POWER SYSTEM OPERATIONOPERATING PROCEDURE: COMMISSIONING TESTSAND TESTING

PREPARED BY: System Management (WA)

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VERSION RELEASE HISTORY

Version	Effective Date	Summary of Changes
1	21 September 2006	Power System Operation Procedure (Market Procedure) for Commissioning and Testing
2	17 July 2009	System Management amended changes to the procedure resulting from Procedure Change Report PPCL0009
3	23 June 2011	System Management amended changes to the procedure resulting from Procedure Change Report PPCL0016
4	Balancing Market Commencement Day	System Management replacement of the procedure resulting from Procedure Change Report PPCL0023
5	1 March 2014	System Management amended changes to the procedure resulting from Procedure Change Proposal PPCL 0025
6~~.0~~	TBC 2018~~dd MMM YYYY~~	Changes resulting from Procedure Change Proposal AEPC_2018_06 ~~XX~~

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1 PROCEDURE OVERVIEW

1.1 Relationship with the Wholesale Electricity Market Rules

1.1.1 This Power System Operation Procedure: Commissioning Tests~~Power System Operating Procedure: [Enter Psop Name]~~ (Procedure) has been developed in accordance with clause 3.21A.15~~[Enter clause ref]~~ of the Wholesale Electricity Market Rules (WEM Rules).

1.1.2 References to particular WEM Rules within the Procedure in bold and square brackets **[Clause XX]** are current as at 27 March 2018.~~[Enter effective date].~~ These references are included for convenience only and are not part of this Procedure.

1.2 Interpretation In this Procedure:

(a) terms that are capitalised but not defined in this Procedure have the meaning given in the WEM Rules;

(b) to the extent that this Procedure is inconsistent with the WEM Rules, the WEM Rules prevail to the extent of the inconsistency;

(c) a reference to the WEM Rules or Market Procedures includes any associated forms required or contemplated by the WEM Rules or Market Procedures;

(d) unless the context requires otherwise, references to AEMO include AEMO in its System Management capacity; and

~~(a)~~(e) words expressed in the singular include the plural or vice versa.

1.3 Purpose and application of this Procedure

1.3.1 The purpose of this Procedure is to detail the processes to be followed by **[Clause 3.21A.15]**:

AEMO IN SCHEDULING AND APPROVING~~RELATIONSHIP WITH MARKET RULES~~

(a) ~~This Power System Operation Procedure (PSOP):~~ Commissioning Tests; and~~and Testing (Procedure) has been developed in accordance with, and should be read in conjunction with, the Wholesale Electricity Market Rules (Market Rules).~~

~~1.~~ AEMO~~References to particular Market Rules within the Procedure in bold and square brackets **[MR XX]** are current as of 1 March 2014. These references are included for convenience only, and are not part of this Procedure.~~

~~2. This Procedure is subservient to the Market Rules. In the event of conflict between this Procedure and the Market Rules or any other document, the order of precedence is as set out in the Market Rules **[MR 1.5.2]**~~

~~3. This Procedure may include explanatory text, including quotations from the Market Rules. Such explanatory text is for information only, does not form part of the Procedure, and is italicised and contained in a rectangular box.~~

~~4. A word or phrase defined in the Electricity Industry Act 2004, or in the Regulations or Market Rules made under that Act, has the same meaning~~

when used in this Procedure. In addition the following are defined terms for the purposes of this Procedure:

a. Test Window means the set of Trading Intervals during which a Commissioning Test may be conducted and for which any additional Ancillary Services required pursuant to Paragraph 2.3.4 are scheduled; and

b. Commissioning Test Schedule means the details of the Commissioning Tests to be conducted, as required by the Market Rules **[MR 3.21A.4(c)]**, during a Trading Day.

RELATED DOCUMENTS

5. 1. This Procedure is related to, and should be read in conjunction with, the following:

PSOP: Dispatch; and

PSOP: Facility Outages.

~~1 SCOPE~~

(b) ~~This Procedure has been developed in accordance with the Market Rules **[MR 3.21A.15]** and details the processes that System Management~~ and Market Participants in~~must follow when~~ planning and conducting Commissioning Tests ~~of a generating system to verify the generating system's output capability~~.

