

CHAPTER 5



5. Network Connection

5.1 Statement of Purpose

5.1.1 [Deleted]

5.1.2 Purpose

- (a) This Chapter:
 - (1) provides the framework for *connection* to a *transmission network* or a *distribution network* and access to the *national grid*; and
 - (2) has the following aims:
 - (i) to detail the principles and guidelines governing *connection* and access to a *network*;
 - (ii) to establish the process to be followed by a *Registered Participant* or a person intending to become a *Registered Participant* for establishing or modifying a *connection* to a *network* or for altering *generating plant connected* to a *network*;
 - (iii) to address a *Connection Applicant's* reasonable expectations of the level and standard of *power transfer capability* that the relevant *network* should provide; and
 - (iv) to establish processes to ensure ongoing compliance with the technical requirements of this Chapter to facilitate management of the *national grid*.
- (b) Any person who is not a *Registered Participant* may agree with a *Network Service Provider* to comply with this Chapter as part of a *connection agreement*.
- (c) Nothing in the *Rules* is to be read or construed as preventing any person from constructing any *network* or *connection assets*.
- (d) Subject to paragraphs (e) and (g), the following *Rules* apply in the application of this Chapter to *transmission services* provided by means of, or in connection with, the *declared transmission system* of an *adoptive jurisdiction*:
 - (1) a reference to a *Network Service Provider* is, in relation to the provision of *connection services*, to be read as a reference to a *declared transmission system operator*; and

- (2) a reference to a *Network Service Provider* is, in relation to the provision of *shared transmission services*, to be read as a reference to *AEMO*.
- (e) A reference in any of the following provisions to a *Network Service Provider* will, in relation to the *declared transmission system* of an *adoptive jurisdiction*, be construed as a reference to *AEMO*:
 - (1) clause 5.2.3(b);
 - (2) clause 5.6.1;
 - (3) clause 5.6.2;
 - (4) clause 5.6.2A (except 5.6.2A(b)(2));
 - (5) clause 5.7.6;
 - (6) clause 5.7.7 (except 5.7.7(c));
 - (7) Schedule 5.1, clause S5.1.2.3;
 - (8) Schedule 5.3 clause S5.3.5.
 - (f) A reference in any of the following provisions to a *Transmission Network Service Provider* will, in relation to the *declared transmission system* of an *adoptive jurisdiction*, be construed as a reference to *AEMO*:
 - (1) clause 5.6.6;
 - (2) clause 5.6.6A;
 - (3) clause 5.6.6B;
 - (g) A reference in any of the following provisions to a *Network Service Provider* will, in relation to the *declared transmission system* of an *adoptive jurisdiction*, be construed as a reference to the relevant *declared transmission system operator*:
 - (1) clause 5.2.3(d)(12), (e) and (e1)(except 5.2.3(e1)(2));
 - (2) clause 5.3.4A(c) and (d);
 - (3) clause 5.9.3;
 - (4) clause 5.9.4;
 - (5) clause 5.9.6;
 - (6) Schedule 5.1, clause S5.1.10.3(a);

- (7) Schedule 5.2 clause S5.2.3(a)(8).

5.1.3 Principles

This Chapter is based on the following principles relating to *connection* to the *national grid*:

- (a) all *Registered Participants* should have the opportunity to form a *connection* to a *network* and have access to the *network services* provided by the *networks* forming part of the *national grid*;
- (b) the terms and conditions on which *connection* to a *network* and provision of *network service* is to be granted are to be set out in commercial agreements on reasonable terms entered into between a *Network Service Provider* and other *Registered Participants*;
- (c) the technical terms and conditions of *connection agreements* regarding standards of performance must be established at levels at or above the *minimum access standards* set out in schedules 5.1, 5.2, 5.3 and 5.3a, with the objective of ensuring that the *power system* operates securely and reliably and in accordance with the *system standards* set out in schedule 5.1a;
- (d) a *Registered Participant* or person intending to become a *Registered Participant* may request *connection* of a facility, modification of a *connection*, or alteration of *connected plant* at a standard below an *automatic access standard* if the *connection*, modification to the *connection*, or alteration of *connected plant* does not adversely affect:
 - (1) *power system security*; and
 - (2) the quality of *supply* to other *Network Users*;
- (e) in some jurisdictions separate agreements may be required for *connection services* and *use of system services*; and
- (f) the operation of the *Rules* should result in the achievement of:
 - (1) long term benefits to *Registered Participants* in terms of cost and *reliability* of the *national grid*; and
 - (2) open communication and information flows relating to *connections* between *Registered Participants* themselves, and between *Registered Participants* and *AEMO*, while ensuring the security of *confidential information* belonging to competitors in the *market*.

5.2 Obligations

5.2.1 Obligations of Registered Participants

- (a) All *Registered Participants* must maintain and operate (or ensure their authorised *representatives* maintain and operate) all equipment that is part of their *facilities* in accordance with:
- (1) relevant laws;
 - (2) the requirements of the Rules; and
 - (3) *good electricity industry practice* and applicable *Australian Standards*.
- (b) All *Registered Participants* must ensure that the *connection agreements* to which they are a party require the provision and maintenance of all required *facilities* consistent with *good electricity industry practice* and must operate their equipment in a manner:
- (1) to assist in preventing or controlling instability within the *power system*;
 - (2) comply with the minimum standards *published* pursuant to clause 3.11.4(c);
 - (3) to assist in the maintenance of, or restoration to, a *satisfactory operating state* of the *power system*; and
 - (4) to prevent uncontrolled separation of the *power system* into isolated *regions* or partly combined *regions*, *intra-regional transmission break-up*, or *cascading outages*, following any *power system* incident.

5.2.2 Connection agreements

- (a) If requested to do so by a *Transmission Network User*, *Distribution Network User*, *AEMO* or the *AER*, a *Network Service Provider* and a *Transmission Network User* or *Distribution Network User* (as the case may be) must document the terms of any *network connection* arrangements made prior to 13 December 1998 and the resulting document will then be deemed to be a *connection agreement* for the purposes of the *Rules*.
- (b) The *Rules* apply to:
- (1) *connection agreements* made after 13 December 1998;
 - (2) deemed *connection agreements* under paragraph (a); and
 - (3) requests to establish *connection* after 13 December 1998.

- (c) This Chapter is neither intended to have, nor is it to be read or construed as having, the effect of:
 - (1) altering any of the terms of a *connection agreement*; or
 - (2) altering the contractual rights or obligations of any of the parties under the *connection agreement* as between those parties; or
 - (3) relieving the parties under any such *connection agreement* of their contractual obligations under such an *agreement*.
- (d) Notwithstanding the provisions of clause 5.2.2(c), if any obligation imposed or right conferred on a *Registered Participant* by this Chapter is inconsistent with the terms of a *connection agreement* to which the *Rules* apply and the application of the inconsistent terms of the *connection agreement* would adversely affect the quality or security of *network service* to other *Network Users*, the parties to the *connection agreement* must observe the provisions of this Chapter as if they prevail over the *connection agreement* to the extent of the inconsistency.

5.2.3 Obligations of network service providers

- (a) To be registered by *AEMO* as a *Network Service Provider*, a person must satisfy the relevant requirements specified in Chapter 2 and submit an application to *AEMO* in such form as *AEMO* may require.
- (b) A *Network Service Provider* must comply with the *power system* performance and quality of *supply* standards:
 - (1) described in schedule 5.1;
 - (2) in accordance with any *connection agreement* with a *Registered Participant*,and if there is an inconsistency between schedule 5.1 and such a *connection agreement*:
 - (3) if compliance with the relevant provision of the *connection agreement* would adversely affect the quality or security of *network service* to other *Network Users*, schedule 5.1 is to prevail;
 - (4) otherwise the *connection agreement* is to prevail.
- (c) Where the provisions of the *connection agreement* vary the technical requirements set out in the schedules to this Chapter, the relevant *Network Service Provider* must report on such variations to *AEMO* on an annual basis. *AEMO* must allow access to such information to all other *Network Service Providers* and the *Network Service Providers* must keep such information confidential.

- (d) A *Network Service Provider* must:
- (1) review and process *applications to connect* or modify a *connection* which are submitted to it and must enter into a *connection agreement* with each *Registered Participant* and any other person to which it has provided a *connection* in accordance with rule 5.3 to the extent that the *connection point* relates to its part of the *national grid*;
 - (1A) co-operate with any other *Network Service Provider* who is processing a *connection* enquiry or *application to connect* to allow that *connection* enquiry or *application to connect* to be processed expeditiously and in accordance with rule 5.3;
 - (2) ensure that, to the extent that a *connection point* relates to its part of the *national grid*, every arrangement for *connection* with a *Registered Participant* or any other arrangement involving a *connection agreement* with that *Network Service Provider* complies with all relevant provisions of the *Rules*;
 - (3) co-ordinate the design aspects of equipment proposed to be *connected* to its *networks* with those of other *Network Service Providers* in accordance with rule 5.4 in order to seek to achieve *power system* performance requirements in accordance with schedule 5.1;
 - (4) together with other *Network Service Providers*, arrange for and participate in planning and development of their *networks* and *connection points* on or with those *networks* in accordance with rule 5.6;
 - (5) permit and participate in inspection and testing of *facilities* and equipment in accordance with rule 5.7;
 - (6) permit and participate in commissioning of *facilities* and equipment which are to be *connected* to its *network* in accordance with rule 5.8;
 - (7) advise a *Registered Participant* or other person with whom there is a *connection agreement* upon request of any expected interruption characteristics at a *connection point* on or with its *network* so that the *Registered Participant* or other person may make alternative arrangements for *supply* during such interruptions, including negotiating for an alternative or backup *connection*;
 - (8) use its reasonable endeavours to ensure that modelling data used for planning, design and operational purposes is complete and accurate and order tests in accordance with rule 5.7 where there are reasonable grounds to question the validity of data;

- (9) provide to *AEMO* and other *Network Service Providers* all data available to it and reasonably required for modelling the static and *dynamic performance* of the *power system*;
 - (10) forward to *AEMO* and other *Network Service Providers* subsequent updates of the data referred to in clause 5.2.3(d)(9) and, to the best of its ability and knowledge, ensure that all data used for the purposes referred to in rule 5.3 is consistent with data used for such purposes by other *Network Service Providers*;
 - (11) provide to *AEMO* the information required from *Generators* under schedule 5.2 and from *Customers* under schedule 5.3 and from *Market Network Service Providers* under schedule 5.3a in relation to a *connection agreement* and details of any *connection points* with other *Network Service Providers*; and
 - (12) where *network augmentations*, setting changes or other technical issues arise which could impact across *regional* boundaries, provide *AEMO* with a written report on the impact and its effects.
- (e) A *Network Service Provider* must arrange for operation of that part of the *national grid* over which it has control in accordance with instructions given by *AEMO*.
- (e1) A *Network Service Provider* must, except in so far as its *market network services* and parts of its *network* which are used solely for the provision of *market network services* are concerned, arrange for:
- (1) management, maintenance and operation of its part of the *national grid* such that, in the *satisfactory operating state*, electricity may be transferred continuously at a *connection point* on or with its *network* up to the *agreed capability*;
 - (2) operation of its *network* such that the fault level at any *connection point* on or with that *network* does not exceed the limits that have been specified in a *connection agreement*;
 - (3) management, maintenance and operation of its *network* to minimise the number of interruptions to *agreed capability* at a *connection point* on or with that *network* by using *good electricity industry practice*; and
 - (4) restoration of the *agreed capability* at a *connection point* on or with that *network* as soon as reasonably practicable following any interruption at that *connection point*.
- (f) A *Network Service Provider* must comply with *applicable regulatory instruments*.

- (g) Each *Network Service Provider* must in respect of new or altered equipment owned, operated or controlled by it for the purpose of providing a *market network service*:
 - (1) submit an *application to connect* and enter into a *connection agreement* with a *Network Service Provider* in accordance with rule 5.3 prior to that equipment being connected to the *network* of that *Network Service Provider* or altered (as the case may be);
 - (2) comply with the reasonable requirements of *AEMO* and the relevant *Network Service Provider* in respect of design requirements of equipment proposed to be *connected* to the *network* of that *Network Service Provider* in accordance with rule 5.4 and schedule 5.3a;
 - (3) provide forecast information to the relevant *Network Service Provider* in accordance with rule 5.6;
 - (4) permit and participate in inspection and testing of *facilities* and equipment in accordance with rule 5.7;
 - (5) permit and participate in commissioning of *facilities* and equipment which are to be *connected* to a *network* for the first time in accordance with rule 5.8; and
 - (6) **[Deleted]**
 - (7) give notice of intended voluntary permanent *disconnection* in accordance with rule 5.9.
- (h) **[Deleted]**
- (h1) **[Deleted]**
- (h2) **[Deleted]**
- (h3) **[Deleted]**
- (i) This Chapter is neither intended to require, nor is it to be read or construed as having the effect of requiring, a *Network Service Provider* to permit *connection* to or to *augment* any part of its *network* which is solely used for the provision of *market network services*.

5.2.4 Obligations of customers

- (a) Each *Customer* must plan and design its *facilities* and ensure that its *facilities* are operated to comply with:
 - (1) its *connection agreement* with a *Network Service Provider*;

- (2) subject to clause 5.2.4(a)(1), all applicable *performance standards*; and
 - (3) subject to clause 5.2.4(a)(2), the *system standards*.
- (b) A *Customer* must:
- (1) submit an *application to connect* in respect of new or altered equipment owned, operated or controlled by the *Customer* and enter into a *connection agreement* with a *Network Service Provider* in accordance with rule 5.3 prior to that equipment being *connected* to the *network* of that *Network Service Provider* or altered (as the case may be);
 - (2) comply with the reasonable requirements of the relevant *Network Service Provider* in respect of design requirements of equipment proposed to be *connected* to the *network* of that *Network Service Provider* in accordance with rule 5.4 and schedule 5.3;
 - (3) provide *load* forecast information to the relevant *Network Service Provider* in accordance with rule 5.6;
 - (4) permit and participate in inspection and testing of *facilities* and equipment in accordance with rule 5.7;
 - (5) permit and participate in commissioning of *facilities* and equipment which are to be *connected* to a *network* for the first time in accordance with rule 5.8; and
 - (6) **[Deleted]**
 - (7) give notice of any intended voluntary permanent *disconnection* in accordance with rule 5.9.

5.2.5 Obligations of Generators

- (a) A *Generator* must plan and design its *facilities* and ensure that they are operated to comply with:
- (1) the *performance standards* applicable to those *facilities*;
 - (2) subject to subparagraph (1), its *connection agreement* applicable to those *facilities*; and
 - (3) subject to subparagraph (2), the *system standards*.
- (b) A *Generator* must:

- (1) submit an *application to connect* in respect of new *generating plant* owned, operated or controlled by the *Generator*, or to be owned, operated or controlled by the *Generator*, and enter into a *connection agreement* with a *Network Service Provider* in accordance with rule 5.3 prior to that *generating plant* being *connected* to the *network* of that provider;
- (2) comply with the reasonable requirements of the relevant *Network Service Provider* in respect of design requirements of *generating plant* proposed to be *connected* to the *network* of that provider in accordance with rule 5.4 and schedule 5.2;
- (3) provide *generation* forecast information to the relevant *Network Service Provider* in accordance with rule 5.6;
- (4) permit and participate in inspection and testing of *facilities* and equipment in accordance with rule 5.7;
- (5) permit and participate in commissioning of *facilities* and equipment which are to be *connected* to a *network* for the first time in accordance with rule 5.8; and
- (6) give notice of intended voluntary permanent *disconnection* in accordance with rule 5.9.

5.3 Establishing or Modifying Connection

5.3.1 Process and procedures

- (a) For the purposes of this rule 5.3:

establish a connection includes modify an existing *connection* or alter *plant* but does not include alterations to *generating plant* in the circumstances set out in clause 5.3.9.
- (b) A *Registered Participant* or person intending to become a *Registered Participant* who wishes to establish a *connection* to a *network* must follow the procedures in this rule 5.3.
- (c) Any person wishing to establish a *connection* to a *network* may elect to follow the procedures in this rule 5.3.
- (d) A *Generator* wishing to alter *connected generating plant* must comply with clause 5.3.9.

5.3.2 Connection enquiry

- (a) A person referred to in clause 5.3.1(b) or (c) who wishes to make an *application to connect* must first make a *connection* enquiry by advising the *Local Network Service Provider* of the type, magnitude and timing of the proposed *connection* to that provider's *network*.
- (b) If the information submitted with a *connection* enquiry is inadequate to enable the *Local Network Service Provider* to process the enquiry the provider must within 5 *business days*, advise the *Connection Applicant* what other relevant preliminary information of the kind listed in schedule 5.4 is required before the *connection* enquiry can be further processed.
- (c) The *Local Network Service Provider* must advise the *Connection Applicant* within 10 *business days* of receipt of the *connection* enquiry and the further information required in accordance with paragraph (b) if the enquiry would be more appropriately directed to another *Network Service Provider*.
- (d) The *Connection Applicant*, notwithstanding the advice received under paragraph (c), may if it is reasonable in all the circumstances, request the *Local Network Service Provider* to process the *connection* enquiry and the provider must meet this request.
- (e) Where the *Local Network Service Provider* considers that the *connection* enquiry should be jointly examined by more than one *Network Service Provider*, with the agreement of the *Connection Applicant*, one of those *Network Service Providers* may be allocated the task of liaising with the *Connection Applicant* and the other *Network Service Providers* to process and respond to the enquiry.
- (f) A *Network Service Provider* must to the extent that it holds technical information necessary to facilitate the processing of a *connection* enquiry made in accordance with paragraph (a) or an *application to connect* in accordance with clause 5.3.4(a), provide that information to the *Connection Applicant* in accordance with the relevant requirements of schedule 5.1, 5.2, 5.3 or 5.3a.

