.2.5.3 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [10]	Method 4 (of 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; and	Every 3 years.		Achieve performance standard.
	(b) Routine testing and/or calibration and validation of relevant sub-system performance including: i. electrical protection; and ii. turbine protection.	As appropriate to the technology of the relevant sub-system.		As above.

[10] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Response to Voltage Disturbances (as required under: S5.2.5.4 in versions 13-47 and S5.2.5.3 in versions 1-12 of the Rules ; and S5.2.5.3 in the initial Code, and all amended versions of the Code) [11]	Method 1 (of 3): (a) Investigating plant trips that occur during significant voltage disturbances; and	On every event.		Achieve performance standard.
	(b) Routine testing and/or calibration of relevant sub-systems including: i. AER systems; ii. Auxiliary power systems; and iii. Protection relays.	As appropriate to the technology of the relevant sub-system.		Consistency with plant characteristics.

[11] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
	Method 2 (of 3): (a) Continuous high speed monitoring; and	On every event where the plant trips or on at least one major voltage disturbance every 3 years.	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.
	(b) Routine testing and/or calibration of relevant sub-systems including: i. AVR systems; ii. Auxiliary power systems; and iii. Protection relays.	As appropriate to the technology of the relevant sub-system.	Where possible, testing of auxiliary power systems should include simulated disturbance testing.	As above.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Response to Voltage Disturbances (as required under: S5.2.5.4 in versions 13-47 and S5.2.5.3 in versions 1-12 of the Rules; and S5.2.5.3 in the initial Code, and all amended versions of the Code) [12]	Method 3 (of 3): (a) With the generator out of service, test the ability of nominated 415 V drives to sustain a specified voltage interruption; and	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 plant trip which may have been associated with a system voltage disturbance.	On every event.	This type of monitoring will be acceptable only if high speed monitoring is not available.	As above.
Response to Disturbances following Contingency Events (as required under S5.2.5.5 in versions 13-47 of the Rules) [13]	Method 1 (of 3): Direct testing by instigating a network trip.	Following plant changes.	Preferred method where possible and where risks can be managed.	Achieve performances standard.

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[12] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.
[13] This provision was amended in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
	Method 2 (of 3): (a) Investigate plant trips that occur during or immediately following major system events; and	On every event.		Achieve performances standard.
	(b) Routine monitoring and testing and/or calibration of relevant sub-systems including suitable testing to confirm circuit breaker operating times.	As appropriate to the technology of the relevant sub-system.		As above.
Response to Disturbances following Contingency Events (as required under S5.2.5.5 in versions 13-47 of the Rules) [14]	Method 3 (of 3): (a) Continuous monitoring using high speed recorders; and	On disturbances when the plant trips or at least one major event every 3 years.	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.

[14] This provision was amended in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
	(b) Routine monitoring and testing and/or calibration of relevant sub-systems.	As appropriate to the technology of the relevant sub-system.		As above.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Quality of Electricity Generated and Continuous Uninterrupted Operation (as required under S5.2.5.6 in versions 13-47 of the Rules) [15]	Method 1 (of 2): (a) Direct measurements using power quality meters to test: i. voltage fluctuation levels; ii. voltage balance; and iii. harmonics, flicker and negative phase sequence voltage prior to synchronisation and to ensure protection settings align to the performance standard;	Following plant changes.		Achieve performance standard and ensure protection settings are consistent with the performance standard.
	(b) Investigating plant trips to ensure the trip is not caused by power-quality protection (harmonics or voltage unbalance); and	Following each event.		Achieve performance standard.
	(c) Routine monitoring and testing and/or calibration of any relevant sub-systems.	As appropriate to the technology of the relevant sub-system.		As above.

[15] This provision was amended in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Quality of Electricity Generated and Continuous Uninterrupted Operation (as required under S5.2.5.6 in versions 13-47 of the Rules) [16]	Method 2 (of 2): Monitoring in-service performance using appropriate metering.	On disturbances when the plant trips including at least one major event every 3 years.	Appropriate to use where suitable metering is available.	Consistency of operation with plant performance specifications.
Partial Load Rejection (as required under: S5.2.5.7 in versions 13-47 and S5.2.5.4 in versions 1-12 of the Rules; and S5.2.5.4 of the initial Code, and all amended versions of the Code) [17]	Method 1 (of 3): (a) Measure response of the generator to system over-frequency and analyse the unit performance; and	On every event where high frequency moves out of the *operational frequency tolerance band*	Directly measurable.	Achieve performance standards.
	(b) Investigation of plant trips.	On every event.		As above.