1.4 Associated documents

1.4.1 The following documents in Table 1~~Table 1Table 1~~ (available on the Market Web Site) provide background information to this Procedure:

Table 1 Background Procedures

Reference	Title	Location
SO_OP_WA_3803	PSOP: Dispatch	Market Web Site
SO_OP_WA_3804	PSOP: Facility Outages	Market Web Site

~~*Tests other than Commissioning Tests and Reserve Capacity Tests may be undertaken by way of balancing movements provided that the Facility conducting the tests follows its Dispatch Instructions and remains within its Tolerance Range or Facility Tolerance Range at all times during the test. Such testing by the Balancing Portfolio may be undertaken by way of variation to the plant schedule **[MR 7.6A.2(a)]**. For further details of the processes for conducting Reserve Capacity Tests refer to the Market Procedure for Reserve Capacity Testing.*~~

2 COMMISSIONING TESTS

2.1 Submitting Commissioning Test Plans

~~The Market Participant carrying out Commissioning Tests must cooperate with System Management and Western Power to develop a Commissioning Test Plan to ensure that the Commissioning Tests are carried out in a manner that:~~

- ~~Does not adversely affect other Market Participants; and~~
- ~~Does not affect Power System Security or Power System Reliability or quality of supply of the power system; and~~
- ~~Minimises the threat of damage to any other Market Participant's equipment.~~

~~1.1 Market Participant to submit Commissioning Test Plan~~

~~*Market Participants are advised to contact System Management to discuss possible system conditions that might influence the Commissioning Test Plan prior to requesting approval of a Commissioning Test Plan. Market Participants must use best endeavours to submit the Commissioning Test Plan at least 7 Trading Days prior to the start of the Commissioning Test Period.*~~

2.1.1 Any Market Participant wishing to conduct a Commissioning Test **[Clause~~MR~~ 3.21A.4]** must provide AEMO~~System Management~~ with a Commissioning Test Plan that:

~~a. includes a Commissioning Test Schedule for each Trading Day during the period over which the Commissioning Test will occur; and~~

(a) is in the form of the Commissioning Test Plan template provided on the Market Web Site;System Management webpage at: http://www.westernpower.com.au/retailersgenerators/systemManagement/Commissioning_Testing.html .

(b) specifies the proposed Commissioning Test Period;

(c) provides details of the proposed Commissioning Test, including an indicative test program for each Trading Day in the proposed Commissioning Test Period; and

(d) provides the other information specified in clause 3.21A.4 of the WEM Rules.

2.1.2 AEMOSystem Management may, at its discretion, vary the requirements set out in the Commissioning Test Plan for a particular Facility.

1.2 Communication in relation to Commissioning Test Plans

1. System Management must advise Market Participants of contact details and modes of communication for the submission of Commissioning Test Plans.

6. A Market Participant must comply with the communication requirements set by System Management pursuant to Paragraph 2.2.1 of this Procedure.

7. System Management and the Market Participant must prepare and agree a communication protocol to apply between System Management and a Market Participant concerning a Commissioning Test being carried out on the Trading Day.

2.2 Assessment and Approval of Commissioning Test Plans

2.2.1 AEMOSystem Management may reject a new or revised Commissioning Test Plan if it reasonably believes that the conditions stipulated in clausesthe Market Rules **[MR** 3.21A.3**]** and **[MR** 3.21A.7 of the WEM Rules**]** have not been met.

*WhereThe Market Rules **[MR 3.21A.3]** states that:*

"System Management may approve a Commissioning Test Plan only for a new generating system that is yet to commence operation, or for an existing generating system that has undergone significant maintenance".

System Management will generally interpret "significant maintenance" to mean maintenance work without which the Facility cannot be reasonably assured of operating at a satisfactory level of reliability for its full output as found on the IMO's Website (http://www.imowa.com.au/market-participants-facility-information).

