

ELECTRICITY INDUSTRY ACT

**ELECTRICITY INDUSTRY (WHOLESALE ELECTRICITY
MARKET) REGULATIONS 2004**

WHOLESALE ELECTRICITY MARKET RULES

**Power System Operation Procedure:
Commissioning and Testing**

Version history	
21 September 2006	Power System Operation Procedure (Market Procedure) for Commissioning and Testing
17 July 2009	System Management amended changes to the procedure resulting from Procedure Change Report PPCL0009
23 June 2011	System Management amended changes to the procedure resulting from Procedure Change Report PPCL0016
Balancing Market Commencement Day	System Management replacement of the procedure resulting from Procedure Change Report PPCL0023
<u>XX XX 2013</u>	<u>System Management amended changes to the procedure resulting from Procedure Change Proposal PPCL XXXX</u>

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RELATIONSHIP WITH MARKET RULES

1. This Power System Operation Procedure (PSOP): Commissioning and Testing (Procedure) has been developed in accordance with, and should be read in conjunction with the Wholesale Electricity Market Rules (Market Rules).
2. References to particular Market Rules within the Procedure in bold and square brackets **[MR XX]** are current as of the Balancing Market Commencement Day. These references are included for convenience only, and are not part of this Procedure.
3. 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]**
4. 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.
5. 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 defined terms have the given meaning:
 - 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 tests to be conducted, as required by the Market Rules **[MR 3.21A.4(c)]**, during a Trading Day.

RELATED DOCUMENTS

6. This Procedure is related to, and should be read in conjunction with, the following:
 - a. PSOP: Dispatch;
 - b. PSOP: Facility Outages; and
 - c. Market Procedure: Reserve Capacity Testing.

COMMENCEMENT

1. This ~~amended Procedure has effect from XX XX 2013~~, replacement Procedure has effect from the Balancing Market Commencement Day.

1 SCOPE

1. 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 must follow when planning and conducting Commissioning Tests of a generating system to verify the generating system's output capability.

*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 at all times during the ~~T~~est. Such testing by Verve Energy 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

The Market Participant carrying out Commissioning Tests must cooperate with System Management and Western Power to develop a Commissioning Test ~~pPlanlan~~ 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 reliability or quality of supply of the power system; and
- Minimises the threat of damage to any other Market Participants equipment.

2.1 Market Participant to submit Commissioning Test ~~Planplan~~

Market Participants are advised to contact System Management to discuss possible system conditions that might influence the Commissioning Test ~~pPlanlan~~ prior to requesting approval of a Commissioning Test ~~pPlanlan~~. System Management will use reasonable endeavors to assist the Market Participant.

1. Any Market Participant wishing to conduct a Commissioning Test **[MR 3.21A.4]** must provide System Management with a Commissioning Test ~~Planplan~~ that:
 - a. includes a Commissioning Test Schedule, containing the information specified in Appendix A of this Procedure, for each Trading Day during the period over which the Commissioning Test will occur; and
 - b. is transmitted in the form specified in Section 2.2 of this Procedure.
2. System Management may, at its discretion, vary the requirements set out in Appendix A for a particular Facility.
3. System Management may, ~~at its discretion,~~ consider a Commissioning Test ~~Planplan~~ submitted after the timing requirements provided in the Market Rules **[MR 3.21A.4]**, but must notify the IMO of a potential breach of the timing requirement if it accepts such a Commissioning Test ~~pPlanlan~~.

The Market Rules [MR 3.21A.4] states a timing requirement of at least 7 Trading Days prior to the start of the Commissioning Test Period. This timing requirement is on a best endeavours basis and while System Management will report instances where a Commissioning Test Plan has been submitted under 7 days, it will be a determination for the IMO to make as to whether a breach has or has not occurred.

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4. System Management must not approve Commissioning Test ~~P~~plans first submitted less than 2 days prior to the commencement of the first Trading Day covered by the Commissioning Test ~~plan~~Plan.

Note the two day limitation does not apply to Commissioning Test Schedules submitted (or re-submitted) pursuant to Paragraph 2.4.1 or 2.4.2(b)(ii).

2.2 Communication in relation to Commissioning Test ~~Plans~~plans

1. System Management must advise Market Participants of contact details and modes of communication for the submission of Commissioning Test ~~Plans~~plans.
2. A Market Participant must comply with the communication requirements set by System Management pursuant to Paragraph 2.2.4 of this Procedure.
3. Market Participants must provide System Management with the communication details of the operating person(s) authorised to submit Commissioning Test ~~P~~plans for each of their facilities.
4. 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.