5.3.3 Response to connection enquiry

- (a) In preparing a response to a *connection* enquiry, the *Network Service Provider* must liaise with other *Network Service Providers* with whom it has *connection agreements*, if the *Network Service Provider* believes, in its reasonable opinion, that compliance with the terms and conditions of those *connection agreements* will be affected. The *Network Service Provider* responding to the *connection* enquiry may include in that response the reasonable requirements of any such other *Network Service Providers* for information to be provided by the *Connection Applicant*.

(b) The *Network Service Provider* must:

- (1) within 10 *business days* after receipt of the *connection* enquiry and all such additional information (if any) advised under clause 5.3.2(b); or
- (2) within 10 *business days* after receipt of a request from the *Connection Applicant* to the *Local Network Service Provider* to process the *connection* enquiry under clause 5.3.2(d),

provide the following information in writing to the *Connection Applicant*:

- (3) the identity of other parties that the *Network Service Provider* considers:
 - (i) will need to be involved in planning to make the *connection* or must be involved under clause 5.3.5(e); and
 - (ii) must be paid for *transmission services* or *distribution services* in the appropriate jurisdiction;
- (4) whether it will be necessary for any of the parties identified in subparagraph (3) to enter into an agreement with the *Connection Applicant* in respect of the provision of *connection* or other *transmission services* or *distribution services* or both, to the *Connection Applicant*;
- (5) whether any service the *Network Service Provider* proposes to provide is *contestable* in the relevant *participating jurisdiction*; and
- (6) a *preliminary program* showing proposed milestones for *connection* and access activities which may be modified from time to time by agreement of the parties, where such agreement must not be unreasonably withheld.

(b1) The *Network Service Provider* must:

- (1) within 20 *business days* after receipt of the *connection* enquiry and all such additional information (if any) advised under clause 5.3.2(b); or
- (2) within 20 *business days* after receipt of a request from the *Connection Applicant* to the *Local Network Service Provider* to process the *connection* enquiry under clause 5.3.2(d),

provide the *Connection Applicant* with the following written details of each technical requirement relevant to the proposed *plant*:

- (3) the *automatic access standards*;
- (4) the *minimum access standards*;

- (5) the applicable *plant standards*;
 - (6) the *negotiated access standards* that will require AEMO's involvement in accordance with clause 5.3.4A(c); and
 - (7) the *normal voltage* level, if that is to change from the *nominal voltage* level.
- (b2) A *Registered Participant*, AEMO or *interested party* may request the *Reliability Panel* to determine whether, in respect of one or more technical requirements for access, an existing Australian or international standard, or a part thereof, may be adopted as a *plant standard* for a particular class of *plant*.
- (b3) Where, in respect of a technical requirement for access, the *Reliability Panel* determines a *plant standard* for a particular class of *plant* in accordance with clause 8.8.1(a)(8) as an acceptable alternative to a particular *minimum access standard* or *automatic access standard*, a *plant* which meets that *plant standard* is deemed to meet the applicable *automatic access standard* or *minimum access standard* for that technical requirement.
- (b4) In making a determination in accordance with clause 5.3.3(b2) the *Reliability Panel* must consult *Registered Participants* and AEMO using the *Rules consultation procedures*.
- (c) Within 20 *business days* after receipt of the *connection* enquiry and all such additional information (if any) advised under clause 5.3.2(b) or, if the *Connection Applicant* has requested the *Local Network Service Provider* to process the *connection* enquiry under clause 5.3.2(d), within 20 *business days* after receipt of that request, the *Network Service Provider* must provide to the *Connection Applicant* written advice of all further information which the *Connection Applicant* must prepare and obtain in conjunction with the *Network Service Provider* to enable the *Network Service Provider* to assess an *application to connect* including:
- (1) details of the *Connection Applicant's connection* requirements, and the *Connection Applicant's* specifications of the *facility* to be connected, consistent with the requirements advised in accordance with clause 5.3.3(b1);
 - (2) details of the *Connection Applicant's* reasonable expectations of the level and standard of service of *power transfer capability* that the *network* should provide;
 - (3) a list of the technical data to be included with the *application to connect*, which may vary depending on the *connection* requirements and the type, rating and location of the *facility* to be *connected* and will generally be in the nature of the information set out in

schedule 5.5 but may be varied by the *Network Service Provider* as appropriate to suit the size and complexity of the proposed *facility* to be *connected*;

- (4) commercial information to be supplied by the *Connection Applicant* to allow the *Network Service Provider* to make an assessment of the ability of the *Connection Applicant* to satisfy the prudential requirements set out in rules 6.6 and 6.7;
- (5) the amount of the application fee which is payable on lodgement of an *application to connect*, such amount not being more than necessary to:
 - (i) cover the reasonable costs of all work anticipated to arise from investigating the *application to connect* and preparing the associated offer to *connect*; and
 - (ii) meet the reasonable costs anticipated to be incurred by *AEMO* and other *Network Service Providers* whose participation in the assessment of the *application to connect* will be required; and
- (6) any other information relevant to the submission of an *application to connect*.

5.3.4 Application for connection

- (a) A person who has made a *connection* enquiry under clause 5.3.2 may, following receipt of the responses under clause 5.3.3, make an *application to connect* in accordance with this clause 5.3.4 and clause 5.3.4A.
- (b) To be eligible for *connection*, the *Connection Applicant* must submit an *application to connect* containing the information specified in clause 5.3.3(c) and the relevant application fee to the relevant *Network Service Provider*.
- (c) The *Connection Applicant* may submit *applications to connect* to more than one *Network Service Provider* in order to receive additional offers to *connect* in respect of *facilities* to be provided that are *contestable*.
- (d) To the extent that an application fee includes amounts to meet the reasonable costs anticipated to be incurred by any other *Network Service Providers* or *AEMO* in the assessment of the *application to connect*, a *Network Service Provider* who receives the *application to connect* and associated fee must pay such amounts to the other *Network Service Providers* or *AEMO*, as appropriate.
- (e) For each technical requirement where the proposed arrangement will not meet the *automatic access standards* nominated by the *Network Service Provider* pursuant to clause 5.3.3(b1), the *Connection Applicant* must

submit with the *application to connect* a proposal for a *negotiated access standard* for each such requirement to be determined in accordance with clause 5.3.4A.

- (f) The *Connection Applicant* may:
 - (1) lodge separate *applications to connect* and separately liaise with the other *Network Service Providers* identified in clause 5.3.3(b) who may require a form of agreement; or
 - (2) lodge one *application to connect* with the *Network Service Provider* who processed the *connection* enquiry and require it to liaise with those other *Network Service Providers* and obtain and present all necessary draft agreements to the *Connection Applicant*.

5.3.4A Negotiated access standards

- (a) For the purposes of this clause 5.3.4A:

AEMO advisory matter means a matter that relates to *AEMO's* functions under the *National Electricity Law* and a matter in which *AEMO* has a role in schedules 5.1a, 5.1, 5.2, 5.3 and 5.3a.
- (b) A *negotiated access standard* must:
 - (1) be no less onerous than the corresponding *minimum access standard* provided by the *Network Service Provider* under clause 5.3.3(b1)(4);
 - (2) be set at a level that will not adversely affect *power system security*;
 - (3) be set at a level that will not adversely affect the quality of *supply* for other *Network Users*; and
 - (4) in respect of *generating plant*, meet the requirements applicable to a *negotiated access standard* in clauses S5.2.5, S5.2.6, S5.2.7 and S5.2.8.
- (c) A *Network Service Provider* must following the receipt of a proposed *negotiated access standard* under clause 5.3.4(e) or paragraph (h), consult with *AEMO* as soon as practicable in relation to *AEMO* advisory matters for that proposed standard.
- (d) *AEMO* must within 20 *business days* following the submission of a proposed *negotiated access standard* under clause 5.3.4(e) or paragraph (h)(3), respond to the *Network Service Provider* in writing in respect of any *AEMO* advisory matters.
- (e) A *Network Service Provider* must within 30 *business days* following the receipt of a proposed *negotiated access standard* in accordance with clause

- 5.3.4(e) or paragraph (h)(3), accept or reject a proposed *negotiated access standard*.
- (f) The *Network Service Provider* must reject the proposed *negotiated access standard* if that *connection*, or alteration of the *generating plant* (as the case may be), at the *negotiated access standard* proposed by the *Connection Applicant* would:
- (1) on *AEMO*'s reasonable advice, adversely affect *power system security*;
 - (2) in the *Network Service Provider*'s reasonable opinion, adversely affect quality of *supply* for other *Network Users*;
 - (3) in the reasonable opinion of *AEMO* or the *Network Service Provider*, in respect of a *AEMO* advisory matter or a matter allocated to the *Network Service Provider*, respectively, be lower than the corresponding *minimum access standard*; or
 - (4) in respect of *generating plant*, in *AEMO*'s reasonable opinion, not satisfy paragraph (b)(4).
- (g) If a *Network Service Provider* rejects a proposed *negotiated access standard*, the *Network Service Provider* must when rejecting the proposed *negotiated access standard*, advise the *Connection Applicant* of a *negotiated access standard* that the *Network Service Provider* will accept.
- (h) The *Connection Applicant* may in relation to a proposed *negotiated access standard* advised by a *Network Service Provider* in accordance with paragraph (g):
- (1) accept the proposed *negotiated access standard*;
 - (2) reject the proposed *negotiated access standard*;
 - (3) propose an alternative *negotiated access standard* to be further evaluated in accordance with the criteria in paragraph (b); or
 - (4) elect to adopt the relevant *automatic access standard* or a corresponding *plant standard*.
- (i) An *automatic access standard* or if the procedures in this clause 5.3.4A have been followed a *negotiated access standard*, that forms part of the terms and conditions of a *connection agreement*, is taken to be the *performance standard* applicable to the *connected plant* for the relevant technical requirement.

5.3.5 Preparation of offer to connect

- (a) The *Network Service Provider* to whom the *application to connect* is submitted:
- (1) at the *automatic access standard* under clause 5.3.4; or
 - (2) at a *negotiated access standard* that the provider has accepted under clause 5.3.4A(e),

must proceed to prepare an offer to *connect* in response.

- (b) The *Network Service Provider* must use its reasonable endeavours to advise the *Connection Applicant* of all risks and obligations in respect of the proposed *connection* associated with planning and environmental laws not contained in the *Rules*.
- (c) The *Connection Applicant* must provide such other additional information in relation to the *application to connect* as the *Network Service Provider* reasonably requires to assess the technical performance and costs of the required *connection* and to enable the *Network Service Provider* to prepare an offer to *connect*.
- (d) So as to maintain levels of service and quality of *supply* to existing *Registered Participants* in accordance with the *Rules*, the *Network Service Provider* in preparing the offer to *connect* must consult with *AEMO* and other *Registered Participants* with whom it has *connection agreements*, if the *Network Service Provider* believes in its reasonable opinion, that compliance with the terms and conditions of those *connection agreements* will be affected, in order to assess the *application to connect* and determine:
- (1) the technical requirements for the equipment to be *connected*;
 - (2) the extent and cost of *augmentations* and changes to all affected *networks*;
 - (3) any consequent change in *network service charges*; and
 - (4) any possible material effect of this new *connection* on the *network power transfer capability* including that of other *networks*.
- (e) If the *application to connect* involves the *connection of generating units* having a *nameplate rating* of 10 MW or greater to a *distribution network*, the *Distribution Network Service Provider* must consult the relevant *Transmission Network Service Provider* regarding the impact of the *connection* contemplated by the *application to connect* on fault levels, line reclosure protocols, and stability aspects.

- (f) The *Transmission Network Service Provider* consulted under paragraph (e) must determine the reasonable costs of addressing those matters for inclusion in the offer to *connect* and the *Distribution Network Service Provider* must make it a condition of the offer to *connect* that the *Connection Applicant* pay these costs.
- (g) The *Network Service Provider* preparing the offer to *connect* must include provision for payment of the reasonable costs associated with *remote control equipment* and *remote monitoring equipment* as required by *AEMO* and it may be a condition of the offer to *connect* that the *Connection Applicant* pay such costs.

5.3.6 Offer to connect

- (a) Subject to clause 5.3.3(b)(6), the *Network Service Provider* processing the *application to connect* must make an offer to *connect* the *Connection Applicant's facilities* to the *network* within the time period specified in the *preliminary program*.
- (a1) The *Network Service Provider* may amend the time period referred to in clause 5.3.6(a) to allow for any additional time taken in excess of the period allowed in the *preliminary program* for the negotiation of *negotiated access standards* in accordance with clause 5.3.4A.
- (b) The offer to *connect* must contain the proposed terms and conditions for *connection* to the *network* including:
 - (1) for each technical requirement identified by the *Network Service Provider* under clause 5.3.3(b1), the *automatic access standard* or the *negotiated access standard* as determined in accordance with clauses 5.3.4 and 5.3.4A; and
 - (2) the terms and conditions of the kind set out in schedule 5.6,and must be capable of acceptance by the *Connection Applicant* so as to constitute a *connection agreement*.
- (b1) The proposed terms and conditions detailed in the offer to *connect* must be no lower than the applicable *minimum access standards*.
- (c) The offer to *connect* must be fair and reasonable and must be consistent with the safe and *reliable* operation of the *power system* in accordance with the *Rules*. Without limitation, unless the parties otherwise agree, to be fair and reasonable an offer to *connect* must offer *connection* and *network services* consistent with schedule 5.1 and (as applicable) schedules 5.2, 5.3 and 5.3a and must not impose conditions on the *Connection Applicant* which are more onerous than those contemplated in schedules 5.1, 5.2, 5.3 or 5.3a.

- (c1) An offer to *connect* and the resulting *connection agreement* must be consistent with any minimum standards set by *AEMO* under clause 3.11.4(b)(1).
- (d) The *Network Service Provider* must use its reasonable endeavours to provide the *Connection Applicant* with an offer to *connect* in accordance with the reasonable requirements of the *Connection Applicant*, including without limitation, the location of the proposed *connection point* and the level and standard of *power transfer capability* that the *network* will provide.
- (e) An offer to *connect* may contain options for *connection* to a *network* at more than one point in a *network* and/or at different levels of service and with different terms and conditions applicable to each *connection point* according to the different characteristics of *supply* at each *connection point*.
- (f) Both the *Network Service Provider* and the *Connection Applicant* are entitled to negotiate with each other in respect of the provision of *connection* and any other matters relevant to the provision of *connection* and, if negotiations occur, the *Network Service Provider* and the *Connection Applicant* must conduct such negotiations in good faith.
- (g) An offer to *connect* must define the basis for determining *transmission service charges* in accordance with Chapter 6A, including the prudential requirements set out in that Chapter.
- (h) An offer to *connect* must define the basis for determining *distribution service charges* in accordance with Chapter 6, including the prudential requirements set out in Part K of Chapter 6.
- (i) An offer to *connect* in respect of a *transmission network* must conform with the access arrangements set out in rule 5.4A.
- (j) An offer to *connect* in respect of a *distribution network* made to an *Embedded Generator* or a *Market Network Service Provider*, must conform with the relevant access arrangements set out in rule 5.5.
- (k) Nothing in the *Rules* is to be read or construed as imposing an obligation on a *Network Service Provider* to effect an extension of a *network* unless that extension is required to effect or facilitate the *connection* of a *Connection Applicant* and the *connection* is the subject of a *connection agreement*.

5.3.7 Finalisation of connection agreements

- (a) If a *Connection Applicant* wishes to accept an offer to *connect*, the *Connection Applicant* must negotiate and enter into a *connection agreement* with each relevant *Network Service Provider* identified in accordance with clauses 5.3.3(b)(3) and (4) and in doing so must use its reasonable

endeavours to negotiate in good faith with all parties with which the *Connection Applicant* must negotiate such a *connection agreement*.

- (b) The *connection agreement* must include proposed *performance standards* with respect to each of the technical requirements identified in schedules 5.2, 5.3 and 5.3a and each proposed *performance standard* must have been established in accordance with the relevant technical requirement.
- (c) The proposed *performance standards* must be based on the *automatic access standard* or, if the procedures in clause 5.3.4A have been followed, the *negotiated access standard*.
- (d) The provision of *connection* by any *Network Service Provider* may be made subject to gaining environmental and planning approvals for any necessary *augmentation* or *extension* works to a *network*.
- (e) Where permitted by the applicable law in the relevant *participating jurisdiction*, the *connection agreement* may assign responsibility to the *Connection Applicant* for obtaining the approvals referred to in paragraph (d) as part of the project proposal and the *Network Service Provider* must provide all reasonable information and may provide reasonable assistance for a reasonable fee to enable preparation of applications for such approvals.
- (f) Subject to paragraph (e), each *connection agreement* must be based on the offer to *connect* as varied by agreement between the parties.
- (g) The *Network Service Provider* responsible for the *connection point* and the *Registered Participant* must jointly notify *AEMO* that a *connection agreement* has been entered into between them and forward to *AEMO* relevant technical details of the proposed *plant* and *connection*, including as applicable:
 - (1) details of all *performance standards* that form part of the terms and conditions of the *connection agreement*;
 - (2) if a *Generator*, the arrangements for updating the information required under clause S5.2.4(b);
 - (3) the proposed *metering installation*;
 - (4) arrangements for the *Metering Provider* to obtain physical access to the *metering installation*; and
 - (5) the terms upon which a *Registered Participant* is to supply any *ancillary services* under the *connection agreement*.
- (h) *AEMO* must, within 20 *business days* of receipt of the notice under paragraph (g), advise the relevant *Network Service Provider* and the *Registered Participant* of whether the proposed *metering installation* is

acceptable for those *metering installations* associated with those *connection points* which are classified as *metering installation* types 1, 2, 3 and 4 as specified in schedule 7.2.