*The Market Rules **[MR 3.21A.7]** state that:*

"System Management must approve a Commissioning Test Plan unless:

(a) in its opinion inadequate information is provided in the Commissioning Test Plan*, AEMO may ; or*

(b) in its opinion conducting any of the proposed activities to be undertaken at the proposed times would pose a threat to Power System Security or Power System Reliability; or

(c) [Blank]

~~(d) in its opinion inadequate time to properly consider the Commissioning Test Plan has been provided, where the~~ request ~~has been received less than 20 Trading Days prior to the start date of the proposed Commissioning Test.~~

~~System Management will generally endeavour to accommodate the requested Commissioning Test Plan, including scheduling any~~ additional ~~Ancillary Services required to maintain Power System Security, provided the Commissioning Test Plan is broadly consistent with expected system conditions at the time of each proposed Commissioning Test.~~

~~8. Where System Management requires additional information to make an assessment of a Commissioning Test Plan, System Management must request such~~ information from the Market Participant. AEMO must give~~, and~~ the Market Participant a period of time that is reasonable in ~~must provide~~ the circumstances (having regard to~~information as soon as practicable.~~

~~9. System Management must consider~~ the proposed~~criteria set out in Appendix A in assessing the expected impact of the draft Commissioning Test Plan on Power System Security and Power System Reliability.~~

~~10. If System Management approves the Commissioning Test Plan,it may schedule additional Ancillary Services during the~~ Commissioning Test Period and~~consistent with its powers under~~ the date when~~Market Rules.~~

~~Additional Ancillary Service requirements will generally be in accordance with~~ the original~~guidelines set out in Appendix B but System Management may vary the application of those guidelines if required to maintain Power System Security or Power System Reliability.~~

*~~The Market Rules allow System Management some discretion in the quantity of Load Following Ancillary Service scheduled, but not in the quantities of Spinning Reserve or Load Rejection Reserve. System Management will consider plant movements reasonably expected as part of commissioning to be "uninstructed output movements from Scheduled Generators" in terms of the Market Rules~~ **~~[MR 3.10.1 (a)(ii)].~~***

2.2.2 ~~System Management must not approve~~ Commissioning Test Plan was~~Plans~~ submitted) before assessing~~later than 8:00am on the Scheduling Day prior to the Trading Day on which~~ the Commissioning Test Plan. ~~would commence~~ **~~[MR3.21A.9].~~**

~~11.~~ Where ~~a Commissioning Test Plan has not been approved, System Management must provide an explanation for its decision in accordance with the Market Rules~~ **~~[MR 3.21A.10(a)(i)].~~**

~~12. Where a Commissioning Test Plan has not been approved due to:~~

~~a. the timing posing a threat to Power System Security or Power System Reliability; or~~

~~b. inadequate time given to consider the Commissioning Test Plan;~~

2.2.3 ~~System Management and~~ the Market Participant provides the information requested within the timeframe specified in step 2.2.2~~2.2.2~~, AEMO must assess the Commissioning Test Plan.~~must then use their best endeavours to agree to an alternative time for the relevant Commissioning Test. If such an agreement is reached, the Market Participant must, as soon as practicable, submit a revised~~

Commissioning Test Plan **[MR 3.21A.10(a)ii]** and **[MR 3.21A.10(a)(iii)].** .

2.3 Update of Commissioning Test Plans

2.3.1 For the purposes of this Procedure, any update to an existing Commissioning Test Plan must be assessed as a new Commissioning Test Plan, and clause 3.21A.7 of the WEM Rules applies with respect to the assessment.

2.3.2 If AEMOSystem Management delays or cancels a Commissioning Test contained within an approved Commissioning Test, it Plan **System Management** must inform the affected Market Participant as soon as practicable **[Clause**in accordance with the Market Rules **[MR 3.21A.11]**.

2.3.3 Where AEMO delays an approved Commissioning Test, the Market Participant must indicate whether it is still able to comply with the latest approved Commissioning Test Plan.

2.3.12.3.4 Where AEMO cancels an approved Commissioning Test Plan, the The Market Participant maymust submit a new Commissioning Test Plan prior to undertaking any Commissioning Tests.