[16] This provision was amended in version 13 of the Rules.
[17] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Partial Load Rejection (as required under: S5.2.5.7 in versions 13-47 and S5.2.5.4 in versions 1-12 of the Rules; and S5.2.5.4 of the initial Code, and all amended versions of the Code) [18]	Method 2 (of 3): (a) Routine testing and/or calibration of relevant sub-systems including: i. Analytical simulation of generator, auxiliary systems and critical protections; and ii. Secondary injection testing of critical protection systems; and	As appropriate to the technology of the relevant sub-system.		Simulation demonstrates ride through of load rejection event specified in Performance Standard.
	(b) Assess any plant trip for relationship to load rejection event.	On every event.	Type Test permissible where multiple units are involved.	Operation over the conditions specified and agreed in the Generator Performance Standard.

[18] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Partial Load Rejection (as required under: S5.2.5.7 in versions 13-47 and S5.2.5.4 in versions 1-12 of the Rules; and S5.2.5.4 of the initial Code, and all amended versions of the Code) [19]	Method 3 (of 3): (a) Response to partial load rejection to be assessed by in service performance; and	On every event.		Achieve performance standard.
	(b) Test for correct operation of turbine overspeed trips.	Every 4 years.	Overspeed protection checked off-line after major overhauls.	That turbine trip operates to within acceptable tolerance of nominal trip setting for overspeed protection.

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[19] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Protection from Power System Disturbances (as required under S5.2.5.8 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [20]	Method 1 (of 3): (a) Continuous monitoring using high speed recorders;	Not relevant assuming alarms are incorporated into the design of the recorder.	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; OR consistency with past performance if the models are not available.
	(b) Routine testing and/or calibration of relevant sub-systems including applicable protection relays; and	As appropriate to the technology of the relevant sub-system.		That protection system operated in accordance with design and the Performance Standard.
	(c) Investigate unit electrical protection trips.	On every event.		

[20] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Protection from Power System Disturbances (as required under S5.2.5.8 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [21]	Method 2 (of 3): (a) Routine testing and/or calibration of relevant sub-systems including: i. Injection of simulated signals (secondary injection) to demonstrate correct operation of the protection; and ii. Repair or recalibrate protection relays as required; and	As appropriate to the technology of the relevant sub-system.		Achieve performance standard.
	(b) Investigate plant trips.	On every event.		As above.
	Method 3 (of 3): (a) Performance is monitored, in-service, where data is available.	At each major overhaul; and/or at least every 5 years by routine functional testing of unit electrical protection systems and verification of	Applicable for wind farms. Changes to turbine control parameters will be controlled such that the performance of the generating system and	Performance is confirmed by the generating system remaining synchronised during power system disturbance conditions where required under a provision of the Rules.

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[21] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

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Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Protection from Power System Disturbances (as required under S5.2.5.8 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [22]		database registered protection settings to occur annually.	generating units is not compromised in relation to the generator performance standard. Appropriate to use where data is available.	
	(b) Routine testing and/or calibration of relevant sub-systems including testing by secondary injection all protection system relays, between the generating unit terminals but within the generating system.	As appropriate to the technology of the relevant sub-system.		Performance will be assessed against the performance standard requirements.

[22] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Protection Systems that Impacts on Power System Security (as required under S5.2.5.9 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [23]	Method 1 (of 3): (a) Routine testing and/or calibration of protection systems including: i. CB opening times; and ii. Protection relay injection testing; and	As appropriate for~~to~~ the technology of the protection system.	Directly Measurable.	Achieve performance standard.
	(b) Confirmation from fault recorder records of actual performance.	Every plant trip.		As above.
	Method 2 (of 3): (a) Routine testing and/or calibration of relevant sub-systems including: i. protection system testing by secondary injection; ii. checking of circuit breaker opening times; iii. redundancy of primary protection systems; and iv. timing of trip signal issued by the breaker fail protection system; and	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.