5.3.7A Application for connection to declared shared network

- (a) In relation to a *declared transmission system*, the powers, functions and responsibilities of the *Network Service Provider* are divided between *AEMO* and the *declared transmission system operator* as follows:
- (1) *AEMO* is the *Network Service Provider* in respect of the provision of *shared transmission services*; and
 - (2) the relevant *declared transmission system operator* is the *Network Service Provider* in respect of the provision of *connection services*.
- (b) If:
- (1) a *declared transmission system operator* receives a *connection* inquiry or an *application to connect* to a *declared shared network*; and
 - (2) the inquiry or application relates in whole or part to the provision of *shared transmission services*;
- the *declared transmission system operator* must pass on to *AEMO* the information provided by the applicant in connection with the inquiry or application.

5.3.8 Provision and use of information

- (a) The data and information provided under this rule 5.3 is *confidential information* and must:
- (1) be prepared, given and used in good faith; and
 - (2) not be disclosed or made available by the recipient to a third party except as set out in clause 3.13.3 or this clause 5.3.8.
- (b) The data and information to be provided under this rule 5.3 may be shared between a *Network Service Provider* and *AEMO* for the purpose of enabling:
- (1) the *Network Service Provider* to advise *AEMO* of *ancillary services* or similar services described in clause 3.11.3(j); and
 - (2) either party to:
 - (i) assess the effect of a proposed *facility* or proposed alteration to *generating plant* (as the case may be) on:

- (A) the performance of the *power system*; or
 - (B) another proposed *facility* or another proposed alteration;
 - (ii) assess proposed *negotiated access standards*; or
 - (iii) determine the extent of any required *augmentation* or *extension*.
- (c) A *Network Service Provider* may disclose the data and information to be provided under this rule 5.3 to another *Network Service Provider* if the *Network Service Provider* considers the information or data is materially relevant to that provider for *connection*.
- (d) A person intending to disclose information under paragraphs (b) or (c) must first advise the relevant *Connection Applicant* of the extent of the disclosure.
- (e) If a *Connection Applicant* or *Network Service Provider* becomes aware of any material change to any information contained in or relevant to an *application to connect*, it must promptly notify the other party in writing of that change.
- (f) A *Registered Participant* must, within 5 *business days* of becoming aware that any information provided to *AEMO* in relation to a *performance standard* or other information of a kind required to be provided to *AEMO* under clause 5.3.7 is incorrect, advise *AEMO* of the correct information.

5.3.9 Procedure to be followed by a Generator proposing to alter a generating system

- (a) This clause 5.3.9 applies where a *Generator* proposes to alter:
- (1) a *connected generating system*; or
 - (2) a *generating system* for which *performance standards* have been previously accepted by *AEMO*,
- in a manner that will affect the performance of the *generating system* relative to any of the technical requirements set out in clauses S5.2.5, S5.2.6, S5.2.7 and S5.2.8.
- (b) A *Generator* to which this clause applies, must submit to the *Network Service Provider* with a copy to *AEMO*:
- (1) a description of the nature of the alteration and the timetable for implementation;
 - (2) in respect of the proposed alteration to the *generating system*, details of the *generating unit* design data and *generating unit* setting data in

accordance with the *Generating System Model Guidelines*, *Generating System Design Data Sheet*, or *Generating System Setting Data Sheet*; and

- (3) in relation to each relevant technical requirement for which the proposed alteration to the equipment will affect the performance of the *generating system*, the proposed amendments to:
- (i) the applicable *automatic access standard*; or
 - (ii) a proposed *negotiated access standard*.
- (c) Clause 5.3.4A applies to a submission by a *Generator* under paragraph (b)(3)(ii).
- (d) Without limiting subparagraph (b)(3), for the purposes of that subparagraph (unless *AEMO* and the *Network Service Provider* otherwise agree), a proposed alteration to the equipment specified in column 1 of the table set out below is taken to affect the performance of the *generating system* relative to technical requirements specified in column 2, thereby necessitating a submission under subparagraph (b)(3).

Column 1 (altered equipment)	Column 2 (clause)
machine windings	S5.2.5.1, S5.2.5.2, S5.2.8
power converter	S5.2.5.1, S5.2.5.2, S5.2.5.5, S5.2.5.12, S5.2.5.13, S5.2.8
reactive compensation plant	S5.2.5.1, S5.2.5.2, S5.2.5.5, S5.2.5.12, S5.2.5.13
<i>excitation control system</i>	S5.2.5.5, S5.2.5.7, S5.2.5.12, S5.2.5.13
<i>voltage control system</i>	S5.2.5.5, S5.2.5.12, S5.2.5.13
<i>governor control system</i>	S5.2.5.7, S5.2.5.11, S5.2.5.14
<i>power control system</i>	S5.2.5.11, S5.2.5.14
<i>protection system</i>	S5.2.5.3, S5.2.5.4, S5.2.5.5, S5.2.5.7, S5.2.5.8, S5.2.5.9
auxiliary supplies	S5.2.5.1, S5.2.5.2, S5.2.8
remote control and monitoring system	S5.2.5.14, S5.2.6.1, S5.2.6.2

- (e) The *Network Service Provider* may as a condition of considering a submission made under paragraph (b), require payment of a fee to meet the reasonable costs anticipated to be incurred by the provider, other *Network Service Providers* and *AEMO*, in the assessment of the submission.
- (f) The *Network Service Provider* must require payment of a fee under paragraph (e) if so requested by *AEMO*.
- (g) On payment of the required fee referred to in paragraph (e), the *Network Service Provider* must pay such amounts as are on account of the costs anticipated to be incurred by the other *Network Service Providers* and *AEMO*, as appropriate.
- (h) If the application of this clause 5.3.9 leads to a variation to an existing *connection agreement* the *Network Service Provider* and the *Generator* must immediately jointly advise *AEMO*.

5.3.10 Acceptance of performance standards for generating plant that is altered

- (a) A *Generator* must not commission altered *generating plant* until the *Network Service Provider* has advised the *Generator* that the provider and *AEMO* are satisfied in accordance with paragraph (b).
- (b) In relation to altered *generating plant*, the *Network Service Provider* and *AEMO*, to the extent of *AEMO*'s advisory role under clause 5.3.4A, must be satisfied that:
 - (1) the *Generator* has complied with clause 5.3.9; and
 - (2) each amended *performance standard* submitted by the *Generator* either meets:
 - (i) the *automatic access standard* applicable to the relevant technical requirement; or
 - (ii) the *negotiated access standard* under clause 5.3.4A as applied in accordance with clause 5.3.9(c).
- (c) For the purposes of paragraph (a), *AEMO* must advise the *Network Service Provider* as to whether it is satisfied with the matters referred to paragraph (b).

5.4 Design of Connected Equipment

5.4.1 Application

This rule 5.4 applies to new installations and modifications to existing installations that include alterations to existing *generating plant*, after:

- (a) 13 December 1998, in the case of installations located in *participating jurisdictions* other than Tasmania; and
- (b) 29 May 2005, in the case of installations located in Tasmania.

5.4.2 Advice of inconsistencies

- (a) At any stage prior to commissioning the *facility* in respect of a *connection* if there is an inconsistency between the proposed equipment and the *connection agreement* including the *performance standards*, the *Registered Participant* or the person intending to be registered as a *Generator* must:
 - (1) advise the relevant *Network Service Provider* and, if the inconsistency relates to *performance standards*, *AEMO*, in writing of the inconsistency; and
 - (2) if necessary, negotiate in good faith with the *Network Service Provider* any necessary changes to the *connection agreement*.
- (b) If an inconsistency in a *connection agreement* including a *performance standard* is identified under paragraph (a), the *Registered Participant* or the person intending to be registered as a *Generator* and the *Network Service Provider* must not commission the *facility* in respect of a *connection* unless the *facility* or the *connection agreement* or *performance standard* has been varied to remove the inconsistency.
- (c) Nothing in this clause 5.4.2 affects the operation of clause 5.3.6(c1).

5.4.3 Additional information

A *Registered Participant* must provide any additional information in relation to its *plant* or associated equipment as the relevant *Network Service Provider* reasonably requests.

5.4.4 Advice on possible non-compliance

- (a) If the relevant *Network Service Provider* reasonably believes that the design of a proposed *facility* has potential to adversely and materially affect the performance of the *power system*, the *Network Service Provider* may require the *Registered Participant* to submit to it specified design information and

drawings to enable the *Network Service Provider* to assess the performance of the *facility* in respect of its interaction with the *power system*:

- (1) after the *Registered Participant* has entered into an agreement for the supply of *plant* or associated equipment to be connected; and
 - (2) when the relevant contractor's designs have progressed to a point where preliminary designs are available but prior to manufacture of equipment.
- (b) The *Network Service Provider* must, within 40 *business days* of receipt of such information, use its reasonable endeavours to advise the *Registered Participant* in writing of any design deficiencies which the *Network Service Provider* believes would cause the design to be inconsistent with the *connection agreement* or the *Rules*.
- (c) Notwithstanding clause 5.4.4(b), it is the *Registered Participant's* sole responsibility to ensure that all *plant* and equipment associated with the *connection* complies with the *connection agreement* and the *Rules*.

5.4A Access arrangements relating to Transmission Networks

- (a) The *Transmission Network Service Provider* referred to in this rule 5.4A is the *Transmission Network Service Provider* required under clause 5.3.3 to process and respond to a *connection* enquiry or required under clause 5.3.5 to prepare an offer to *connect* for the establishment or modification of a *connection* to the *transmission network* owned, controlled or operated by that *Transmission Network Service Provider* or for the provision of *network service*.
- (b) If requested by a *Connection Applicant*, whether as part of a *connection* enquiry, application to *connect* or the subsequent negotiation of a *connection* agreement, the *Transmission Network Service Provider* must negotiate in good faith with the *Connection Applicant* to reach agreement in respect of the *transmission network user access* arrangements sought by the *Connection Applicant*.
- (c) As a basis for negotiations under paragraph (b):
- (1) the *Connection Applicant* must provide to the *Transmission Network Service Provider* such information as is reasonably requested relating to the expected operation of:
 - (i) its *generating units* (in the case of a *Generator*);
 - (ii) its *network elements* used in the provision of *network service* (in the case of a *Network Service Provider*); or

- (iii) its *plant* (in the case of any other kind of *Connection Applicant*);
and
 - (2) the *Transmission Network Service Provider* must provide to the *Connection Applicant* such information as is reasonably requested to allow the *Connection Applicant* to fully assess the commercial significance of the *transmission network user access* arrangements sought by the *Connection Applicant* and offered by the *Transmission Network Service Provider*.
- (d) A *Connection Applicant* may seek *transmission network user access* arrangements at any level of *power transfer capability* between zero and:
 - (1) in the case of a *Generator*, the *maximum power input* of the relevant *generating units* or group of *generating units*;
 - (2) in the case of a *Network Service Provider*, the *power transfer capability* of the relevant *network elements*; and
 - (3) in the case of any other kind of *Connection Applicant*, the *maximum demand* at the *connection point* for the relevant *plant*.
- (e) The *Transmission Network Service Provider* must use reasonable endeavours to provide the *transmission network user access* arrangements being sought by the *Connection Applicant* subject to those arrangements being consistent with *good electricity industry practice* considering:
 - (1) the *connection assets* to be provided by the *Transmission Network Service Provider* or otherwise at the *connection point*; and
 - (2) the potential *augmentations* or *extensions* required to be undertaken on all affected *transmission networks* or *distribution networks* to provide that level of *power transfer capability* over the period of the *connection agreement* taking into account the amount of *power transfer capability* provided to other *Registered Participants* under *transmission network user access* or *distribution network user access* arrangements in respect of all affected *transmission networks* and *distribution networks*.
- (f) The *Transmission Network Service Provider* and the *Connection Applicant* must negotiate in good faith to reach agreement as appropriate on:
 - (1) the *connection service charge* to be paid by the *Connection Applicant* in relation to *connection assets* to be provided by the *Transmission Network Service Provider*;
 - (2) in the case of a *Market Network Service Provider*, the service level standards to which the *Market Network Service Provider* requires the

Transmission Network Service Provider to adhere in providing it services;

- (3) the *use of system services* charge to be paid:
- (i) by the *Connection Applicant* in relation to any augmentations or extensions required to be undertaken on all affected transmission networks and distribution networks; and
 - (ii) where the *Connection Applicant* is a *Market Network Service Provider*, to the *Market Network Service Provider* in respect of any reduction in the long run marginal cost of *augmenting* the *transmission network* as a result of it being *connected* to the *transmission network*;

(‘*negotiated use of system charges*’); and

- (4) the amounts (‘*access charges*’) referred to in paragraphs (g)-(j).
- (g) The amount to be paid by the *Connection Applicant* to the *Transmission Network Service Provider* in relation to the costs reasonably incurred by the provider in providing *transmission network user access*.
- (h) Where the *Connection Applicant* is a *Generator*:
- (1) the compensation to be provided by the *Transmission Network Service Provider* to the *Generator* in the event that the *generating units* or group of *generating units* of the *Generator* are *constrained off* or *constrained on* during a *trading interval*; and
 - (2) the compensation to be provided by the *Generator* to the *Transmission Network Service Provider* in the event that *dispatch* of the *Generator’s generating units* or group of *generating units* causes another *Generator’s generating units* or group of *generating units* to be *constrained off* or *constrained on* during a *trading interval*.
- (i) Where the *Connection Applicant* is a *Market Network Service Provider*:
- (1) the compensation to be provided by the *Transmission Network Service Provider* to the *Market Network Service Provider* in the event that the *transmission network user access* is not provided; and
 - (2) the compensation to be provided by the *Market Network Service Provider* to the *Transmission Network Service Provider* in the event that *dispatch* of the relevant *market network service* causes a *Generator’s generating units* or group of *generating units* to be *constrained off* or *constrained on* during a *trading interval* or causes the *dispatch* of another *market network service* to be *constrained*.

- (j) In the case of any other kind of *Connection Applicant*, the compensation to be provided by the *Transmission Network Service Provider* to the *Connection Applicant* in the event that the *transmission network user access* is not provided.
- (k) The maximum charge that can be applied by the *Transmission Network Service Provider* in respect of *negotiated use of system charges* for the *transmission network* is a charge that is determined in accordance with Part J of Chapter 6A.

5.5 Access arrangements relating to Distribution Networks

- (a) In this rule 5.5:
 - (1) the *Distribution Network Service Provider* is the *Distribution Network Service Provider* required under clause 5.3.3 to process and respond to a *connection enquiry* or required under clause 5.3.5 to prepare an offer to *connect* for the establishment or modification of a *connection* to the *distribution network* owned, controlled or operated by that *Distribution Network Service Provider* or for the provision of *network service*; and
 - (2) the references to a *Connection Applicant* are to an *Embedded Generator* or *Market Network Service Provider* who makes a *connection enquiry* under clause 5.3.2 or an application to *connect* under clause 5.3.4 in relation to any *generating units* or group of *generating units*, or any *network elements* used in the provision of *network service*, as the case may be.
- (b) If requested by a *Connection Applicant*, whether as part of a *connection enquiry*, application to *connect* or the subsequent negotiation of a *connection agreement*, the *Distribution Network Service Provider* must negotiate in good faith with the *Connection Applicant* to reach agreement in respect of the *distribution network user access* arrangements sought by the *Connection Applicant*.
- (c) As a basis for negotiations under paragraph (b):
 - (1) the *Connection Applicant* must provide to the *Distribution Network Service Provider* such information as is reasonably requested relating to the expected operation of:
 - (i) its *generating units* (in the case of an *Embedded Generator*); or
 - (ii) its *network elements* used in the provision of *network service* (in the case of a *Market Network Service Provider*); and

-
- (2) the *Distribution Network Service Provider* must provide to the *Connection Applicant* such information as is reasonably requested to allow the *Connection Applicant* to fully assess the commercial significance of the *distribution network user access* arrangements sought by the *Connection Applicant* and offered by the *Distribution Network Service Provider*.
- (d) A *Connection Applicant* may seek *distribution network user access* arrangements at any level of *power transfer capability* between zero and:
- (1) in the case of an *Embedded Generator*, the *maximum power input* of the relevant *generating units* or group of *generating units*; and
 - (2) in the case of a *Market Network Service Provider*, the *power transfer capability* of the relevant *network elements*.
- (e) The *Distribution Network Service Provider* must use reasonable endeavours to provide the *distribution network user access* arrangements being sought by the *Connection Applicant* subject to those arrangements being consistent with *good electricity industry practice* considering:
- (1) the *connection assets* to be provided by the *Distribution Network Service Provider* or otherwise at the *connection point*; and
 - (2) the potential *augmentations* or *extensions* required to be undertaken on all affected *transmission networks* or *distribution networks* to provide that level of *power transfer capability* over the period of the *connection agreement* taking into account the amount of *power transfer capability* provided to other *Registered Participants* under *transmission network user access* or *distribution network user access* arrangements in respect of all affected *transmission networks* and *distribution networks*.
- (f) The *Distribution Network Service Provider* and the *Connection Applicant* must negotiate in good faith to reach agreement as appropriate on:
- (1) the *connection service charge* to be paid by the *Connection Applicant* in relation to *connection assets* to be provided by the *Distribution Network Service Provider*;
 - (2) in the case of a *Market Network Service Provider*, the service level standards to which the *Market Network Service Provider* requires the *Distribution Network Service Provider* to adhere in providing it services;
 - (3) the *use of system services charge* to be paid:

- (i) by the *Connection Applicant* in relation to any *augmentations* or *extensions* required to be undertaken on all affected *transmission networks* and *distribution networks*; and
 - (ii) where the *Connection Applicant* is a *Market Network Service Provider*, to the *Market Network Service Provider* in respect of any reduction in the long run marginal cost of *augmenting* the *distribution network* as a result of it being *connected* to the *distribution network*,

(‘*negotiated use of system charges*’); and
- (4) the following amounts:
- (i) the amount to be paid by the *Connection Applicant* to the *Distribution Network Service Provider* in relation to the costs reasonably incurred by the *Distribution Network Service Provider* in providing *distribution network user access*;
 - (ii) where the *Connection Applicant* is an *Embedded Generator*:
 - (A) the compensation to be provided by the *Distribution Network Service Provider* to the *Embedded Generator* in the event that the *generating units* or group of *generating units* of the *Embedded Generator* are *constrained off* or *constrained on* during a *trading interval*; and
 - (B) the compensation to be provided by the *Embedded Generator* to the *Distribution Network Service Provider* in the event that dispatch of the *Embedded Generator’s generating units* or group of *generating units* causes another *Generator’s generating units* or group of *generating units* to be *constrained off* or *constrained on* during a *trading interval*; and
 - (iii) where the *Connection Applicant* is a *Market Network Service Provider*:
 - (A) the compensation to be provided by the *Distribution Network Service Provider* to the *Market Network Service Provider* in the event that the *distribution network user access* is not provided; and
 - (B) the compensation to be provided by the *Market Network Service Provider* to the *Distribution Network Service Provider* in the event that *dispatch* of the relevant *market network service* causes a *Generator’s generating units* or group of *generating units* to be *constrained off* or

constrained on during a trading interval or causes the dispatch of another market network service to be constrained.