2.3.22.3.5 WhereAt any stage where a Market Participant no longer plans to conduct a Commissioning Test **[ClauseMR 3.21A.6]**, or becomes aware of conditions thatwhich may prevent the generating Facility from conforming to itstheir most recently approved Commissioning Test Plan **[ClauseMR 3.21A.13]**, the Market Participant must:

(a) as soon as practicable notify AEMO as soon as practicableSystem Management; and

(b) either:

(i) withdraw the Commissioning Test Plan; or

(ii) submit a new Commissioning Test Plan.

i. if the conditions relate to the ability of the generating Facility to conform to a Commissioning Test Schedule, provide a revised Commissioning Test Plan, in accordance with Section 2.1 of this Procedure, to System Management as soon as practicable before 8.00 am on the Scheduling Day prior to the commencement of the Trading Day to which the revised Commissioning Test Plan relates. System Management will assess the revised Commissioning Test Plan in accordance with Section 2.3 of this Procedure;.

2.4 Conduct of Commissioning Tests

2.4.1 A Market Participant must only conduct Commissioning Tests in accordance with an approved Commissioning Test Plan **[Clause 3.21A.12]**.

2.4.2 A Market Participant must seek AEMO's verbal approval before carrying out each activity specified in the Commissioning Test Plan.

1. For the series of activities in the approved Commissioning Test Plan for which similar system conditions and incremental Ancillary Services are required, System Management must define a Test Window(s) based on the timelines notified by the Market Participant in the Commissioning Test Plan

~~and for which any additional Ancillary Services required pursuant to Paragraph 2.3.4 are scheduled, taking into account other related market impacts.~~

~~*The "Test Window" is intended to provide flexibility for Market Participants to make changes to the timing of their commissioning activities insofar as they may do so without threatening Power System Security. System Management will endeavour to align the Test Windows with the Commissioning Test details specified in the Market Participant's Commissioning Test Plan as far as practicable taking into account the associated impacts on the market such as the scheduling of additional Ancillary Services.*~~

13. ~~System Management must issue an Operating Instruction for each Trading Day covered by the approved Commissioning Test Plan, prior to the commencement of the Trading Day.~~
14. ~~System Management may issue subsequent Operating Instructions on the Trading Day for a revised Commissioning Test Schedule in conjunction with the approved Commissioning Test Plan.~~
15. ~~The Market Participant must seek System Management's verbal approval to commence any Commissioning Test in the Commissioning Test Plan. If the Market Participant's advice regarding the timing of the Commissioning Test is inconsistent with the current Dispatch Instruction(s) for the Trading Intervals affected, System Management must deem the Market Participant to have declined the Dispatch Instruction in accordance with the PSOP: Dispatch.~~
16. ~~If subsequent updates to the Balancing Merit Order render the Dispatch Instructions to be Out of Merit, System Management must issue new Dispatch Instructions consistent with the Balancing Merit Order.~~

~~*Note that System Management will not issue Dispatch Instructions to commissioning generators except in accordance with the Balancing Merit Order or Forecast Balancing Merit Order. Maintaining consistency between Balancing Submissions and physical operations remains the responsibility of the Market Participant at all times.*~~

~~APPENDIX A: PREFERRED TIMES FOR COMMISSIONING TESTING~~

~~The commissioning of some new or upgraded Market Generators may take place so that the Market Generator will be available to supply commercial load before the time of summer peak. Regardless of the time of year during which a generator is being commissioned it should be commissioned according to the following 'time of day' periods.~~

~~The testing of ramp up capability between load points could occur when there is an increase in system loads in the periods leading up to morning and evening peaks. The preferred time however to do these tests is during the middle of the day when the load profile is relatively flat and plant movements minimal. This allows for easier configuration of Load Following and Spinning Reserve. The Market Generator output should be held at a steady value during evening peaks. Ramp down and de-commitment should take place after evening peak, or before evening peak period begins.~~

~~A general principle to be observed is that commissioning should only take place when there is sufficient plant on the system to maintain system security. This would tend to rule out commissioning during periods of low over night system load.~~

~~Load rejection or trip tests should be done during times of flat load profile, and with maximum Spinning Reserve.~~

~~Requirements for specific tests are shown below.~~

~~**C Tests** (Note that these tests are compulsory under the Technical Rules)~~

~~**C2A Step changes to AVR voltage reference with PSS out of service.**~~	
~~**Generator Output and Test Sequence**~~	~~**System Conditions**~~
~~(i) 50% rated MW~~	~~System base load OR typical conditions and typical connection at Generator~~
~~(ii) 100% rated MW~~	~~System base load OR typical conditions and typical connection at Generator~~