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[23] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Protection Systems that Impacts on Power System Security (as required under S5.2.5.9 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [24]	(b) Assessment of protection system performance in the event of protection system.	On every event		That protection system is operated in accordance with design and the Performance Standard.
	Method 3 (of 3): (a) Performance is monitored, in-service, where data is available;	At each major overhaul; and/or at least every 5 years by routine functional testing of unit electrical protection systems and verification of database registered protection settings to occur annually.	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.	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.

[24] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Protection Systems that Impacts on Power System Security (as required under S5.2.5.9 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [25]	(b) Relevant testing and/or calibration of any relevant sub-systems including protection system relays shall be tested by secondary injection; and	As appropriate to the technology of the relevant sub-system.		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.
	(c) Verification of database registered protection settings to occur in conjunction with injection testing.	At least every 5 years.		As above.

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[25] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Asynchronous Operation of Synchronous Generating Units / Protection to Trip Plant for Unstable Operation (as required under S5.2.5.10 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [26]	Method 1: (a) Routine testing and/or calibration of relevant sub-systems including protection system testing by secondary injection; and	As appropriate to the technology of the relevant sub-system.		That all protection relays operate satisfactorily and to within design tolerance of setting value.
	(b) Assessment of protection system performance in the event of protection system operation or of asynchronous operation.	On every event.		That protection system is operated in accordance with design and the Performance Standard.

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[26] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Frequency Control / Frequency Responsiveness and/or Governor Stability and Governor System (as required under: S5.2.5.11 in versions 1-47 of the Rules; S5.2.5.11 and S5.2.6.4 in the initial Code, and all amended versions of the Code before 27 March 2003; and S5.2.5.11 of all amended versions of the Code from 27 March 2003 onwards) [27]	Method 1 (of 4): Monitor in-service performance using high speed frequency data.	After every major frequency excursion.	Appropriate to use where high speed monitors are available and models have been used in establishing compliance or when plant has no capability of responding to frequency deviations ie. asynchronous machines.	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 2 (of 4): 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.

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[27] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

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Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Frequency Control / Frequency Responsiveness and/or Governor Stability and Governor System (as required under: S5.2.5.11 in versions 1-47 of the Rules; S5.2.5.11 and S5.2.6.4 in the initial Code, and all amended versions of the Code before 27 March 2003; and S5.2.5.11 of all amended versions of the Code from 27 March 2003 onwards) [28]	Method 3 (of 4): (a) Analytical simulation of turbine and governor systems; and	Type Test permissible where multiple units are involved.		Achieves the performance standard.
	(b) Assess generator response to disturbances using high speed recording data.	~~Ongoing~~ On every event		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 (of 4): (a) Step response test of the governor to test damping and droop characteristics; and	Every 4 years.		Plant performance complies with the Generator Performance Standard.
	(b) Routine calibration tests.	Every 4 years.		As above.

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[28] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Stability / Impact on Network Capability (as required under S5.2.5.12 in versions 1-47 of the Rules, and all amended versions of the Code from 27 March 2003 onwards)[29]	Method 1 (of 1): (a) Monitor in-service performance for relevant performance characteristics not otherwise tested; and	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; OR consistency with past performance if the models are not available.
	(b) Routine monitoring and testing and/or calibration 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.		As above.

[29] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Excitation Control System / Voltage and Reactive Power Control (as required under: S5.2.5.13 in versions 1-47 of the Rules; S5.2.5.13 and S5.2.6.5 in the initial Code, and all amended versions of the Code before 27 March 2003; and S5.2.5.13 of all amended versions of the Code from 27 March 2003 onwards) [30]	Method 1: (a) Transfer function measurements and step response tests with the unit unsynchronised and at full load; and	Every 4 years.		Consistency of operation with plant models used to establish initial compliance; OR consistency with past performance if the models are not available.
	(b) Assess the stability of limiter operation; and	Every 4 years.		As above.
	(c) Monitoring in-service performance or undertaking in-service ~~e~~ transfer function measurements.	Report every 4 years.		As above.