- (g) The maximum negotiated *use of system* charges applied by a *Distribution Network Service Provider* must be in accordance with the applicable requirements of Chapter 6 and the *Negotiated Distribution Service Criteria* applicable to the *Distribution Network Service Provider*.
- (h) A *Distribution Network Service Provider* must pass through to a *Connection Applicant* the amount calculated in accordance with paragraph (i) for the locational component of *prescribed TUOS services* that would have been payable by the *Distribution Network Service Provider* to a *Transmission Network Service Provider* had the *Connection Applicant* not been *connected* to its *distribution network* ('avoided charges for the locational component of *prescribed TUOS services*').
- (i) To calculate the amount to be passed through to a *Connection Applicant* in accordance with paragraph (h), a *Distribution Network Service Provider* must, if prices for the locational component of *prescribed TUOS services* were in force at the relevant *transmission network connection point* throughout the relevant *financial year*:
 - (1) determine the charges for the locational component of *prescribed TUOS services* that would have been payable by the *Distribution Network Service Provider* for the relevant *financial year*:
 - (i) where the *Connection Applicant* is an *Embedded Generator*, if that *Embedded Generator* had not injected any *energy* at its *connection point* during that *financial year*;
 - (ii) where the *Connection Applicant* is a *Market Network Service Provider*, if the *Market Network Service Provider* had not been *connected* to the *Distribution Network Service Provider's distribution network* during that *financial year*; and
 - (2) determine the amount by which the charges calculated in subparagraph (1) exceed the amount for the locational component of *prescribed TUOS services* actually payable by the *Distribution Network Service Provider*, which amount will be the relevant amount for the purposes of paragraph (h).
- (j) Where prices for the locational component of *prescribed TUOS services* were not in force at the relevant *distribution network connection point* throughout the relevant *financial year*, as referred to in paragraph (i), the *Distribution Network Service Provider* must apply an equivalent procedure to that referred to in paragraph (i) in relation to that component of its *transmission use of system service* charges which is deemed by the relevant

Transmission Network Service Provider to represent the marginal cost of *transmission*, less an allowance for locational signals present in the *spot market*, to determine the relevant amount for the purposes of paragraph (h).

5.6 Planning and Development of Network

5.6.1 Forecasts for connection points to transmission network

- (a) The relevant *Network Service Provider* must give at least 40 *business days* written notice to each relevant *Registered Participant* of the annual date by which the *Registered Participant* must provide the relevant *Network Service Provider* with the short and long term electricity *generation, market network service* and *load* forecast information listed in schedule 5.7 in relation to each *connection point* which *connects* the *Registered Participant* to a *transmission network* of that *Network Service Provider* and any other relevant information as reasonably required by the *Network Service Provider*.
- (b) Details of planned future *generating units, market network services* and *loads*, being details regarding the proposed commencing date, *active power capability* and *reactive power capability, power transfer capability*, operating times/seasons and special operating requirements, must be given by each relevant *Registered Participant* to the relevant *Network Service Provider* on reasonable request.
- (c) Each relevant *Registered Participant* must use reasonable endeavours to provide accurate information under clause 5.6.1(a) which must include details of any factors which may impact on *load* forecasts or proposed *facilities* for *generation* or *market network services*.
- (d) If the *Network Service Provider* reasonably believes any forecast information to be inaccurate, the *Network Service Provider* may modify that forecast information and must advise the relevant *Registered Participant* and *AEMO* in writing of this action and the reason for the modification. The *Network Service Provider* is not responsible for any adverse consequences of this action or for failing to modify forecast information under this clause 5.6.1(d).

5.6.2 Network Development

- (a1) The terms *Network Service Provider, Transmission Network Service Provider* and *Distribution Network Service Provider* when used in this clause 5.6.2 are not intended to refer to, and are not to be read or construed as referring to, any *Network Service Provider* in its capacity as a *Market Network Service Provider*.
- (a) Each *Transmission Network Service Provider* and *Distribution Network Service Provider* must analyse the expected future operation of its

transmission networks or *distribution networks* over an appropriate planning period, taking into account the relevant forecast *loads*, any future *generation*, *market network service*, demand side and *transmission* developments and any other relevant data.

- (b) Each *Transmission Network Service Provider* must conduct an annual planning review with each *Distribution Network Service Provider* connected to its *transmission network* within each *region*. The annual planning review must:
 - (1) incorporate the forecast *loads* as submitted or modified in accordance with clause 5.6.1; and
 - (2) include a review of the adequacy of existing *connection points* and relevant parts of the *transmission system* and planning proposals for future *connection points*; and
 - (3) take into account the most recent *NTNDP*; and
 - (4) consider the potential for *augmentations*, or non-*network* alternatives to *augmentations*, that are likely to provide a net economic benefit to all those who produce, consume and transport electricity in the *market*.
- (c) Where the need for an *augmentation* or a non-*network* alternative is identified (either by the annual planning review or independently of that review), the relevant parties must undertake joint planning in order to determine plans for consideration by relevant *Registered Participants*, *AEMO* and *interested parties*. For this purpose, the relevant parties are:
 - (1) for the *declared shared network* of an *adoptive jurisdiction* – the relevant *declared transmission system operator*, the relevant *Distribution Network Service Provider*, *AEMO* and any *interested party* that has informed *AEMO* of its interest in the joint planning process; and
 - (2) for any other case – the relevant *Network Service Providers*.
- (d) The minimum planning period for the purposes of the annual planning review is 5 years for *distribution networks* and 10 years for *transmission networks*.
- (e) Each *Network Service Provider* must:
 - (1) extrapolate the forecasts provided to it by *Registered Participants* for the purpose of planning;
 - (2) if the analysis required by subparagraph (1) indicates that any relevant technical limits of the *transmission or distribution systems*

will be exceeded, either in normal conditions or following the contingencies specified in schedule 5.1, notify any affected *Registered Participants* and *AEMO* of these limitations; and

- (3) notify any affected *Registered Participants* and *AEMO* of the expected time for undertaking proposed corrective action which may consist of:
 - (i) *dual function assets* or *transmission investment* designed to address limitations in respect of a *distribution network* notified under subparagraph (2); and
 - (ii) *network* or non *network* corrective action or modifications to *connection facilities*, designed to address the limitations notified under subparagraph (2).
- (e1) For corrective action proposals of a kind referred to in paragraph (e)(3)(i), the processes detailed in paragraphs (f), (g1) and (h)-(m) must be conducted jointly by the relevant *Distribution Network Service Provider* and *Transmission Network Service Provider*.
- (e2) For corrective action proposals of a kind referred to in paragraph (e)(3)(ii) and notified by a *Distribution Network Service Provider*, the processes detailed in paragraphs (f) and (g), (h)-(m) must be conducted by the relevant *Distribution Network Service Provider*.
- (f) Before making the report referred to in paragraph (h), the relevant *Distribution Network Service Provider* or *Network Service Providers* must consult with affected *Registered Participants*, *AEMO* and *interested parties* on the possible options, including but not limited to demand side options, *generation* options and *market network service* options to address the projected limitations of the relevant *distribution system* except that a *Distribution Network Service Provider* does not need to consult on a *network* option which would be a *new small distribution network asset*.
- (g) Each *Distribution Network Service Provider* must carry out an economic cost effectiveness analysis of possible options to identify options that satisfy the *regulatory test*, while meeting the technical requirements of schedule 5.1, and where the *Network Service Provider* is required by clause 5.6.2(f) to consult on the option this analysis and allocation must form part of the consultation on that option.
- (g1) For corrective action proposals of a kind referred to in paragraph (e)(3)(i), the relevant *Transmission Network Service Provider* and *Distribution Network Service Provider* must carry out an economic cost effectiveness analysis of possible options to identify options that satisfy the *regulatory test*, while meeting the technical requirements of schedule 5.1 and that

analysis and allocation must form part of any consultation required by paragraph (f).

- (h) Following conclusion of the process outlined in paragraphs (f) and (g) or (g1), the relevant *Distribution Network Service Provider* or *Network Service Providers* must prepare a report that is to be made available to affected *Registered Participants*, *AEMO* and *interested parties* which:
- (1) includes an assessment of all identified options referred to in paragraph (g) or (g1);
 - (2) includes details of the preferred proposal including:
 - (i) its economic cost effectiveness analysis in accordance with paragraph (g) or (g1); and
 - (ii) the consultations conducted for the purposes of paragraph (g) or (g1);
 - (3) summarises the submissions from the consultations; and
 - (4) recommends the action to be taken.
- (i) *Registered Participants* may dispute the recommendation of the report prepared under clause 5.6.2(h) within 40 *business days* after the report is made available in respect of any proposal that is a *new large distribution network asset* or is reasonably likely to change the *distribution use of system service* charges applicable to that *Registered Participant* by more than 2% at the date of the next price review, based on the assumption that the same approach to *distribution network* pricing is taken for the next review period as that taken for the current review period.
- (j) If any *Registered Participant* disputes a recommendation under paragraph (i), the relevant *Distribution Network Service Provider* or *Network Service Providers* and the relevant affected *Registered Participant* must negotiate in good faith to reach agreement on the action to be taken.
- (k) Following:
- (1) completion of the 40 *business day* period referred to in clause 5.6.2(i) or on resolution of any dispute in accordance with rule 8.2, in relation to proposals to which clause 5.6.2(j) applies; or
 - (2) completion of the report referred to in clause 5.6.2(h), in relation to any other *network* option recommended by the report,

the relevant *Distribution Network Service Provider* or *Transmission Network Service Provider* must arrange for the *network* options (if any)

recommended by its report made in accordance with clause 5.6.2(h) to be available for service by the agreed time.

- (k1) The relevant *Distribution Network Service Provider* or *Transmission Network Service Provider* must, as appropriate, include the cost of the relevant *network* options referred to in paragraph (k) in either:
 - (1) the calculation of *distribution service* prices determined in accordance with Chapter 6; or
 - (2) the calculation of *transmission use of system charges*.
- (l) If a *use of system service* or the provision of a service at a *connection point* is directly affected by a *transmission network* or *distribution network augmentation*, appropriate amendments to relevant *connection agreements* must be negotiated in good faith between the parties to them.
- (m) Where the relevant *Transmission Network Service Provider* or *Distribution Network Service Provider* decides to implement a *generation* option as an alternative to *network augmentation*, the *Network Service Provider* must:
 - (1) register the *generating unit* with *AEMO* and specify that the *generating unit* may be periodically used to provide a *network support* function and will not be eligible to set *spot prices* when *constrained on* in accordance with clause 3.9.7; and
 - (2) include the cost of this *network support* service in the calculation of *transmission service* and *distribution service* prices determined in accordance with Chapter 6 or Chapter 6A, as the case may be.
- (n) *AEMO* must provide to *Network Service Providers* on request, a copy of any report provided to *AEMO* by a *Network Service Provider* under clause 5.2.3(d)(12). If a *Registered Participant* reasonably considers that it is or may be adversely affected by a development or change in another *region*, the *Registered Participant* may request the preparation of a report by the relevant *Network Service Provider* as to the technical impacts of the development or change. If so requested, the *Network Service Provider* must prepare such a report and provide a copy of it to *AEMO*, the *Registered Participant* requesting the report and, on request, any other *Registered Participant*.

5.6.2A Annual Planning Report

- (a) By 30 June each year all *Transmission Network Service Providers* must *publish* an *Annual Planning Report* setting out the results of the annual planning review conducted in accordance with clause 5.6.2(a) and (b).
- (b) The *Annual Planning Report* must set out:

- (1) the forecast *loads* submitted by a *Distribution Network Service Provider* in accordance with clause 5.6.1 or as modified in accordance with clause 5.6.1(d);
- (2) planning proposals for future *connection points*;
- (3) a forecast of *constraints* and inability to meet the *network* performance requirements set out in schedule 5.1 or relevant legislation or regulations of a *participating jurisdiction* over 1, 3 and 5 years;
- (3a) in respect of information required by subparagraph (3), where an estimated reduction in forecast *load* would defer a forecast *constraint* for a period of 12 months, include:
 - (i) the year and months in which a *constraint* is forecast to occur;
 - (ii) the relevant *connection points* at which the estimated reduction in forecast *load* may occur;
 - (iii) the estimated reduction in forecast *load* in MW needed; and
 - (iv) a statement of whether the *Transmission Network Service Provider* plans to issue a request for proposals for *augmentation* or a non-network alternative identified by the annual planning review conducted under clause 5.6.2(b) and if so, the expected date the request will be issued;
- (4) for all proposed *augmentations* to the *network* the following information, in sufficient detail relative to the size or significance of the project and the proposed operational date of the project:
 - (i) project/asset name and the month and year in which it is proposed that the asset will become operational;
 - (ii) the reason for the actual or potential *constraint*, if any, or inability, if any, to meet the *network* performance requirements set out in schedule 5.1 or relevant legislation or regulations of a *participating jurisdiction*, including *load* forecasts and all assumptions used;
 - (iii) the proposed solution to the *constraint* or inability to meet the *network* performance requirements identified in clause 5.6.2A(b)(4)(ii), if any;
 - (iv) total cost of the proposed solution;
 - (v) whether the proposed solution will have a *material inter-network impact*. In assessing whether an *augmentation* to

- the *network* will have a *material inter-network impact* a *Transmission Network Service Provider* must have regard to the objective set of criteria *published* by *AEMO* in accordance with clause 5.6.3(b) (if any such criteria have been *published* by *AEMO*); and
- (vi) other reasonable *network* and non-*network* options considered to address the actual or potential *constraint* or inability to meet the *network* performance requirements identified in clause 5.6.2A(b)(4)(ii), if any. Other reasonable *network* and non-*network* options include, but are not limited to, *interconnectors*, *generation* options, demand side options, *market network service* options and options involving other *transmission* and *distribution networks*;
- (5) the manner in which the proposed *augmentations* relate to the most recent *NTNDP* and the development strategies for current or potential *national transmission flow paths* that are specified in that *NTNDP*.
 - (6) for all proposed *replacement transmission network assets*:
 - (i) a brief description of the new *replacement transmission network asset* project, including location;
 - (ii) the date from which the *Transmission Network Service Provider* proposes that the proposed new *replacement transmission network asset* will become operational;
 - (iii) the purpose of the proposed new *replacement transmission network asset*;
 - (iv) a list of any reasonable *network* or non-*network* alternatives to the proposed new *replacement transmission network asset* which are being, or have been, considered by the *Transmission Network Service Provider* (if any). Those alternatives include, but are not limited to, *interconnectors*, *generation* options, demand side options, *market network service* options and options involving other *transmission* or *distribution networks*; and
 - (v) the *Transmission Network Service Provider's* estimated total capitalised expenditure on the proposed new *replacement transmission network asset*; and
 - (7) any information required to be included in an *Annual Planning Report* under clause 5.6.5C(c) in relation to a *transmission investment* which is determined to be required to address an urgent and unforeseen *network* issue.