~~**C2B Step changes to AVR voltage reference with PSS in service.**~~	
~~**Generator Output and Test Sequence**~~	~~**System Conditions**~~
~~(i) 50% rated MW~~	~~System base load OR typical conditions and connection at Generator~~
~~(ii) 100% rated MW~~	~~System base load OR typical conditions and connection at Generator~~

~~C3A Step changes to AVR voltage reference with PSS out of service.~~	
~~Generator Output~~	~~System Conditions~~
~~100% rated MW~~	~~(i) System minimum load with no other generation on the same bus OR relatively weak connection to Network~~
~~100% rated MW~~	~~(ii) System maximum load with maximum generation on the same bus OR relatively strong connection to Network~~

~~C3B Step changes to AVR voltage reference with PSS in service.~~	
~~Generator Output~~	~~System Conditions~~
~~100% rated MW~~	~~(i) System minimum load with no other generation on the same bus OR relatively weak connection to Network~~
~~100% rated MW~~	~~(ii) System maximum load with maximum generation on the same bus OR relatively strong connection to Network~~

~~C4 Step change of MVA on the transmission system.~~	
~~Generator Output and Test Sequence~~	~~System Conditions~~
~~(i) 50% rated MW with PSS out of service~~	~~System base load OR typical conditions and connection at Generator~~
~~(ii) 50% rated MW with PSS in service~~	~~System base load OR typical conditions and connection at Generator~~

~~C5 Real power load rejection (generator trip test)~~	
~~Generator Output and Test Sequence~~	~~System Conditions~~
~~(i) 25% rated MW~~	~~To be done at time of flat system load profile~~

~~(ii) 50% rated MW~~	~~To be done at time of flat system load profile~~
~~(iii) 100% rated MW~~	~~To be done at time of flat system load profile~~

~~**C6 Steady state over-excitation limiter (OEL) operation**~~	
~~**Generator Output and Test Sequence**~~	~~**System Conditions**~~
~~(i) 100% rated MW~~	~~After peak or during decommitment~~
~~(ii) 75% rated MW~~	~~After peak or during decommitment~~
~~(iii) 50% rated MW~~	~~After peak or during decommitment~~
~~(iv) 25% rated MW~~	~~After peak or during decommitment~~
~~(v) min MW output~~	~~After peak or during decommitment~~

~~**C7 Steady state under-excitation limiter (UEL) operation**~~	
~~**Generator Output and Test Sequence**~~	~~**System Conditions**~~
~~(i) 100% rated MW~~	~~After peak or during decommitment~~
~~(ii) 75% rated MW~~	~~After peak or during decommitment~~
~~(iii) 50% rated MW~~	~~After peak or during decommitment~~
~~(iv) 25% rated MW~~	~~After peak or during decommitment~~
~~(v) min MW output~~	~~After peak or during decommitment~~

~~**C9 MVAR capability at full MW output**~~	
~~**Generator Output**~~	~~**System Conditions**~~
~~MW and MVAR output levels set to 100% of rated values and maintained for one hour.~~	~~System Maximum load and maximum generation in high ambient temperature.~~

~~**S TESTS (t**hese tests, though not compulsory, may be included in a commissioning programme)~~

~~S1 (a) and S2 (a) and S1 (b) Load rejection (reactive power)~~	
~~Generator reactive power output~~	~~Generator real power output~~
~~(i) -30% rated MVAR~~	~~0 or Min MW output~~
~~(ii) +25% rated MVAR~~	~~0 or Min MW output~~

~~S5 AVR / OEL changeover~~	
~~Generator Output~~	~~System Conditions~~
~~100% rated MW output.~~	~~To be done at time of flat system load profile~~

~~S6 AVR / UEL changeover~~	
~~Generator Output~~	~~System Conditions~~
~~100% rated MW output~~	~~To be done at time of flat system load profile~~

~~S8 Tripping of an adjacent generating unit.~~	
~~Generator Output~~	~~System Conditions~~
~~At a level sufficiently below its rated output so that in combination with LF and SR generators it would assist with maintaining system frequency~~	~~To be done at time of flat system load profile~~