[30] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Excitation Control System / Voltage and Reactive Power Control (as required under: S5.2.5.13 in versions 1-47 of the Rules; S5.2.5.13 and S5.2.6.5 in the initial Code, and all amended versions of the Code before 27 March 2003; and S5.2.5.13 of all amended versions of the Code from 27 March 2003 onwards) [31]	Method 2 (of 3): (a) AER step response tests; and	Every 4 years.		Consistency of operation with plant models used to establish initial compliance; OR consistency with past performance if the models are not available.
	(b) AER step response test of OEL and UEL operation; and	Every 4 years.		As above.
	(c) AER and PSS transfer function measurements over required frequency range.	Every 4 years.		As above.

[31] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Excitation Control System / Voltage and Reactive Power Control (as required under: S5.2.5.13 in versions 1-47 of the Rules; S5.2.5.13 and S5.2.6.5 in the initial Code, and all amended versions of the Code before 27 March 2003; and S5.2.5.13 of all amended versions of the Code from 27 March 2003 onwards) [32]	Method 3 (of 3): 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 Generator Performance Standard.	Consistency of operation with plant models used to establish initial compliance; OR consistency with past performance if the models are not available.

[32] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Active Power Control (as required under S5.2.5.14 in versions 13-47 of the Rules) [33]	Method 1 (of 2): One off installation.	Following plant change.		Achieve performance standard.
	Method 2 (of 2): Monitor non-compliance with dispatch market systems.	After major event.		Achieve performance standard.
Remote Monitoring (as required under S5.2.6.1 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [34]	Method 1 (of 2): (a) Calibration of Transducers; and	Following plant change and at least every 5 years.		Confirmation at each end of the communications system by both parties.
	(b) Verification of the accuracy of transmitted data.	Following plant change and at least every 5 years.		As above.
	Method 2 (of 2): (a) SCADA monitored values and farm panel metering will be routinely checked.	Every 5 years.	Applicable for Wind Farms.	Achieve performance standard.

[33] This provision was amended in version 13 of the Rules.
[34] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Remote Monitoring (as required under S5.2.6.1 in versions 1-47 of the Rules, the initial Code, and all amended versions of the Code) [35]	(b) The calibration of transducers and Wind Farm panel metering will be checked.	At each major outage or once every 5 years.		As above.
Communications Equipment (as required under: S5.2.6.2 in versions 13-47 and S5.2.6.3 in versions 1-12 of the Rules; and S5.2.6.3 of the initial Code, and all amended versions of the Code) [36]	Method 1 (of 1): (a) Confirmation of the availability of communication links, including any backup links with AEMO; and	Annual.		Achieve performance standard.
	(b) Testing and/or calibration of relevant sub-systems including any power backup or UPS system.	As appropriate to the technology of the relevant sub-system.		As above.

[35] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.
[36] This provision was amended in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Power Station Auxiliary Transformers / Supplies (as required under: S5.2.7 in versions 13-47 and S5.2.8 in versions 1-12 of the Rules; and S5.2.8 of the initial Code, and all amended versions of the Code) [37]	Method 1 (of 2): (a) Metering of active and reactive power at the auxiliary supply connection point; and	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.
	(b) Testing and/or calibration of any relevant sub-systems including capacitor banks and circuit breakers.	As appropriate to the technology of the relevant sub-systems.		Performance to specification.
	Method 2(of 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	Achieve performance standard.

[37] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Power Station Auxiliary Transformers / Supplies (as required under: S5.2.7 in versions 13-47 and S5.2.8 in versions 1-12 of the Rules; and S5.2.8 of the initial Code, and all amended versions of the Code) [38]			connection point when units are on-line. Very small wind farm station service auxiliary load requirements are considered negligible under NEM CMP requirements.	
Fault Level / Current (as required under: S5.2.8 in versions 13-47 and S5.2.9 in versions 1-12 of the Rules; and S5.2.9 in all amended versions of the Code from 27 March 2003 onwards) [39]	Method 1 (of 3): (a) Monitoring in-service performance during faults near the connection point; and	Review following any event.		Calculation confirms current fault current contribution.
	(b) Review and recalculation of fault levels; and	Following plant change.		As above.