5.6.3 AEMO's obligation to publish information and guidelines and provide advice

- (a) In carrying out its *NTP functions*, AEMO must:
 - (1) *publish* an objective set of criteria for assessing whether a proposed *transmission network augmentation* is reasonably likely to have a *material inter-network impact*; and
 - (2) prepare and *publish augmentation technical reports* on proposed *transmission network augmentations* that are reasonably likely to have a *material inter-network impact*; and
 - (3) *publish* guidelines to assist *Registered Participants* to determine when an *inter-network test* may be required; and
 - (4) provide advice to the AEMC as requested about the exercise of the *last resort planning power*.
- (b) AEMO must develop and *publish*, and may vary from time to time, an objective set of criteria for assessing whether a proposed *transmission network augmentation* is reasonably likely to have a *material inter-network impact*. In developing (or varying) the objective set of criteria, AEMO must:
 - (1) proceed in accordance with the *Rules consultation procedures*; and
 - (2) have regard to:
 - (i) the relevant guiding objectives and principles provided by the AEMC; and
 - (ii) the advice of *jurisdictional planning representatives*.
- (c) The AEMC must provide AEMO with guiding objectives and principles for the development by AEMO of the objective set of criteria for assessing whether or not a proposed *transmission network augmentation* is reasonably likely to have a *material inter-network impact*.
- (d) If AEMO receives a written request for an *augmentation technical report* on a proposed *transmission network augmentation* that is reasonably likely to have a *material inter-network impact*, or AEMO decides in the course of exercising its functions under Chapter 8, Part H, that a proposed *transmission network augmentation* is reasonably likely to have a *material inter-network impact*, AEMO must:
 - (1) immediately undertake a review of all matters referred to it by the *Transmission Network Service Provider* in order to assess the proposed *augmentation*; and

- (2) consult with, and take into account the recommendations of, the *jurisdictional planning representatives* in relation to the proposed *augmentation*; and
- (3) make a determination as to:
 - (i) the performance requirements for the equipment to be *connected*; and
 - (ii) the extent and cost of *augmentations* and changes to all affected *transmission networks*; and
 - (iii) the possible material effect of the new *connection* on the *network power transfer capability* including that of other *transmission networks*; and
- (4) within 90 *business days* of the date of the request or decision (or some other period agreed between the *Transmission Network Service Provider* and *AEMO*), *AEMO* must *publish an augmentation technical report* that sets out:
 - (i) *AEMO's* determination; and
 - (ii) the reasons for the determination (including a statement of any information and assumptions on which the determination is based).

A request for an *augmentation technical report* on a proposed *transmission network augmentation* must be accompanied by sufficient information to enable *AEMO* to make a proper assessment of the proposed *augmentation* and *AEMO's* reasonable fees covering the direct costs and expenses of preparing the report.

- (e) *AEMO* may, for the purpose of preparing an *augmentation technical report*, by written notice request a *Transmission Network Service Provider* to provide *AEMO* with additional information reasonably available to it and the *Transmission Network Service Provider* must comply with the request.
- (f) The period for *AEMO* to *publish an augmentation technical report* will be automatically extended by the time taken by the *Transmission Network Service Provider* to provide additional information requested by *AEMO*.
- (g) If the objective set of criteria developed and published under paragraph (b) is changed after a project assessment draft report has been made available to *Registered Participants* and *AEMO*, the relevant *Transmission Network Service Provider* is entitled to choose whether the new criteria, or the criteria that existed when the project

assessment draft report was made available to *Registered Participants* and *AEMO*, are to be applied.

5.6.4 Last Resort Planning Power

(a) In this clause 5.6.4:

directed party means one or more *Registered Participants* directed by the *AEMC* in accordance with this clause 5.6.4 and may include:

- (1) a single *Registered Participant*;
- (2) two or more *Registered Participants* who are directed by the *AEMC* to jointly and co-operatively comply with a direction under paragraph (c).

direction notice is a notice issued under paragraph (i).

Purpose

(b) The purpose of a *last resort planning power* is to ensure timely and efficient *inter-regional transmission* investment for the long term interests of consumers of electricity.

AEMC last resort planning power

(c) The *AEMC* may, in accordance with this clause 5.6.4, direct one or more *Registered Participants*:

- (1) to identify a *potential transmission project* and apply the *regulatory investment test for transmission* to that project; or
- (2) to apply the *regulatory investment test for transmission* to a *potential transmission project* identified by the *AEMC*.

(d) The *AEMC* must exercise a *last resort planning power*:

- (1) consistently with the purpose referred to in paragraph (b); and
- (2) in accordance with the *last resort planning power guidelines*.

Advice from AEMO

(e) The *AEMC* may request advice from *AEMO* in relation to the exercise of the *last resort planning power*, in accordance with the *last resort planning power guidelines*.

(f) **[Deleted]**

Relevant considerations

- (g) In deciding whether or not to exercise a *last resort planning power* the *AEMC* must take into account:
 - (1) advice provided by *AEMO*;
 - (2) the *NTNDP* for the current and the previous year;
 - (3) *Annual Planning Reports* published by *Transmission Network Service Providers* under clause 5.6.2A; and
 - (4) other matters that are relevant in all the circumstances.
- (h) In deciding whether or not to exercise the *last resort planning power* the *AEMC* must:
 - (1) identify a problem relating to *constraints* in respect of *national transmission flow paths* between *regional reference nodes* or a *potential transmission project* (**the problem or the project**);
 - (2) make reasonable inquiries to satisfy itself that there are no current processes underway for the application of the *regulatory investment test for transmission* in relation to the problem or the project;
 - (3) consider whether there are other options, strategies or solutions to address the problem or the project, and must be satisfied that all such other options are unlikely to address the problem or the project in a timely manner;
 - (4) be satisfied that the problem or the project may have a significant impact on the efficient operation of the *market*; and
 - (5) be satisfied that but for the *AEMC* exercising the *last resort planning power*, the problem or the project is unlikely to be addressed.

Direction notice

- (i) The *AEMC* must exercise a *last resort planning power* by giving a direction notice in writing to a directed party that states:
 - (1) the relevant action under paragraph (c) that the directed party is required to undertake; and
 - (2) the *AEMC's* reasons for exercising the *last resort planning power*.
- (j) A direction notice given by the *AEMC* under paragraph (i) may specify one or more of the following:

- (1) one or more alternative projects which a directed party must consider when applying the *regulatory investment test for transmission to potential transmission projects*;
 - (2) the time period within which the application of the *regulatory investment test for transmission* must be carried out by a directed party; or
 - (3) consultation and publication requirements that are in addition to those required by the *regulatory investment test for transmission*.
- (k) The *AEMC* must *publish* the direction notice referred to in paragraph (i) on its website.
- (l) A directed party must comply with:
- (1) a direction notice;
 - (2) the requirements of the *last resort planning power guidelines*; and
 - (3) the requirements for the application of the *regulatory investment test for transmission*.
- (m) If a directed party (an **earlier directed party**) fails to comply with a direction notice, the *AEMC* may:
- (1) in accordance with this clause 5.6.4, give a direction notice to a *Registered Participant* other than the earlier directed party; and
 - (2) inform the *AER* of the earlier directed party's failure to comply with the direction notice.

Annual reporting for last resort planning power

- (n) The *AEMC* must report annually on the matters which the *AEMC* has considered during that year in deciding whether or not to exercise the *last resort planning power*, and may include the information in its Annual Report published under s.27 of the Australian Energy Market Commission Establishment Act 2004 (South Australia).

Last resort planning power guidelines

- (o) The *AEMC* must develop and *publish* guidelines ('the *last resort planning power guidelines*') for or with respect to:
- (1) the processes to be followed by the *AEMC* in exercising the *last resort planning power*;
 - (2) **[Deleted]**

- (3) the advice to be provided to the *AEMC* by *AEMO*, including the terms of reference for any such advice;
 - (4) the matters that *AEMO* and the *AEMC* may consider in recommending or nominating a person as an appropriate directed party; and
 - (5) the provision of information to the *AEMC* in relation to the exercise of the *last resort planning power*.
- (p) The *AEMC* must develop and *publish* the *last resort planning power guidelines* in accordance with the *transmission consultation procedures*.
- (q) The *AEMC* must develop and *publish* the first *last resort planning power guidelines* by 1 January 2008 and there must be such guidelines available at all times after that date.
- (r) The *AEMC* may from time to time and in accordance with the *transmission consultation procedures*, amend or replace the *last resort planning power guidelines*.

5.6.5 [Deleted]

5.6.5A Investments subject to the regulatory test

- (a) The *AER* must develop and *publish* the *regulatory test* in accordance with this clause 5.6.5A.
- (b) The purpose of the *regulatory test* is to identify *new network investments* or *non-network* alternative options that:
- (1) maximise the net economic benefit to all those who produce, consume and transport electricity in the *market*; or
 - (2) in the event the option is necessitated to meet the service standards linked to the technical requirements of schedule 5.1 or in *applicable regulatory instruments*, minimise the present value of the costs of meeting those requirements.
- (c) In so far as it relates to paragraph (b)(1), the *regulatory test* must:
- (1) be based on a cost-benefit analysis of the future (which includes assessment of reasonable scenarios of future supply and demand conditions):
 - (i) were the *new network investment* to take place, compared to the likely alternative option or options,
 - (ii) were the *new network investment* not to take place;

- (2) as a minimum, list or provide for:
 - (i) the classes of possible benefits that may be included as benefits, and classes of possible benefits that may not be included as benefits;
 - (ii) the method or methods permitted for estimating the magnitude of the different classes of benefits;
 - (iii) the classes of possible costs that may be counted as costs, and classes of possible costs that may not be included as costs;
 - (iv) the method or methods permitted for estimating the magnitude of the different classes of costs; and
 - (v) the appropriate method and value for specific inputs, where relevant, for determining the discount rate to be applied;
- (3) ensure that the identification of the likely alternative option referred to in subparagraph (1) is informed by a consideration of all genuine and practicable alternative options to the proposed *new network investment* without bias regarding:
 - (i) energy source;
 - (ii) technology;
 - (iii) ownership;
 - (iv) the extent to which the *new network investment* or the non-*network* alternative enables *intra-regional* or *inter-regional* trading of electricity;
 - (v) whether it is a *network* or non-*network* alternative;
 - (vi) whether the *new network investment* or non-*network* alternative is intended to be regulated; or
 - (vii) any other factor;
- (4) **[Deleted]**
- (5) contain a requirement that where there is more than one likely alternative option to the *new network investment*, and no single alternative option is significantly more likely to occur than the other, then the cost-benefit analysis referred to in subparagraph (1) must be undertaken in relation to each such likely alternative option;

- (6) not require the level of analysis to be disproportionate to the scale and size of the *new network investment*;
- (7) be capable of predictable, transparent and consistent application; and
- (8) provide that alternative options may include (without limitation) *generation*, demand side management, other *network* options, or the substitution of demand for electricity by the provision of alternative forms of energy.

Preparation, publication and amendment of regulatory test and regulatory test application guidelines

- (d) At the same time as the *AER publishes* a proposed *regulatory test* under the *distribution consultation procedures*, the *AER* must also *publish* guidelines for the operation and application of the *regulatory test* ('the **regulatory test application guidelines**') in accordance with the requirements of this clause 5.6.5A.
- (e) The *regulatory test* application guidelines must give effect to and be consistent with this clause 5.6.5A and provide guidance on the operation and application of the *regulatory test*.
- (f) The *AER* must develop and *publish* the first *regulatory test* and *regulatory test* application guidelines under this clause 5.6.5A by 31 December 2007 and there must be a *regulatory test* and *regulatory test* application guidelines in force at all times after that date.
- (g) The *AER* may, from time to time and in accordance with the *distribution consultation procedures*, amend or replace the *regulatory test* and *regulatory test* application guidelines developed and *published* under this clause, provided that such amendments must be *published* at the same time.
- (h) An amendment as referred to in paragraph (g) does not apply to a current application of the *regulatory test* and the *regulatory test* application guidelines under the *Rules* (however described) by a *Network Service Provider*.

5.6.5B Regulatory investment test for transmission

Principles

- (a) The *AER* must develop and *publish* the *regulatory investment test for transmission* in accordance with the *transmission consultation procedure* and this clause 5.6.5B.
- (b) The purpose of the *regulatory investment test for transmission* is to identify the *credible option* that maximises the present value of net economic benefit

to all those who produce, consume and transport electricity in the *market* (the *preferred option*). For the avoidance of doubt, a *preferred option* may, in the relevant circumstances, have a negative net economic benefit (that is, a net economic cost) where the *identified need* is for *reliability corrective action*.

- (c) The *regulatory investment test for transmission* must:
- (1) be based on a cost-benefit analysis that is to include an assessment of reasonable scenarios of future supply and demand if each *credible option* were implemented compared to the situation where no option is implemented;
 - (2) not require a level of analysis that is disproportionate to the scale and likely impact of each of the *credible options* being considered;
 - (3) be capable of being applied in a predictable, transparent and consistent manner;
 - (4) require the *Transmission Network Service Provider* to consider the following classes of market benefits that could be delivered by the *credible option*:
 - (i) changes in fuel consumption arising through different patterns of *generation dispatch*;
 - (ii) changes in voluntary *load* curtailment;
 - (iii) changes in involuntary *load shedding*, with the market benefit to be considered using a reasonable forecast of the value of electricity to consumers;
 - (iv) changes in costs for parties, other than the *Transmission Network Service Provider*, due to:
 - (A) differences in the timing of new *plant*;
 - (B) differences in capital costs; and
 - (C) differences in the operating and maintenance costs;
 - (v) differences in the timing of *transmission investment*;
 - (vi) changes in *network* losses;
 - (vii) changes in *ancillary services* costs;
 - (viii) competition benefits;

- (ix) any additional option value (where this value has not already been included in the other classes of market benefits) gained or foregone from implementing that *credible option* with respect to the likely future investment needs of the *market*; and
- (x) other classes of market benefits that are:
 - (A) determined to be relevant by the *Transmission Network Service Provider* and agreed to by the *AER* in writing before the date the relevant *project specification consultation report* is made available to other parties under clause 5.6.6; or
 - (B) specified as a class of market benefit in the *regulatory investment test for transmission*;
- (5) require a *Transmission Network Service Provider* to include a quantification of all classes of market benefits which are determined to be material in the *Transmission Network Service Provider's* reasonable opinion;
- (6) require a *Transmission Network Service Provider* to consider all classes of market benefits as material unless it can, in the *project assessment draft report* or in respect of a proposed *preferred option* which is subject to the exemption contained in clause 5.6.6(y), in the *project specification consultation report*, provide reasons why:
 - (i) a particular class of market benefit is likely not to affect materially the outcome of the assessment of the *credible options* under the *regulatory investment test for transmission*; or
 - (ii) the estimated cost of undertaking the analysis to quantify the market benefit is likely to be disproportionate to the scale, size and potential benefits of each *credible option* being considered in the report;
- (7) with respect to the classes of market benefits set out in subparagraphs (4)(ii) and (iii), ensure that, if the *credible option* is for *reliability corrective action*, the quantification assessment required by paragraph (5) will only apply insofar as the market benefit delivered by the *credible option* exceeds the minimum standard required for *reliability corrective action*;
- (8) require the *Transmission Network Service Provider* to quantify the following classes of costs:
 - (i) costs incurred in constructing or providing the *credible option*;

- (ii) operating and maintenance costs in respect of the *credible option*;
- (iii) the cost of complying with laws, regulations and applicable administrative requirements in relation to the construction and operation of the *credible option*; and
- (iv) any other class of costs that are:
 - (A) determined to be relevant by the *Transmission Network Service Provider* and agreed to by the *AER* in writing before the date the relevant *project specification consultation report* is made available to other parties under clause 5.6.6; or
 - (B) specified as a class of cost in the *regulatory investment test for transmission*;
- (9) provide that any cost or market benefit which cannot be measured as a cost or market benefit to *Generators, Distribution Network Service Providers, Transmission Network Service Providers* or consumers of electricity may not be included in any analysis under the *regulatory investment test for transmission*;
- (10) specify:
 - (i) the method or methods permitted for estimating the magnitude of the different classes of market benefits;
 - (ii) the method or methods permitted for estimating the magnitude of the different classes of costs;
 - (iii) the method or methods permitted for estimating market benefits which may occur outside the *region* in which the *Transmission Network Service Provider's network* is located; and
 - (iv) the appropriate method and value for specific inputs, where relevant, for determining the discount rate or rates to be applied;
- (11) specify that a sensitivity analysis is required of any modelling relating to the cost-benefit analysis; and
- (12) reflect that the *credible option* that maximises the present value of net economic benefit to all those who produce, consume or transport electricity in the *market* may, in some circumstances, have a negative net economic benefit (that is, a net economic cost) where the *identified need* is for *reliability corrective action*.