~~S10 Step changes added to and subtracted from governor / load reference (Note this test is not a ramp rate test.)~~	
~~Generator Output~~	~~System Conditions~~
~~Output at 50-85% rated MW~~ ~~(i) 2.5% step increase in MW demand signal~~ ~~(ii) 2.5% step decrease in MW demand signal~~	~~To be done at time of flat system load profile~~

~~(iii) Equivalent of 0.05 HZ subtracted from governor speed reference~~ ~~(iv) Equivalent of 0.1 HZ added to governor speed reference~~	

~~**OTHER TESTS** (these tests although not compulsory are commonly included in commissioning programmes for new plant)~~

~~**Maximum Ramp Rate**~~	
~~**Generator Output**~~	~~**System Conditions**~~
~~0 to Maximum output at maximum ramp rate~~	~~To be done at flat system load profile and sufficient balancing plant on the system (ie during the middle of the day) or during time of rising load.~~
~~Maximum Output to 0MW at maximum output~~	~~To be done at flat system load profile and sufficient balancing plant on the system (ie during the middle of the day) or during time of falling load.~~

~~APPENDIX B: GUIDELINES FOR ADDITIONAL ANCILLARY SERVICES DURING COMMISSIONING TESTS~~

~~In this appendix the following definitions apply:~~

~~Normal LF refers to the Load Following Service Ancillary Service Requirement as determined in System Management's Ancillary Services Report for the current financial year and which is required to be approved by the IMO under the Market Rules **[MR 3.11.4, MR 3.11.6, MR 3.11.11, MR 3.11.12, MR 3.11.13].**~~

~~Normal SR refers to the Spinning Reserve Service Ancillary Service Requirement as determined in System Management's Ancillary Services Report for the current financial year and which is required to be approved by the IMO under the Market Rules **[MR 3.11.4, MR 3.11.6, MR 3.11.11, MR 3.11.12, MR 3.11.13].**~~

~~The annual approved Ancillary Services Report is available on the Market Web Site at:~~

~~http://www.imowa.com.au/ancillary-services-annual-reports~~

~~**C Tests** (note that these tests are compulsory under the Technical Rules):~~

~~**C2A Step changes to AVR voltage reference with PSS out of service.**~~			
~~**Generator Output and Test Sequence**~~	~~**Load Following Service**~~	~~**Spinning Reserve Service**~~	~~**Indicative Balancing Market submission**~~
~~(i) 50% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1.Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 50% at floor and 50% at cap~~
~~(ii) 100% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~

~~**C2B Step changes to AVR voltage reference with PSS in service.**~~			
~~**Generator Output and Test Sequence**~~	~~**Load Following Service**~~	~~**Spinning Reserve Service**~~	~~**Indicative Balancing Market submission**~~

~~(i) 50% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 50% at floor and 50% at cap~~
~~(ii) 100% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~

~~C3A Step changes to AVR voltage reference with PSS out of service.~~			
~~Generator Output~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~100% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~
~~100% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~

~~C3B Step changes to AVR voltage reference with PSS in service.~~			
~~Generator Output~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~100% rated MW~~	~~Normal LF~~	~~Greater of:~~	~~Bid 100% at floor and 0% at cap~~

		~~1. Normal SR~~ ~~2.100% of test generator output.~~	
~~100% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~

~~C4 Step change of MVA on the transmission system.~~			
~~Generator Output and Test Sequence~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~(i) 50% rated MW with PSS out of service~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 50% at floor and 50% at cap~~
~~(ii) 50% rated MW with PSS in service~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 50% at floor and 50% at cap~~

~~C5 Real power load rejection (generator trip test)~~			
~~Generator Output and Test Sequence~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~(i) 25% rated MW~~	~~Normal LF~~	~~Normal SR plus load rejection amount.~~	~~Bid 12.5% at floor and 87.5% at cap for trip interval~~

~~(ii) 50% rated MW~~	~~Normal LF~~	~~Normal SR plus load rejection amount.~~	~~Bid 25% at floor and 75% at cap for trip interval~~
~~(iii) 100% rated MW~~	~~Normal LF~~	~~Normal SR plus load rejection amount.~~	~~Bid 50% at floor and 50% at cap for trip interval~~