2.3 Assessment and Approval of Commissioning Test ~~Plans~~plans

1. System Management may reject a ~~draft~~ Commissioning Test ~~Plan~~plan if it reasonably believes that the conditions stipulated in the Market Rules [MR 3.21A.3] ~~-and [MR 3.21A.7]~~ have not been met.

The 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 Western Power Website.

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

“System Management must ~~approve~~~~accept~~ a ~~request for a~~ Commissioning Test ~~Plan~~ unless:

(a) in its opinion inadequate information is provided in the ~~Commissioning Test Plan~~~~request~~; or

~~(b) in its opinion the 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) in the case of a new generating system that is yet to commence operation, the proposed Commissioning Test Period is greater than four months". [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 ~~pPlanlan~~, including by scheduling any additional Ancillary Services required to maintain power system security, provided the Commissioning Test ~~Planplan~~ is broadly consistent with expected system conditions at the time of each proposed ~~Ttest~~.

2. Where System Management requires additional information to make an assessment of a ~~draft~~ Commissioning Test ~~pPlanlan~~, System Management must request such information from the Market Participant, and the Market Participant must provide the information as soon as practicable.
3. System Management must consider the criteria set out in Appendix B in assessing the expected impact of the draft Commissioning Test ~~pPlanlan~~ on Power System Security and Power System Reliability.
4. If System Management approves the ~~draft~~ Commissioning Test ~~Planplan~~, it may schedule additional Ancillary Services during the Commissioning Test Period consistent with its powers under the Market Rules.

Additional Ancillary Services requirements will generally be in accordance with the guidelines set out in Appendix C 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)].

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

6. 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;

System Management and the Market Participant must then use their best endeavours to agree to an alternative time for the relevant Commissioning Test. If such an agreement is reached, ~~T~~the Market Participant, as soon as

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~~practicable, may then must~~ submit a ~~new revised draft~~ Commissioning Test Plan [MR 3.21A.10(a)ii]. ~~plan, which should take into account the explanation provided by System Management.~~

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2.4 Update of Commissioning Test Plans

~~5.1.~~ If System Management delays or cancels a ~~T~~est contained within a previously approved Commissioning Test ~~p~~lan and informs the affected Market Participant in accordance with the Market Rules [MR 3.21A.11], the Market Participant must submit a new Commissioning Test ~~Plan~~ prior to undertaking any Commissioning Tests.

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~~6.2.~~ At any stage where a Market Participant becomes aware of conditions which may prevent the generating Facility from conforming to an approved Commissioning Test ~~Plan~~ [MR 3.21A.13], the Market Participant must:

- a. immediately notify System Management; and
- b. either:
 - i. ~~-~~withdraw the Commissioning Test ~~plan~~; or
 - ii. if the conditions only relate to the ability of the generating Facility to conform to a Commissioning Test Schedule, provide an amended Commissioning Test Schedule, in accordance with Section 2.1 of this Procedure, to System Management for approval as soon as practicable before commencement of the Trading Day to which the Commissioning Test Schedule relates; ~~or-~~

~~iii.~~ if the conditions require an extension of the Commissioning Test Period, submission of a new Commissioning Test Plan in accordance with Section 2.1 of this Procedure.

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2.5 Conduct of Commissioning Tests

2.5

~~1.~~ For each Test or series of successive Tests 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.

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~~1.~~ For each ~~T~~est or series of successive ~~T~~ests in the approved Commissioning Test ~~P~~lan 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 under Appendix A~~ and for which any additional ~~A~~ncillary ~~S~~ervices required pursuant to Paragraph 2.3.4 are ~~schedule~~d, ~~ted~~.

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~~4.2.~~ ~~2.~~ ~~taking~~ 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 ~~T~~est details specified in the Market Participant’s Commissioning Test ~~plan~~ Plan as far as practicable taking into account the associated impacts on the market such as the scheduling of additional Ancillary Services.

~~7.3.~~ System Management must issue an Operating Instruction for each Trading Day covered by the approved Commissioning Test ~~plan~~ Plan, prior to the commencement of the Trading Day.

~~4.~~ 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.

~~4.~~ For each Test Window, System Management must pre-issue Dispatch Instructions to the Market Participant for all Trading Intervals in the Test Window prior to commencement of the Test Window.