[38] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.
[39] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Fault Level / Current (as required under: S5.2.8 in versions 13-47 and S5.2.9 in versions 1-12 of the Rules; and S5.2.9 in all amended versions of the Code from 27 March 2003 onwards) [40]	(c) Routine testing and/or calibration of any relevant sub-systems.	As appropriate to the technology of the relevant sub-system.		As above.
	Method 2 (of 3): (a) Modelling and simulation of plant characteristics to make sure the plant is capable of meeting agreed standards; and	Following plant change.		Calculation confirms current fault current contribution.
	(b) Monitoring of generator contribution on fault event.	Review following any event.		As above.
	Method 3 (of 3): (a) Performance of relevant sub-systems will be monitored using the following systems: digital protection relays; other data-logging equipment as required; and	As appropriate to the technology of the relevant sub-system.		Achieve performance standard.

[40] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 1 – Delta Electricity Suggested Further Amendments (derived from the Template in the DRAFT REPORT after accepting all changes already proposed in the DRAFT REPORT version)

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[1]	Suggested frequency of testing[2]	Notes	Basis for compliance assessment
Fault Level / Current (as required under: S5.2.8 in versions 13-47 and S5.2.9 in versions 1-12 of the Rules; and S5.2.9 in all amended versions of the Code from 27 March 2003 onwards) [41]	(b) Where recorded data is available, comparison to be made of measured fault currents and computer simulations; and	Following a fault.		Consistency of operation with plant models used to establish initial compliance; OR consistency with past performance if the models are not available.
	(c) Review and recalculation of fault levels.	Following plant change.		As above.

[41] This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Attachment 2 – Suggested Format change to better display each individual standard and guidance.

- **It is generally considered that the table is presently in a simple format and lacks clear divisions between the various items of the standards. It is considered that the process of using the template could be made easier if it was converted to single (or double) page format for each standard in a form style.**

- **Utilising the template in the development of a company's compliance program could also be improved if the template was also available in a MS Word version, and Excel spreadsheet and an Access database rather than just a PDF.**

As an example, the following page demonstrates a view that provides a little more clarity of each standard and the expectation:

Attachment 2 – Suggested Format change to better display each individual standard and guidance.

Reliability Panel – AEMC
Template for Generator Compliance Program 28 March 2012

Power Station:

Performance Standard Title: Reactive Power Capability

Rules/Code Version:

Relevant Rules/Code Clause: S5.2.5.1

Template Testing Methodologies (delete the Methods not being applied):

METHOD 1 of 5

Suitable testing and monitoring methodology	Suggested frequency of testing	Adopted frequency of testing	Notes	Basis for compliance assessment
At rated power output, adjust the reactive power at the connection point to specified levels	Every 3 years and after plant change		Directly Measurable Applies to synchronous and conventional plant, and entire windfarms.	Achieve reactive power requirements of the performance standard

METHOD 2 of 5

Suitable testing and monitoring methodology	Suggested frequency of testing	Adopted frequency of testing	Notes	Basis for compliance assessment
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 of 5

Suitable testing and monitoring methodology	Suggested frequency of testing	Adopted frequency of testing	Notes	Basis for compliance assessment

Comment [BS4]: Generators should insert their Power Station Name

Comment [BS5]: Generators should insert the version(s) of Rules/Code that is applicable to the relevant standard

Comment [BS6]: Generator to insert the frequency selected for the application at the relevant power station.

Comment [BS7]: Generator to insert the frequency selected for the application at the relevant power station.

Attachment 2 – Suggested Format change to better display each individual standard and guidance.

Step testing of AVR limiters	Every 3 years and after plant change		Applies to conventional plant	Achieve reactive power requirements of the performance standard

Comment [BS8]: Generator to insert the frequency selected for the application at the relevant power station.

METHOD 4 of 5

Suitable testing and monitoring methodology	Suggested frequency of testing	Adopted frequency of testing	Notes	Basis for compliance assessment
(a) Capability will be tested by component; and	Following plant change		Applies to wind farms plant	Achieve performance standard
(b) Capability will be monitored using SCADA under normal wind farm operation.	Annual review of a selection of events			Consistency with plant characteristics

Comment [BS9]: Generator to insert the frequency selected for the application at the relevant power station.

METHOD 5 of 5

Suitable testing and monitoring methodology	Suggested frequency of testing	Adopted frequency of testing	Notes	Basis for compliance assessment
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

Comment [BS10]: Generator to insert the frequency selected for the application at the relevant power station.

Prepared by:

Authorised by:

Comment [BS11]: Generator to insert the name of the officer preparing and coordinating the program.

Comment [BS12]: Generator to insert the name of the manager authorising the program selected.