Regulatory investment test for transmission guidelines

- (d) At the same time as the *AER* develops and *publishes* a proposed *regulatory investment test for transmission* under the *transmission consultation procedure*, the *AER* must also develop and *publish* guidelines for the operation and application of the *regulatory investment test for transmission* (the *regulatory investment test for transmission application guidelines*) in accordance with the *transmission consultation procedure* and this clause 5.6.5B.
- (e) The *regulatory investment test for transmission application guidelines* must:
 - (1) give effect to and be consistent with this clause 5.6.5B and clauses 5.6.5C, 5.6.5D, 5.6.6, 5.6.6A and 5.6.6AA; and
 - (2) provide guidance on:
 - (i) the operation and application of the *regulatory investment test for transmission*;
 - (ii) the process to be followed in applying the *regulatory investment test for transmission*; and
 - (iii) how disputes raised in relation to the *regulatory investment test for transmission* and its application will be addressed and resolved.
- (f) The *regulatory investment test for transmission application guidelines* must provide guidance and worked examples as to:
 - (1) what constitutes a *credible option*;
 - (2) acceptable methodologies for valuing the costs of a *credible option*;
 - (3) what may constitute an externality under the *regulatory investment test for transmission*;
 - (4) the classes of market benefits to be considered for the purposes of paragraph (c)(4);
 - (5) the suitable modelling periods and approaches to scenario development;
 - (6) the acceptable methodologies for valuing the market benefits of a *credible option* referred to in paragraph (c), including the option value, competition benefits and market benefits that accrue across *regions*;
 - (7) the appropriate approach to undertaking a sensitivity analysis for the purposes of paragraph (c)(11);

- (8) the appropriate approaches to assessing uncertainty and risks; and
 - (9) when a person is sufficiently committed to a *credible option* for *reliability corrective action* to be characterised as a proponent for the purposes of clause 5.6.5D(b)(7).
- (g) The *AER* must develop and *publish* the first *regulatory investment test for transmission* and *regulatory investment test for transmission application guidelines* by 1 July 2010, and there must be a *regulatory investment test for transmission* and *regulatory investment test for transmission application guidelines* in force at all times after that date.
- (h) The *AER* may, from time to time, amend or replace the *regulatory investment test for transmission* and *regulatory investment test for transmission application guidelines* in accordance with the *transmission consultation procedures*, provided the *AER* *publishes* any amendments to, or replacements of, the *regulatory investment test for transmission* or *regulatory investment test for transmission application guidelines* at the same time.
- (i) An amendment referred to in paragraph (h) does not apply to a current application of the *regulatory investment test for transmission* and the *regulatory investment test for transmission application guidelines* under the *Rules* by a *Transmission Network Service Provider*.
- (j) For the purposes of paragraph (i), a “current application” means any action or process initiated under the *Rules* which relies on or is referenced to the *regulatory investment test for transmission* and/or the *regulatory investment test for transmission application guidelines* and is not completed at the date of the relevant amendment to the *regulatory investment test for transmission* and/or the *regulatory investment test for transmission application guidelines*.

5.6.5C Investments subject to the regulatory investment test for transmission

- (a) A *Transmission Network Service Provider* must apply the *regulatory investment test for transmission* to a proposed *transmission investment* except in circumstances where:
- (1) the proposed *transmission investment* is required to address an urgent and unforeseen *network* issue that would otherwise put at risk the *reliability* of the *transmission network* as described in paragraph (b);
 - (2) the estimated capital cost of the most expensive option to address the relevant *identified need* which is technically and economically feasible is less than \$5 million (as varied in accordance with a *cost threshold determination*);

- (3) the proposed expenditure relates to maintenance or replacement and is not intended to augment the *transmission network* (including *replacement transmission network assets*);
 - (4) the maintenance, or replacement expenditure also results in an *augmentation* to the *network*, and the estimated capital cost for the *augmentation* component of the proposed expenditure is less than \$5 million (as varied in accordance with a *cost threshold determination*), as allocated by the *Transmission Network Service Provider* in accordance with recognised *cost allocation methodologies* and any applicable *AER* guidelines under rule 6A.19;
 - (5) the proposed *transmission investment* is an investment undertaken by a *Transmission Network Service Provider* which:
 - (i) re-routes one or more paths of the *network* for the long term; and
 - (ii) has a substantial primary purpose other than the need to augment the *network*;

(a *reconfiguration investment*) and which the relevant *Transmission Network Service Provider* reasonably estimates to have an estimated capital cost of less than \$5 million (as varied in accordance with a *cost threshold determination*) or which has, or is likely to have, no material impact on *network* users;
 - (6) the proposed *transmission investment* will be a *dual function asset*;
 - (7) the proposed *transmission investment* is designed to address limitations in respect of a *distribution network* notified under clause 5.6.2(e)(2);
 - (8) the proposed *transmission investment* will be a *connection asset*; or
 - (9) the cost of the proposed *transmission investment* is to be fully recovered through charges in relation to *negotiated transmission services*.
- (b) For the purposes of paragraph (a)(1), a proposed *transmission investment* will be required to address an urgent and unforeseen *network* issue that would otherwise put at risk the *reliability* of the *transmission network* if:
- (1) it is necessary that the proposed *transmission investment* be operational within 6 months of the *Transmission Network Service Provider* identifying the *identified need*;

- (2) the event or circumstances causing the *identified need* was not reasonably foreseeable by, and was beyond the reasonable control of, the *Transmission Network Service Provider*;
 - (3) a failure to address the *identified need* is likely to materially adversely affect the *reliability* and *secure operating state* of the *transmission network*; and
 - (4) it is not a *contingent project*.
- (c) If a proposed *transmission investment* is determined to be required to address an urgent and unforeseen *network* issue as described in paragraph (b), the *Transmission Network Service Provider* must provide the following information in its next *Annual Planning Report* following the identification of the need for the *transmission investment*:
- (1) the date when the proposed *transmission investment* became or will become operational;
 - (2) the purpose of the proposed *transmission investment*; and
 - (3) the total cost of the proposed *transmission investment*.
- (d) With the exception of *funded augmentations*, for each proposed investment to which the *regulatory investment test for transmission* does not apply in accordance with subparagraphs (a)(1)-(9), the *Transmission Network Service Provider* must ensure, acting reasonably, that the investment is planned and developed at least cost over the life of the investment.
- (e) A *Transmission Network Service Provider* must not treat different parts of an integrated solution to an *identified need* as distinct and separate options for the purposes of determining whether the *regulatory investment test for transmission* applies to each of those parts.

5.6.5D Identification of a credible option

- (a) A *credible option* is an option (or group of options) that:
- (1) addresses the *identified need*;
 - (2) is (or are) commercially and technically feasible; and
 - (3) can be implemented in sufficient time to meet the *identified need*,
- and is (or are) identified as a *credible option* in accordance with paragraph (b).
- (b) In applying the *regulatory investment test for transmission*, a *Transmission Network Service Provider* must consider, in relation to a proposed

transmission investment to address an *identified need* other than those described in clauses 5.6.5C(a)(1)-(9), all options that could reasonably be classified as *credible options*, taking into account:

- (1) energy source;
 - (2) technology;
 - (3) ownership;
 - (4) the extent to which the *credible option* enables *intra-regional* or *inter-regional* trading of electricity;
 - (5) whether it is a *network* or *non-network* option;
 - (6) whether the *credible option* is intended to be regulated;
 - (7) whether the *credible option* has a proponent; and
 - (8) any other factor which the *Transmission Network Service Provider* reasonably considers should be taken into account.
- (c) The absence of a proponent does not exclude a *transmission investment* option from being considered a *credible option*.

5.6.5E Review of Costs Thresholds

- (a) Every 3 years the *AER* must undertake a review (the *cost threshold review*) of the changes in the input costs used to calculate the estimated capital costs in relation to *replacement transmission network assets* and in relation to *transmission investment* as referred to in the definition of *new network investment* and referred to in clauses 5.6.2A(b)(6), 5.6.5C(a)(2), (4) and (5) and 5.6.6(y)(1) for the purposes of determining whether the amounts:
- (1) in relation to *replacement transmission network assets*;
 - (2) of less than \$5 million referred to in clause 5.6.5C(a)(2);
 - (3) of less than \$5 million referred to in clause 5.6.5C(a)(4);
 - (4) of less than \$5 million referred to in clause 5.6.5C(a)(5);
 - (5) of less than \$35 million referred to in clause 5.6.6(y)(1); and
 - (6) in excess of \$5 million in relation to *transmission investment* as referred to in the definition of *new network investment*,

(each a *cost threshold*) need to be changed to maintain the appropriateness of the *cost thresholds* over time by adjusting those *cost thresholds* to reflect

any increase or decrease in the input costs since 1 July 2009 in respect of the first *cost threshold review* and since the date of the previous review in respect of every subsequent *cost threshold review*.

- (b) Each *cost threshold review* is to be commenced by the *AER* on 31 July of the relevant year, with the first such review to be initiated in 2012.
- (c) Within 6 weeks following the commencement of a *cost threshold review*, the *AER* must *publish* a draft determination outlining:
 - (1) whether the *AER* has formed the view that any of the *cost thresholds* need to be amended to reflect increases or decreases in the input costs to ensure that the appropriateness of the *cost thresholds* is maintained over time;
 - (2) its reasons for determining whether the *cost thresholds* need to be varied to reflect increases or decreases in the input costs;
 - (3) if there is to be a variation in a *cost threshold*, the amount of the new *cost threshold* and the date the new *cost threshold* will take effect; and
 - (4) its reasons for determining the amount of the new *cost threshold*.
- (d) At the same time as it *publishes* the draft determination under paragraph (c), the *AER* must *publish* a notice seeking submissions on the draft determination and which specifies the period within which written submissions can be made (the *cost threshold consultation period*) which must be no less than 5 weeks from the date of the notice.
- (e) The *AER* must consider any written submissions received during the *cost threshold consultation period* in making its final determination in respect of the matters outlined in paragraph (c).
- (f) The final determination must be made and *published* by the *AER* within 5 weeks following the end of the *cost threshold consultation period* (the *cost threshold determination*).

5.6.6 Regulatory investment test for transmission procedures

- (a) In addition to the procedures to make a *connection* to a *network* in rule 5.3, the *Transmission Network Service Provider* must comply with the access arrangements and procedures set out in this clause 5.6.6 and in clause 5.6.6A.
- (b) A *Transmission Network Service Provider* who proposes to make a *transmission investment*, other than an investment of the kind described in clauses 5.6.5C(a)(1)-(9), must consult all *Registered Participants*, *AEMO* and *interested parties* on the proposed *transmission investment* in accordance with this clause 5.6.6.

Project specification consultation report

- (c) A *Transmission Network Service Provider* must prepare a report (the *project specification consultation report*), which must include:
- (1) a description of the *identified need*;
 - (2) the assumptions used in identifying the *identified need* (including, in the case of proposed *reliability corrective action*, why the *Transmission Network Service Provider* considers *reliability corrective action* is necessary);
 - (3) the technical characteristics of the *identified need* that a non-*network* option would be required to deliver, such as:
 - (i) the size of *load* reduction or additional supply;
 - (ii) location; and
 - (iii) operating profile;
 - (4) if applicable, reference to any discussion on the description of the *identified need* or the *credible options* in respect of that *identified need* in the most recent *National Transmission Network Development Plan*;
 - (5) a description of all *credible options* of which the *Transmission Network Service Provider* is aware that address the *identified need*, which may include, without limitation, alternative *transmission* options, *interconnectors*, *generation*, *demand side management*, *market network services* or other *network* options;
 - (6) for each *credible option* identified in accordance with subparagraph (5), information about:
 - (i) the technical characteristics of the *credible option*;
 - (ii) whether the *credible option* is reasonably likely to have a material *inter-regional impact*;
 - (iii) the classes of market benefits that the *Transmission Network Service Provider* considers are likely not to be material in accordance with clause 5.6.5B(c)(6), together with reasons of why the *Transmission Network Service Provider* considers that these classes of market benefits are not likely to be material;
 - (iv) the estimated construction timetable and commissioning date; and

- (v) to the extent practicable, the total indicative capital and operating and maintenance costs.
- (d) The *Transmission Network Service Provider* must make available to all *Registered Participants*, *AEMO* and other *interested parties* the *project specification consultation report*.
- (e) The *Transmission Network Service Provider* must:
 - (1) provide a summary of the *project specification consultation report* to *AEMO* within 5 *business days* of making the *project specification consultation report*; and
 - (2) upon request by an *interested party*, provide a copy of the *project specification consultation report* to that person within 3 *business days* of the request.
- (f) Within 3 *business days* of receipt of the summary, *AEMO* must *publish* the summary of the *project specification consultation report* on its website.
- (g) The *Transmission Network Service Provider* must seek submissions from *Registered Participants*, *AEMO* and *interested parties* on the *credible options* presented, and the issues addressed, in the *project specification consultation report*.
- (h) The period for consultation period referred to in paragraph (g) must be not less than 12 weeks from the date that *AEMO publishes* the summary of the *project specification consultation report* on its website.
- (i) A *Transmission Network Service Provider* may discharge its obligation under paragraph (d) to make the *project specification consultation report* available by including the *project specification consultation report* as part of its *Annual Planning Report*.

Project assessment draft report

- (j) If the *Transmission Network Service Provider* elects to proceed with the proposed *transmission investment*, within 12 months of the end date of the consultation period referred to in paragraph (h), or such longer time period as is agreed in writing by the *AER*, the *Transmission Network Service Provider* must prepare a report (the *project assessment draft report*), having regard to the submissions received, if any, under paragraph (g) and make that report available to all *Registered Participants*, *AEMO* and *interested parties*.
- (k) The *project assessment draft report* must include:
 - (1) a description of each *credible option* assessed;

- (2) a summary of, and commentary on, the submissions to the *project specification consultation report*;
- (3) a quantification of the costs, including a breakdown of operating and capital expenditure, and classes of material market benefit for each *credible option*;
- (4) a detailed description of the methodologies used in quantifying each class of material market benefit and cost;
- (5) reasons why the *Transmission Network Service Provider* has determined that a class or classes of market benefit are not material;
- (6) the identification of any class of market benefit estimated to arise outside the *Transmission Network Service Provider's region*, and quantification of the value of such market benefits (in aggregate across all *regions*);
- (7) the results of a net present value analysis of each *credible option* and accompanying explanatory statements regarding the results;
- (8) the identification of the proposed *preferred option*;
- (9) for the proposed *preferred option* identified under subparagraph (8), the *Transmission Network Service Provider* must provide:
 - (i) details of the technical characteristics;
 - (ii) the estimated construction timetable and commissioning date;
 - (iii) if the proposed *preferred option* is likely to have a *material inter-regional network impact*, and if the *Transmission Network Service Provider* has received an *augmentation technical report*, that report; and
 - (iv) a statement and the accompanying detailed analysis that the *preferred option* satisfies the *regulatory investment test for transmission*.
- (l) If a *Transmission Network Service Provider* elects to proceed with a proposed *transmission investment* which is for *reliability corrective action*, it can only do so where the proposed *preferred option* has a proponent. The identity of that proponent must be included in the *project assessment draft report*.
- (m) A *Transmission Network Service Provider* may discharge its obligation under paragraph (j) to make the *project assessment draft report* available by including the *project assessment draft report* as part of its *Annual Planning Report* provided its *Annual Planning Report* is published within 12 months

of the end date of the consultation period required under paragraph (h) or within 12 months of the end of such longer time period as is agreed by the *AER* in writing under paragraph (j).

- (n) The *Transmission Network Service Provider* must:
 - (1) provide a summary of the *project assessment draft report* to *AEMO* within 5 *business days* of making the *project assessment draft report*; and
 - (2) upon request by an *interested party*, provide a copy of the *project assessment draft report* to that person within 3 *business days* of the request.
- (o) Within 3 *business days* of receipt of the summary, *AEMO* must *publish* the summary of the *project assessment draft report* on its website.
- (p) The *Transmission Network Service Provider* must seek submissions from *Registered Participants*, *AEMO* and *interested parties* on the *preferred option* presented, and the issues addressed, in the *project assessment draft report*.
- (q) The period for consultation referred to in paragraph (p) must be not less than 6 weeks from the date that *AEMO publishes* the summary of the report on its website.
- (r) Within 4 weeks after the end of the consultation period required under paragraph (q), at the request of an *interested party*, a *Registered Participant* or *AEMO* (each being a “relevant party” for the purposes of this paragraph), the *Transmission Network Service Provider* must meet with the relevant party if a meeting is requested by two or more relevant parties and may meet with a relevant party if after having considered all submissions, the *Transmission Network Service Provider*, acting reasonably, considers that the meeting is necessary.

Project assessment conclusions report

- (s) As soon as practicable after the end of the consultation period on the *project assessment draft report* referred to in paragraph (q), the *Transmission Network Service Provider* must, having regard to the submissions received, if any, under paragraph (p) and the matters discussed at any meetings held, if any, under paragraph (r), prepare and make available to all *Registered Participants*, *AEMO* and *interested parties* and *publish* a report (the *project assessment conclusions report*).
- (t) If:
 - (1) the *Transmission Network Service Provider* is exempt from making a *project assessment draft report* under paragraph (y); and

- (2) the *Transmission Network Service Provider* elects to proceed with the proposed *transmission investment*, within 12 months of the end date of the period for consultation referred to in paragraph (h), or within 12 months of the end date of such longer time period as is agreed in writing by the AER,

the *Transmission Network Service Provider* must, having regard to the submissions received, if any, under paragraph (h) as soon as practicable prepare and make available to all *Registered Participants*, *AEMO* and *interested parties* and *publish* a report (*the project assessment conclusions report*).

- (u) The *project assessment conclusions report* must set out:
- (3) the matters detailed in the *project assessment draft report* as required under paragraph (k); and
- (4) a summary of, and the *Transmission Network Service Provider's* response to, submissions received, if any, from *interested parties* sought under paragraph (p).
- (v) The *Transmission Network Service Provider* must:
- (1) provide a summary of the *project assessment conclusions report* to *AEMO* within 5 *business days* of making the *project assessment conclusions report*; and
- (2) upon request by an *interested party*, provide a copy of the *project assessment conclusions report* to that person within 3 *business days* of the request.
- (w) Within 3 *business days* of receipt of the summary, *AEMO* must *publish* the summary of the *project assessment conclusions report* on its website.
- (x) A *Transmission Network Service Provider* may discharge its obligation under paragraph (s) and (t) to make the *project assessment conclusions report* available by including the *project assessment conclusions report* as part of its *Annual Planning Report* provided that *Annual Planning Report* is *published* within 4 weeks from the date of making available the *project assessment conclusions report* under paragraph (s) or (t), as the case may be.