~~9.5.~~ The Market Participant must seek System Management’s verbal approval to commence any ~~T~~est in the Commissioning Test ~~Plan~~ plan. If the Market Participant’s advice regarding the timing of the ~~T~~est 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.

~~10.6.~~ If subsequent updates to the Balancing Merit Order render the Dispatch Instructions to be ~~Out of Merit~~ “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 ~~c~~Commissioning ~~g~~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.

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APPENDIX A: COMMISSIONING TEST PLAN STANDARD FORM TEMPLATE

An excel template of the Commissioning Test Plan Standard Form Template can be found under the following link;

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http://www.westernpower.com.au/retailersgenerators/systemManagement/Commissioning_Testing.html

COMMISSIONING TEST <u>PLAN</u> PROFORMA			
Generator Details			
Market Participant	<input type="checkbox"/>		
Facility Designation:			
Contact Details:		Operational	Commercial
	Email		
	Mobile		
	Phone		
	Fax		
Fuel Types:	Fuel "1"	Fuel "2"	Fuel "3"
Test Details	<p>Note the Test Details section may be duplicated as required to specify multiple preferred "Test Windows" (the period between the start time and the end time). Each entry should clearly specify which tests are to be conducted in that Window.</p>		
Test Period (Trade Date):	Start Time (dd/mm/yyyy HH:MM)	End Time (dd/mm/yyyy HH:MM)	Formatted: Space Before: 12 pt
Purpose of Test(s):	<input type="checkbox"/> <u>New Generating System</u> OR <input type="checkbox"/> <u>Significant Maintenance</u>		
	<u>Details: (if Significant Maintenance, please provide corresponding approved Outage number)</u>		

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System Under Test:

Test Description

Contingency Plan(s):

Schedule

Day (dd/mm/yyyy)	Net Output		Fuel Mix "1", "2", "3", "1&2", "1&3", "2&3", or All	Trip Risk Low, Medium, or High	Specific Tests			
	MW Active Power	MVAR Reactive Power			Technical Rule, Table A11.1	Technical Rule, Table A11.2	(other specify)	(other specify)
8:00								
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APPENDIX B: 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 (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	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
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100% rated MW output	To be done at time of flat system load profile
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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 (iii) Equivalent of 0.05 HZ subtracted from governor speed reference (iv) Equivalent of 0.1 HZ added to governor speed reference	To be done at time of flat system load profile

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 C: GUIDELINES FOR ADDITIONAL ANCILLARY SERVICES DURING COMMISSIONING TESTS

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	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
(i) 50% rated MW	Normal LF ¹ 400%	Greater of: 1. Normal SR ² 2. 100% of test generator output.	Bid 50% at floor and 50% at cap
(ii) 100% rated MW	Normal LF ¹ 400%	Greater of: 1. Normal SR ² 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	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
(i) 50% rated MW	Normal LF ¹ 400%	Greater of: 1. Normal SR ² 2. 100% of test generator output.	Bid 50% at floor and 50% at cap
(ii) 100% rated MW	Normal LF ¹ 400%	Greater of: 1. Normal SR ² 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	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
100% rated MW	Normal LF ¹ 400%	Greater of: 1.Normal SR ² 2.100% of test generator output.	Bid 100% at floor and 0% at cap
100% rated MW	Normal LF ¹ 400%	Greater of: 1.Normal SR ² 2.100% of test generator output.	Bid 100% at floor and 0% at cap

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C3B Step changes to AVR voltage reference with PSS in service.			
Generator Output	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
100% rated MW	Normal LF ¹ 400%	Greater of: 1.Normal SR ² 2.100% of test generator output.	Bid 100% at floor and 0% at cap
100% rated MW	Normal LF ¹ 400%	Greater of: 1.Normal SR ² 2.100% of test generator output.	Bid 100% at floor and 0% at cap

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		<u>output.</u>	

C4 Step change of MVA on the transmission system.