~~**C6 Steady state over-excitation limiter (OEL) operation**~~			
~~**Generator Output and Test Sequence**~~	~~**Load Following Service**~~	~~**Spinning Reserve Service**~~	~~**Indicative Balancing Market submission**~~
~~(i) 100% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~
~~(ii) 75% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 75% at floor and 25% at cap~~
~~(iii) 50% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 50% at floor and 50% at cap~~
~~(iv) 25% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 25% at floor and 75% at cap~~
~~(v) min MW output~~	~~Normal LF~~	~~Greater of:~~	~~Bid min at floor and remainder at cap~~

		~~1. Normal SR~~ ~~2.100% of test generator output.~~	

~~C7 Steady state under-excitation limiter (UEL) operation~~			
~~Generator Output and Test Sequence~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~(i) 100% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~
~~(ii) 75% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 75% at floor and 25% at cap~~
~~(iii) 50% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 50% at floor and 50% at cap~~
~~(iv) 25% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 25% at floor and 75% at cap~~
~~(v) min MW output~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid min MW output at floor and remainder at cap~~

~~C9 MVAR capability at full MW output~~			
~~Generator Output~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~MW and MVAR output levels set to 100% of rated values and maintained for one hour.~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~

~~S TESTS (these tests, though not compulsory, may be included in a commissioning programme).~~

~~S1 (a) and S2 (a) and S1 (b) Load rejection (reactive power)~~			
~~Generator reactive power output~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~(i) -30% rated MVAR~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid min MW output at floor and remainder at cap~~
~~(ii) +25% rated MVAR~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid min MW output at floor and remainder at cap~~

~~S5 AVR / OEL changeover~~

~~Generator Output~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~100% rated MW output.~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~

~~S6 AVR / UEL changeover~~			
~~Generator Output~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~100% rated MW output~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 100% at floor and 0% at cap~~

~~S8 Tripping of an adjacent generating unit.~~			
~~Generator Output~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~At a level sufficiently below its rated output so that in combination with LF and SR generators it would assist with maintaining system frequency~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~ ~~Plus 100% of adjacent tripped generator output.~~	~~Bid initial amount at floor and remainder at cap. For adjacent generator bid MW to be tripped at floor and remainder at cap, and then for the interval of tripping 0% at floor and 0% at cap~~

~~S10 Step changes added to and subtracted from governor / load reference (Note this test is not a ramp rate test.)~~			
~~Generator Output~~	~~Load Following Service~~	~~Spinning Reserve Service~~	~~Indicative Balancing Market submission~~
~~Output at 50-85% rated MW~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid 50-85% at floor and 50-15% at cap~~
~~(i) 2.5% step increase in MW demand signal~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid (50-85%) + 2.5% at floor and (50-15%) – 2.5% at cap~~
~~(ii) 2.5% step decrease in MW demand signal~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid (50-85%) - 2.5% at floor and (50-15%) + 2.5% at cap~~
~~(iii) Equivalent of 0.05 HZ subtracted from governor speed reference~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid (50-85%) - MW equivalent of 0.05 HZ for the generator at floor and (50-15%) + MW equivalent of 0.05 HZ for the generator at cap~~
~~(iv) Equivalent of 0.1 HZ added to governor speed reference~~	~~Normal LF~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid (50-85%) + MW equivalent of 0.1 HZ for the generator at floor and (50-15%) – MW equivalent of 0.1 HZ for the generator at cap~~

~~OTHER TESTS~~ ~~(these tests although not compulsory are commonly included in commissioning programmes for new plant)~~

~~Maximum Ramp Rate~~			
~~Generator Output~~	**~~Load Following Service~~**	**~~Spinning Reserve Service~~**	**~~Indicative Balancing Market submission~~**
~~0 to Maximum output at maximum ramp rate~~	~~Normal LF Plus ramp range.~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid initial amount at floor and remainder at cap for intervals prior to test. Bid full capacity at cap. If generator to stay at maximum output after this test bid these intervals at the floor.~~
~~Maximum to 0 output at maximum ramp rate~~	~~Normal LF Plus ramp range.~~	~~Greater of:~~ ~~1. Normal SR~~ ~~2.100% of test generator output.~~	~~Bid initial amount at cap if previously bid this full capacity otherwise at the floor if an extension of ramp up test. If generator to stay at 0MW output after this test bid these intervals at the cap.~~