Exemption from preparing a project assessment draft report for proposed transmission investments without material market benefits

- (y) A *Transmission Network Service Provider* is exempt from paragraphs (j) to (r) if:

- (1) the estimated capital cost of the proposed *preferred option* is less than \$35 million (as varied in accordance with a *cost threshold determination*);
 - (2) the *Transmission Network Service Provider* has identified in its *project specification consultation report*:
 - (i) its proposed *preferred option*;
 - (ii) its reasons for the proposed *preferred option*; and
 - (iii) that its proposed *transmission investment* has the benefit of this exemption;
 - (3) the *Transmission Network Service Provider* considers, in accordance with clause 5.6.5B(c)(6), that the proposed *preferred option* and any *other credible option* in respect of the *identified need* will not have a material market benefit for the classes of market benefit specified in clause 5.6.5B(c)(4) except those classes specified in clauses 5.6.5B(c)(4)(ii) and (iii), and has stated this in its *project specification consultation report*; and
 - (4) the *Transmission Network Service Provider* forms the view that no submissions were received on the *project specification consultation report* which identified additional *credible options* that could deliver a material market benefit.
- (z) The *Transmission Network Service Provider* must address in the *project assessment conclusions report* any issues that were raised in relation to a proposed *preferred option* to which paragraph (y) applies during the consultation on the *project specification consultation report*.

5.6.6A Disputes in relation to application of regulatory investment test for transmission

- (a) *Registered Participants*, the *AEMC*, *Connection Applicants*, *Intending Participants*, *AEMO* and *interested parties* may, by notice to the *AER*, dispute conclusions made by the *Transmission Network Service Provider* in the *project assessment conclusions report* in relation to:
 - (1) the application of the *regulatory investment test for transmission*;
 - (2) the basis on which the *Transmission Network Service Provider* has classified the *preferred option* as being for *reliability corrective action*; or
 - (3) the *Transmission Network Service Provider's* assessment regarding whether the *preferred option* will have a *material inter-network*

impact, in accordance with any criteria for a *material inter-network impact* that are in force at the time of the preparation of the *project assessment conclusions report*.

- (b) A dispute under this clause 5.6.6A may not be raised in relation to any matters set out in the *project assessment conclusions report* which:
 - (1) are treated as externalities by the *regulatory investment test for transmission*; or
 - (2) relate to an individual's personal detriment or property rights.
- (c) Within 30 days of the date of *publication* of the *project assessment conclusions report* under clause 5.6.6(s) or (t) (as the case may be), the party disputing a conclusion made in the *project assessment conclusions report* (a *disputing party*) must:
 - (1) give notice of the dispute in writing setting out the grounds for the dispute (the *dispute notice*) to the *AER*; and
 - (2) at the same time, give a copy of the *dispute notice* to the relevant *Transmission Network Service Provider*.
- (d) Subject to paragraph (e)(3), within 40 days of receipt of the *dispute notice* or within an additional period of up to 60 days where the *AER* notifies *interested parties* that the additional time is required to make a determination because of the complexity or difficulty of the issues involved, the *AER* must either:
 - (1) reject any dispute by written notice to the person who initiated the dispute if the *AER* considers that the grounds for the dispute are misconceived or lacking in substance; and
 - (2) notify the *Transmission Network Service Provider* that the dispute has been rejected; or
 - (3) subject to paragraph (f), make and *publish* a determination:
 - (i) directing the *Transmission Network Service Provider* to amend the matters set out in the *project assessment conclusions report*; or
 - (ii) stating that, based on the grounds of the dispute, the *Transmission Network Service Provider* will not be required to amend the *project assessment conclusions report*.
- (d1) A *Transmission Network Service Provider* must comply with an *AER* determination made under paragraph (d)(3)(i) within a timeframe specified by the *AER* in its determination.

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- (e) In making a determination under paragraph (d)(3), the *AER*:
- (1) must only take into account information and analysis that the *Transmission Network Service Provider* could reasonably be expected to have considered or undertaken at the time that it performed the *regulatory investment test for transmission*;
 - (2) must *publish* its reasons for making a determination;
 - (3) may request further information regarding the dispute from the *disputing party* or the *Transmission Network Service Provider* in which case the period of time for rejecting a dispute or issuing a determination under paragraph (d) is extended by the time it takes the relevant party to provide the requested further information to the *AER*;
 - (4) may disregard any matter raised by the *disputing party* or the *Transmission Network Service Provider* that is misconceived or lacking in substance; and
 - (5) where making a determination under subparagraph (d)(3)(i), must specify a reasonable timeframe for the *Transmission Network Service Provider* to comply with the *AER*'s direction to amend the matters set out in the *project assessment conclusions report*.
- (f) The *AER* may only make a determination under subparagraph (d)(3)(i) if it determines that:
- (1) the *Transmission Network Service Provider* has not correctly applied the *regulatory investment test for transmission* in accordance with the *Rules*;
 - (2) the *Transmission Network Service Provider* has erroneously classified the *preferred option* as being for *reliability corrective action*;
 - (3) the *Transmission Network Service Provider* has not correctly assessed whether the *preferred option* will have a *material inter-network impact*;
or
 - (4) there was a manifest error in the calculations performed by the *Transmission Network Service Provider* in applying the *regulatory investment test for transmission*.
- (g) A *disputing party* or the *Transmission Network Service Provider* (as the case may be) must as soon as reasonably practicable provide any information requested under paragraph (e)(3) to the *AER*.
- (h) The relevant period of time in which the *AER* must make a determination under paragraph (d)(3) is automatically extended by the period of time taken by the *Transmission Network Service Provider* or a *disputing party* to

provide any additional information requested by the *AER* under this clause 5.6.6A, provided:

- (1) the *AER* makes the request for the additional information at least 7 *business days* prior to the expiry of the relevant period; and
- (2) the *Transmission Network Service Provider* or the *disputing party* provides the additional information within 14 *business days* of receipt of the request.

5.6.6AA Determination that proposed transmission investment satisfies the regulatory investment test for transmission

- (a) After the expiry of the 30 day period referred to in clause 5.6.6A(c) and where a *preferred option* is not for *reliability corrective action*, the *Transmission Network Service Provider* may request, in writing to the *AER*, that the *AER* make a determination as to whether the *preferred option* satisfies the *regulatory investment test for transmission*.
- (b) The *AER*:
 - (1) must, within 120 *business days* of receipt of the request from the applicant, subject to paragraph (c), make and *publish* a determination, including reasons for its determination;
 - (2) must use the findings and recommendations in the *project assessment conclusions report* in making its determination under subparagraph (1);
 - (3) may request further information from the *Transmission Network Service Provider*; and
 - (4) may have regard to any other matter the *AER* considers relevant.
- (c) The relevant period of time in which the *AER* must make a determination under paragraph (b) is automatically extended by the period of time taken by the *Transmission Network Service Provider* to provide any additional information requested by the *AER* under this clause 5.6.6AA, provided:
 - (1) the *AER* makes the request for the additional information at least 7 *business days* prior to the expiry of the relevant period; and
 - (2) the *Transmission Network Service Provider* provides the additional information within 14 *business days* of receipt of the request.

Costs determinations

- (d) Where the *AER* engages a consultant to assist in making a determination under clauses 5.6.6A and 5.6.6AA, the *AER* may make a costs determination.
- (e) Where a costs determination is made, the *AER* may:
 - (1) render the *Transmission Network Service Provider* an invoice for the costs; or
 - (2) determine that the costs should:
 - (i) be shared by all the parties to the dispute, whether in the same proportion or differing proportions; or
 - (ii) be borne by a party or parties to the dispute other than the *Transmission Network Service Provider* whether in the same proportion or differing proportions; and
 - (iii) the *AER* may render invoices accordingly.
- (f) If an invoice is rendered, the *AER* must specify a time period for the payment of the invoice that is no later than 30 *business days* from the date the *AER* makes a determination under paragraph (d).

5.6.6B Construction of Funded Augmentations

- (a) The term *Transmission Network Service Provider* when used in this clause 5.6.6B is not intended to refer to, and is not to be read or construed as referring to, any *Transmission Network Service Provider* in its capacity as a *Market Network Service Provider*.
- (b) A *Transmission Network Service Provider* who proposes to construct a *funded augmentation* must make available to all *Registered Participants* and *AEMO* a notice which must set out:
 - (1) a detailed description of the proposed *funded augmentation*;
 - (2) all relevant technical details concerning the proposed *funded augmentation*, the impact of the *funded augmentation* on the relevant *transmission network's Transmission Network Users* and the construction timetable and commissioning date for the *funded augmentation*;
 - (3) an *augmentation technical report* prepared by *AEMO* if, and only if, the *funded augmentation* is reasonably likely to have a *material inter-network impact* and the *Transmission Network Service Provider* has not received consent to proceed with construction from all *Transmission Network Service Providers* whose *transmission networks* are materially affected by the *funded augmentation*. In

assessing whether a *funded augmentation* is reasonably likely to have a *material inter-network impact*, the *Transmission Network Service Provider* must have regard to the objective set of criteria *published* by *AEMO* (if any such criteria have been *published* by *AEMO*).

- (c) The *Transmission Network Service Provider* must provide a summary of the notice prepared in accordance with clause 5.6.6B(b) to *AEMO*. Within 3 *business days* of receipt of the summary, *AEMO* must *publish* the summary on its website.
- (d) The *Transmission Network Service Provider* must consult with any *interested parties*, in accordance with the *Rules consultation procedures*, on any matter set out in the notice prepared in accordance with clause 5.6.6B(b).

5.6.6C [Deleted]

5.6A National Transmission Planning

5.6A.1 Preliminary consultation

- (a) By no later than 30 January each year, *AEMO* must *publish*:
 - (1) a document that sets out the *NTNDP inputs* that it proposes to use for the preparation or revision of the *NTNDP* for the following calendar year; and
 - (2) a document (the **statement of material issues**):
 - (i) summarising the issues *AEMO* considers to be the material issues involved in the preparation or revision of the *NTNDP* for the following calendar year; and
 - (ii) giving an indication of *AEMO's* preliminary views on how those issues should be resolved.
- (b) At the same time as it *publishes* the documents referred to in paragraph (a), *AEMO* must *publish* an invitation for written submissions to be made to *AEMO* within a period (at least 30 *business days*) specified in the invitation on:
 - (1) the proposed *NTNDP inputs*; and
 - (2) the content of the *NTNDP* as it applies for the current year, including the location of the current and potential *national transmission flow paths* identified in the *NTNDP*; and
 - (3) the issues raised in the *statement of material issues*.

- (c) A person may make a written submission to *AEMO* on the proposed *NTNDP inputs*, the content of the *NTNDP* as it applies for the current year, or an issue raised in the *statement of material issues* within the period specified in the invitation.

5.6A.2 Publication of NTNDP

- (a) By no later than 31 December each year, *AEMO* must *publish* the *NTNDP* for the following year.
- (b) In preparing the *NTNDP* that is to be *published* under paragraph (a), *AEMO* must:
 - (1) take into account the submissions made in response to the invitation referred to in clause 5.6A.1(b); and
 - (2) consider the following matters:
 - (i) the quantity of electricity that flowed, the periods in which the electricity flowed, and *constraints* on the *national transmission flow paths* over the previous year;
 - (ii) the forecast quantity of electricity that is expected to flow, the periods in which the electricity is expected to flow, and the magnitude and significance of future *network losses* and *constraints*, on the current and potential *national transmission flow paths* over the year in which the *NTNDP* is to apply or some other period to which a scenario that is used for the purposes of the *NTNDP* applies;
 - (iii) the projected capabilities of the *national transmission grid*, and the *network control ancillary services* required to support the existing and future capabilities of the *national transmission grid*, under each of the scenarios that is being used for the purposes of the *NTNDP*;
 - (iv) relevant intra-jurisdictional developments and any incremental works that may be needed to co-ordinate *national transmission flow path* planning with intra-jurisdictional planning;
 - (v) such other matters as *AEMO*, in consultation with the *participating jurisdictions*, considers appropriate; and
 - (3) have regard to the following documents:
 - (i) the most recent *Annual Planning Reports* that have been *published*;

- (ii) the most recent *statement of opportunities* that has been *published*;
 - (iii) the most recent gas statement of opportunities published under the National Gas Law;
 - (iv) the current revenue determination for each *Transmission Network Service Provider*;
 - (v) any other documents that *AEMO* considers relevant.
- (c) An *NTNDP* that is published under paragraph (a) must:
- (1) consider and assess an appropriate course for the efficient development of the *national transmission grid* for a planning horizon of at least 20 years from the beginning of the year in which the *NTNDP* applies; and
 - (2) take into account all *transmission elements* which are part of, or materially affect, the transmission capability of any current or potential *national transmission flow paths*; and
 - (3) identify a range of credible scenarios for the geographic pattern of the demand for, and supply of, electricity for the planning horizon of the *NTNDP*; and
 - (4) identify the location of current *national transmission flow paths* and specify their transmission capability; and
 - (5) identify the location of the potential *national transmission flow paths* over the planning horizon of the *NTNDP* under each of the scenarios referred to in subparagraph (3); and
 - (6) specify a development strategy for each current and potential *national transmission flow path* in accordance with clause 5.6A.3; and
 - (7) include a summary of the information specified in rule 3.7A in relation to congestion on each current *national transmission flow path*; and
 - (8) include a consolidated summary of the *augmentations* proposed by each *Transmission Network Service Provider* in the most recent *Annual Planning Reports* they have *published* and an analysis of the manner in which the proposed *augmentations* relate to the *NTNDP* and any previous *NTNDP*; and
 - (9) summarise the material issues arising from the submissions received in response to the invitation referred to in clause 5.6A.1(b), explain

how those issues have been addressed in the *NTNDP* and give reasons for not addressing any of those issues in the *NTNDP*.

- (d) *AEMO* must *publish* the first *NTNDP* (the *NTNDP* for 2011) no later than 31 December 2010.
- (e) If, after the *publication* of the most recent *NTNDP*, *AEMO* becomes aware of information that shows the *NTNDP* to be incorrect in a material respect, *AEMO* must *publish* a correction of the *NTNDP* as soon as practicable.

5.6A.3 Development strategies for national transmission flow paths

A development strategy for a current or potential *national transmission flow path* that is specified in accordance with clause 5.6A.2(c)(6) must:

- (1) be proposed for each of the scenarios referred to in clause 5.6A.2(c)(3); and
- (2) to the extent reasonably practicable and appropriate, be consistent with:
 - (i) the co-optimisation of *network* and non-*network* investment; and
 - (ii) the maximisation of net economic benefit to all those who produce, consume and transport electricity to the *market*; and
 - (iii) the service standards that are linked to the technical requirements of schedule 5.1 or in *applicable regulatory instruments*; and
- (3) take into account the following matters:
 - (i) the current or likely capacity of the *national transmission flow path*, and the need to increase that capacity to relieve current or likely *constraints* and congestion points; and
 - (ii) technically feasible *network* and non-*network* options (including additional *generation* and demand side options) for relieving current or likely *constraints* or congestion points; and
 - (iii) possible market benefits associated with each of the options identified under subparagraph (ii); and
- (4) include a high level assessment as to:
 - (i) which of the options, or combination of options, identified under paragraph(3)(ii) provides the most efficient strategy for the development of the *national transmission grid* under each of the scenarios referred to in clause 5.6A.2(c)(3); and
 - (ii) the manner in which each such option, or combination of options, relates to the overall development of the *power system*.

5.6A.4 NTNDP database

- (a) *AEMO* must establish, maintain and make available to the public a database (the *NTNDP database*) that includes *NTNDP inputs* used by it in preparing the most recent *NTNDP*.
- (b) The *NTNDP inputs* for an *NTNDP* include:
 - (1) assumptions made about the cost of fuel used for the generation of electricity (including gas and coal); and
 - (2) the conversion factors used to relate the consumption of a given quantity of fuel to the production of electricity using that quantity of fuel; and
 - (3) assumptions about the capital costs associated with the generation of electricity; and
 - (4) prevailing location of generation capacity; and
 - (5) assumptions about the price of carbon; and
 - (6) electricity demand forecasts.
- (c) *AEMO* may establish a part of the database for the inclusion of *confidential information*.
- (d) A part of the database established for *confidential information* is not to be accessible to the public.

Note

The disclosure of *protected information* to the public may however be authorised under the *National Electricity Law*.

5.6A.5 Jurisdictional planning bodies and jurisdictional planning representatives

- (a) A *jurisdictional planning body* must provide assistance *AEMO* reasonably requests in connection with the performance of its *NTP functions*.
- (b) If there is no *jurisdictional planning body* or no *jurisdictional planning representative* for a *participating jurisdiction*, *AEMO* may assume the functions of such a body or representative under the *Rules*.