Generator Output and Test Sequence	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
(i) 50% rated MW with PSS out of service	<u>Normal LF¹100%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 50% at floor and 50% at cap
(ii) 50% rated MW with PSS in service	<u>Normal LF¹100%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 50% at floor and 50% at cap

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C5 Real power load rejection (generator trip test)

Generator Output and Test Sequence	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
(i) 25% rated MW	<u>Normal LF¹100%+ load rejection</u>	<u>Normal SR² plus load rejection</u>	Bid 12.5% at floor and 87.5% at cap for trip interval

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	<u>amount</u>	<u>amount.</u>	
(ii) 50% rated MW	<u>Normal LF¹400%+ load rejection amount</u>	<u>Normal SR² plus load rejection amount.</u>	Bid 25% at floor and 75% at cap for trip interval
(iii) 100% rated MW	<u>Normal LF¹400%+ load rejection amount</u>	<u>Normal SR² plus load rejection amount.</u>	Bid 50% at floor and 50% at cap for trip interval

C6 Steady state over-excitation limiter (OEL) operation

Generator Output and Test Sequence	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
(i) 100% rated MW	<u>Normal LF¹400%</u>	<u>Greater of: 1.Normal SR² 2.100% of test generator output.</u>	Bid 100% at floor and 0% at cap
(ii) 75% rated MW	<u>Normal LF¹400%</u>	<u>Greater of: 1.Normal SR² 2.100% of test generator output.</u>	Bid 75% at floor and 25% at cap
(iii) 50% rated MW	<u>Normal LF¹400%</u>	<u>Greater of: 1.Normal SR² 2.100% of test generator</u>	Bid 50% at floor and 50% at cap

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		<u>output.</u>	
(iv) 25% rated MW	<u>Normal</u> <u>LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 25% at floor and 75% at cap
(v) min MW output	<u>Normal</u> <u>LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid min at floor and remainder at cap

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C7 Steady state under-excitation limiter (UEL) operation

Generator Output and Test Sequence	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
(i) 100% rated MW	<u>Normal</u> <u>LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 100% at floor and 0% at cap
(ii) 75% rated MW	<u>Normal</u> <u>LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 75% at floor and 25% at cap
(iii) 50% rated MW	<u>Normal</u>	<u>Greater of:</u>	Bid 50% at floor and 50% at

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	<u>LF¹400%</u>	<u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	cap
(iv) 25% rated MW	<u>Normal</u> <u>LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 25% at floor and 75% at cap
(v) min MW output	<u>Normal</u> <u>LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid min MW output at floor and remainder at cap

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C9 MVAR capability at full MW output

Generator Output	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
MW and MVAR output levels set to 100% of rated values and maintained for one hour.	<u>Normal</u> <u>LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 100% at floor and 0% at cap

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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	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
(i) -30% rated MVAR	<u>Normal LF¹70%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid min MW output at floor and remainder at cap
(ii) +25% rated MVAR	<u>Normal LF¹70%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid min MW output at floor and remainder at cap

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S5 AVR / OEL changeover

Generator Output	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
100% rated MW output.	<u>Normal LF¹100%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 100% at floor and 0% at cap

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S6 AVR / UEL changeover

Generator Output	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
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100% rated MW output	<u>Normal LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 100% at floor and 0% at cap
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S8 Tripping of an adjacent generating unit.

Generator Output	Additional Load Following and/or Spinning Reserve	Spinning Reserve	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	<u>Normal LF¹400%+ amount supplied by generator to be tripped</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u> <u>Plus 100% of adjacent tripped generator output.</u>	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

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**S10 Step changes added to and subtracted from governor / load reference
(Note this test is not a ramp rate test.)**

Generator Output	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
Output at 50-85% rated MW	<u>Normal LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid 50-85% at floor and 50-15% at cap
(i) 2.5% step increase in MW demand signal	<u>Normal LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	Bid (50-85%) + 2.5% at floor and (50-15%) – 2.5% at cap
(ii) 2.5% step decrease in MW demand signal	<u>Normal LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	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	<u>Normal LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	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	<u>Normal LF¹400%</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	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

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

Maximum Ramp Rate			
Generator Output	Additional Load Following and/or Spinning Reserve	Spinning Reserve	Indicative Balancing Market submission
0 to Maximum output at maximum ramp rate	<u>Normal LF¹</u> <u>Plus ramp range+100% for Test Window.</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	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.
0 to Maximum <u>to 0</u> output at maximum ramp rate	<u>Normal LF¹</u> <u>100% for Test Window</u> <u>Plus ramp range.-</u>	<u>Greater of:</u> <u>1.Normal SR²</u> <u>2.100% of test generator output.</u>	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.

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¹ Normal LF is the Load Following Ancillary Service Requirement as defined in the Ancillary Services Report for the current financial year as found on the IMO's website (<http://www.imowa.com.au/ancillary-services-annual-reports>).

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² Normal SR is the Spinning Reserve Ancillary Service Requirement as defined in the Ancillary Services Report for the current financial year as found on the IMO's website (<http://www.imowa.com.au/ancillary-services-annual-reports>).

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