5.7 Inspection and Testing

5.7.1 Right of entry and inspection

- (a) If a *Registered Participant* who is party to a *connection agreement* reasonably believes that the other party to the *connection agreement* (being a party who is also a *Registered Participant*) is not complying with a technical provision of the *Rules* and that, as a consequence, the first *Registered Participant* is suffering, or is likely to suffer, a material adverse effect, then the first *Registered Participant* may enter the relevant *facility* at the *connection point* of the other *Registered Participant* in order to assess compliance by the other *Registered Participant* with its technical obligations under the *Rules*.
- (b) A *Registered Participant* who wishes to inspect the *facilities* of another *Registered Participant* under clause 5.7.1(a) must give that other *Registered Participant* at least 2 *business days* notice of its intention to carry out an inspection.
- (c) A notice given under clause 5.7.1(b) must include the following information:
 - (1) the name of the *representative* who will be conducting the inspection on behalf of the *Registered Participant*;
 - (2) the time when the inspection will commence and the expected time when the inspection will conclude; and
 - (3) the nature of the suspected non-compliance with the *Rules*.
- (d) Neither a *Registered Participant* nor *AEMO* may carry out an inspection under this rule 5.7 within 6 *months* of any previous inspection except for the purpose of verifying the performance of corrective action claimed to have been carried out in respect of a non-conformance observed and documented on the previous inspection or (in the case of *AEMO*) for the purpose of reviewing an operating incident in accordance with clause 4.8.15.
- (e) At any time when the *representative* of a *Registered Participant* is in another *Registered Participant's facility*, that *representative* must:
 - (1) cause no damage to the *facility*;
 - (2) only interfere with the operation of the *facility* to the extent reasonably necessary and approved by the relevant *Registered Participant* (such approval not to be unreasonably withheld or delayed); and
 - (3) observe “permit to test” access to sites and clearance protocols of the operator of the *facility*, provided that these are not used by the

operator of the *facility* solely to delay the granting of access to site and inspection.

- (f) Any *representative* of a *Registered Participant* conducting an inspection under this clause 5.7.1 must be appropriately qualified to perform the relevant inspection.
- (g) The costs of inspections under this clause 5.7.1 must be borne by the *Registered Participant* requesting the inspection.
- (h) *AEMO* or any of its *representatives* may, in accordance with this rule 5.7, inspect a *facility* of a *Registered Participant* and the operation and maintenance of that *facility* in order to:
 - (1) assess compliance by the relevant *Registered Participant* with its operational obligations under Chapter 3 or 4, or an *ancillary services agreement*;
 - (2) investigate any possible past or potential threat to *power system security*; or
 - (3) conduct any periodic familiarisation or training associated with the operational requirements of the *facility*.
- (i) Any inspection under clause 5.7.1(a) or (h) must only be for so long as is reasonably necessary.
- (j) Any equipment or goods installed or left on land or in premises of a *Registered Participant* after an inspection conducted under clause 5.7.1 do not become the property of the relevant *Registered Participant* (notwithstanding that they may be annexed or affixed to the relevant land or premises).
- (k) In respect of any equipment or goods left on land or premises of a *Registered Participant* during or after an inspection, a *Registered Participant*:
 - (1) must not use any such equipment or goods for a purpose other than as contemplated in the *Rules* without the prior written approval of the owner of the equipment or goods;
 - (2) must allow the owner of any such equipment or goods to remove any such equipment or goods in whole or in part at a time agreed with the relevant *Registered Participant*, such agreement not to be unreasonably withheld or delayed; and
 - (3) must not create or cause to be created any mortgage, charge or lien over any such equipment or goods.

- (l) A *Registered Participant* (in the case of an inspection carried out under clause 5.7.1(a)) or *AEMO* (in the case of an inspection carried out under clause 5.7.1(h)) must provide the results of that inspection to the *Registered Participant* whose *facilities* have been inspected, any other *Registered Participant* which is likely to be materially affected by the results of the test or inspection and *AEMO* (in the case of an inspection carried out under clause 5.7.1(a)).

5.7.2 Right of testing

- (a) A *Registered Participant*, who has reasonable grounds to believe that equipment owned or operated by a *Registered Participant* with whom it has a *connection agreement* (which equipment is associated with the *connection agreement*) may not comply with the *Rules* or the *connection agreement*, may request testing of the relevant equipment by giving notice in writing to the other *Registered Participant*.
- (b) If a notice is given under clause 5.7.2(a) the relevant test is to be conducted at a time agreed by *AEMO*.
- (c) The *Registered Participant* who receives a notice under clause 5.7.2(a) must co-operate in relation to conducting tests requested under clause 5.7.2(a).
- (d) The cost of tests requested under clause 5.7.2(a) must be borne by the *Registered Participant* requesting the test, unless the equipment is determined by the tests not to comply with the relevant *connection agreement* and the *Rules*, in which case all reasonable costs of such tests must be borne by the owner of that equipment.
- (e) Tests conducted in respect of a *connection point* under clause 5.7.2 must be conducted using test procedures agreed between the relevant *Registered Participants*, which agreement is not to be unreasonably withheld or delayed.
- (f) Tests under clause 5.7.2 must be conducted only by persons with the relevant skills and experience.
- (g) A *Transmission Network Service Provider* must give *AEMO* adequate prior notice of intention to conduct a test in respect of a *connection point* to that *Network Service Provider's network*.
- (h) The *Registered Participant* who requests a test under this clause 5.7.2 may appoint a *representative* to witness a test and the relevant *Registered Participant* must permit a *representative* appointed under this clause 5.7.2(h) to be present while the test is being conducted.
- (i) A *Registered Participant* who conducts a test must submit a report to the *Registered Participant* who requested the relevant test, *AEMO* and to any

other *Registered Participant* which is likely to be materially affected by the results of the test, within a reasonable period after the completion of the test and the report is to outline relevant details of the tests conducted, including but not limited to the results of those tests.

- (j) A *Network Service Provider* may attach test equipment or *monitoring equipment* to *plant* owned by a *Registered Participant* or require a *Registered Participant* to attach such test equipment or *monitoring equipment*, subject to the provisions of clause 5.7.1 regarding entry and inspection.
- (k) In carrying out monitoring under clause 5.7.2(j) the *Network Service Provider* must not cause the performance of the monitored *plant* to be *constrained* in any way.

5.7.3 Tests to demonstrate compliance with connection requirements for generators

- (a) Each *Generator* must, in accordance with the time frames specified in rule 4.15, provide evidence to any relevant *Network Service Provider* with which that *Generator* has a *connection agreement* and to *AEMO*, that its *generating system* complies with:
 - (1) the applicable technical requirements of clause S5.2.5; and
 - (2) the relevant *connection agreement* including the *performance standards*.
- (b) **[Deleted]**
- (c) If a test required by clause 5.7.3(a) demonstrates that a *generating system* is not complying with one or more technical requirements of clause S5.2.5 or the relevant *connection agreement* or one or more of the *performance standards* then the *Generator* must:
 - (1) promptly notify the relevant *Network Service Provider* and *AEMO* of that fact; and
 - (2) promptly notify the *Network Service Provider* and *AEMO* of the remedial steps it proposes to take and the timetable for such remedial work; and
 - (3) diligently undertake such remedial work and report at monthly intervals to the *Network Service Provider* on progress in implementing the remedial action; and

- (4) conduct further tests or monitoring on completion of the remedial work to confirm compliance with the relevant technical requirements or *performance standards* (as the case may be).
- (d) If *AEMO* reasonably believes that a *generating system* is not complying with one or more applicable *performance standards* or one or more applicable technical requirements of clause S5.2.5 or the relevant *connection agreement*, *AEMO* may instruct the *Generator* to conduct tests within 25 *business days* to demonstrate that the relevant *generating system* complies with those *performance standards* or technical requirements.
- (e) If the tests undertaken in accordance with paragraph (d) provide evidence that the *generating system* continues to comply with those requirements *AEMO* must reimburse the *Generator* for the reasonable expenses incurred as a direct result of conducting the tests.
- (f) If *AEMO*:
 - (1) is satisfied that:
 - (i) a *generating system* is not complying with the relevant *performance standards* for that system in respect of one or more of the technical requirements contained in S5.2.5, S5.2.6, S5.2.7 or S5.2.8 and the relevant *connection agreement*; or
 - (ii) a *generating system's* performance is not adequately represented by the applicable analytical model provided under clause 5.7.6(h) or clause S5.2.4; and
 - (2) holds the reasonable opinion that the performance of the *generating system*, or inadequacy of the applicable analytical model of the *generating system* is or will impede *AEMO's* ability to carry out its role in relation to *power system security*,

AEMO may direct the relevant *Generator* to operate the *generating system* at a particular *generated* output or in a particular mode until the relevant *Generator* submits evidence reasonably satisfactory to *AEMO* that the *generating system* is complying with the relevant *performance standard* and performing substantially in accordance with the applicable analytical model.

- (g) Each *Generator* must maintain records for 7 years for each of its *generating systems* and *power stations* setting out details of the results of all technical performance and monitoring conducted under this clause 5.7.3 and make these records available to *AEMO* on request.

5.7.4 Routine testing of protection equipment

- (a) A *Registered Participant* must co-operate with any relevant *Network Service Provider* to test the operation of equipment forming part of a *protection system* relating to a *connection point* at which that *Registered Participant* is connected to a *network* and the *Registered Participant* must conduct these tests:
- (1) prior to the *plant* at the relevant *connection point* being placed in service; and
 - (2) at intervals specified in the *connection agreement* or in accordance with an asset management plan agreed between the *Network Service Provider* and the *Registered Participant*.
- (a1) A *Network Service Provider* must institute and maintain a compliance program to ensure that its *facilities* of the following types, to the extent that the proper operation of a *facility* listed in this clause may affect *power system security*, operate reliably and in accordance with their performance requirements under schedule 5.1:
- (1) *protection systems*;
 - (2) *control systems* for maintaining or enhancing *power system* stability;
 - (3) *control systems* for controlling *voltage* or *reactive power*; and
 - (4) *control systems* for *load shedding*.
- (a2) A compliance program under clause 5.7.4(a1) must:
- (1) include monitoring of the performance of the *facilities*;
 - (2) to the extent reasonably necessary, include provision for periodic testing of the performance of those *facilities* upon which *power system security* depends;
 - (3) provide reasonable assurance of ongoing compliance of the *facilities* with the relevant performance requirements of schedule 5.1; and
 - (4) be in accordance with *good electricity industry practice*.
- (a3) A *Network Service Provider* must immediately notify *AEMO* if it reasonably believes that a *facility* of a type listed in clause 5.7.4(a1) does not comply with, or is likely not to comply with, its performance requirements.
- (a4) A notice issued under clause 5.7.4(a3) must:

- (1) identify the *facility* and the requirement with which the *facility* does not comply;
 - (2) give an explanation of the reason why the *facility* failed to comply with its performance requirement;
 - (3) give the date and time when the *facility* failed to comply with its performance requirement;
 - (4) give the date and time when the *facility* is expected to again comply with its performance requirement; and
 - (5) describe the expected impact of the failure on the performance of the *Network Service Provider's transmission system* or *distribution system*.
- (b) Each *Registered Participant* must bear its own costs of conducting tests under this clause 5.7.4.

5.7.5 Testing by Registered Participants of their own plant requiring changes to normal operation

- (a) A *Registered Participant* proposing to conduct a test on equipment related to a *connection point*, which requires a change to the normal operation of that equipment, must give notice in writing to the relevant *Network Service Provider* of at least 15 *business days* except in an emergency.
- (b) The notice to be provided under clause 5.7.5(a) must include:
 - (1) the nature of the proposed test;
 - (2) the estimated start and finish time for the proposed test;
 - (3) the identity of the equipment to be tested;
 - (4) the *power system* conditions required for the conduct of the proposed test;
 - (5) details of any potential adverse consequences of the proposed test on the equipment to be tested;
 - (6) details of any potential adverse consequences of the proposed test on the *power system*; and
 - (7) the name of the person responsible for the co-ordination of the proposed test on behalf of the *Registered Participant*.
- (c) The *Network Service Provider* must review the proposed test described in a notice provided under clause 5.7.5(a) to determine whether the test:

- (1) could adversely affect the normal operation of the *power system*;
 - (2) could cause a threat to *power system security*;
 - (3) requires the *power system* to be operated in a particular way which differs from the way in which the *power system* is normally operated;
or
 - (4) could affect the normal *metering of energy* at a *connection point*.
- (d) If the *Network Service Provider* determines that the proposed test does fulfil one of the conditions specified in clause 5.7.5(c), then the *Registered Participant* and *Network Service Provider* must seek *AEMO's* approval prior to undertaking the test, which approval must not be unreasonably withheld or delayed.
 - (e) If, in *AEMO's* reasonable opinion, a test could threaten public safety, damage or threaten to damage equipment or adversely affect the operation of the *power system*, *AEMO* may direct that the proposed test procedure be modified or that the test not be conducted at the time proposed.
 - (f) *AEMO* must advise *Network Service Providers* of any test which may have a possible effect on normal *metering of energy* at a *connection point*.
 - (g) *AEMO* must advise any other *Registered Participants* who might be adversely affected by a proposed test and consider any reasonable requirements of those *Registered Participants* when approving the proposed test.
 - (h) The *Registered Participant* who conducts a test under this clause 5.7.5 must ensure that the person responsible for the co-ordination of a test promptly advises *AEMO* when the test is complete.
 - (i) If *AEMO* approves a proposed test, *AEMO* must use its reasonable endeavours to ensure that *power system* conditions reasonably required for that test are provided as close as is reasonably practicable to the proposed start time of the test and continue for the proposed duration of the test.
 - (j) Within a reasonable period after any such test has been conducted, the *Registered Participant* who has conducted a test under this clause 5.7.5 must provide the *Network Service Provider* with a report in relation to that test including test results where appropriate.

5.7.6 Tests of generating units requiring changes to normal operation

- (a) A *Network Service Provider* may, at intervals of not less than 12 months per *generating system*, require the testing by a *Generator* of any *generating unit connected* to the *network* of that provider in order to determine analytic

parameters for modelling purposes or to assess the performance of the relevant *generating unit* or *generating system* for the purposes of a *connection agreement*, and that provider is entitled to witness such tests.

- (b) If *AEMO* reasonably considers that:
 - (1) the analytic parameters for modelling of a *generating unit* or *generating system* are inadequate; or
 - (2) available information, including results from a previous test of a *generating unit* or *generating system*, are inadequate to determine parameters for an applicable model developed in accordance with the *Generating System Model Guidelines*, or otherwise agreed with *AEMO* under clause S5.2.4(c)(2),

AEMO may direct a *Network Service Provider* to require a *Generator* to conduct a test under paragraph (a), and *AEMO* may witness such a test.

- (c) Adequate notice of not less than 15 *business days* must be given by the *Network Service Provider* to the *Generator* before the proposed date of a test under paragraph (a).
- (d) The *Network Service Provider* must use its best endeavours to ensure that tests permitted under this clause 5.7.6 are conducted at a time which will minimise the departure from the *commitment* and *dispatch* that are due to take place at that time.
- (e) If not possible beforehand, a *Generator* must conduct a test under this clause 5.7.6 at the next scheduled *outage* of the relevant *generating unit* and in any event within 9 months of the request.
- (f) A *Generator* must provide any reasonable assistance requested by the *Network Service Provider* in relation to the conduct of tests.
- (f1) If requested by a *Network Service Provider* who required the test under clause 5.7.6(a), a *Generator* must provide to the *Network Service Provider* any relevant information relating to the *plant* which is the subject of a test carried out under this clause 5.7.6, including model source code provided to *AEMO* under clause S5.2.4(b)(6).
- (g) Tests conducted under this clause 5.7.6 must be conducted in accordance with test procedures agreed between the *Network Service Provider* and the relevant *Generator* and a *Generator* must not unreasonably withhold its agreement to test procedures proposed for this purpose by the *Network Service Provider*.
- (h) A *Generator* must provide the test records obtained from a test under paragraph (a) to the *Network Service Provider*, who must derive the analytical parameters for the applicable model developed in accordance with

the *Generating System Model Guidelines*, or otherwise agreed with AEMO under clause S5.2.4(c)(2) and provide them and any new or revised model source code to the relevant *Generator*.

- (i) The *Generator*, the *Network Service Provider* and AEMO must each bear its own costs associated with tests conducted under this clause 5.7.6 and no compensation is to be payable for financial losses incurred as a result of these tests or associated activities.

5.7.7 Inter-network power system tests

- (a) For each kind of development or activity described in the first column of chart 1 below, the *Proponent* is as set out in the second column and the *Relevant Transmission Network Service Provider* (“*Relevant TNSP*”) is as set out in the third column, respectively, opposite the description of the development or activity.

Chart 1

No.	Kind of development or activity	<i>Proponent</i>	<i>Relevant TNSP</i>
	column 1	column 2	column 3
1.	A new <i>transmission line</i> between two <i>networks</i> , or within a <i>transmission network</i> , that is anticipated to have a <i>material inter-network impact</i> is commissioned.	<i>Network Service Provider</i> in respect of the new <i>transmission line</i> .	<i>Proponent</i> and the <i>Transmission Network Service Provider</i> in respect of any <i>network</i> to which the <i>transmission line</i> is connected.
2.	An existing <i>transmission line</i> between two <i>networks</i> , or within a <i>transmission network</i> , that is anticipated to have a <i>material inter-network impact</i> is augmented or substantially modified.	<i>Network Service Provider</i> in respect of the <i>augmentation</i> or modification of the <i>transmission line</i> .	<i>Proponent</i> and the <i>Transmission Network Service Provider</i> in respect of any <i>network</i> to which the <i>transmission line</i> is connected.
3.	A new <i>generating unit</i> or <i>facility</i> of a <i>Customer</i> or a <i>network</i> development is commissioned that is anticipated to have a <i>material inter-network</i>	<i>Generator</i> in respect of the <i>generating unit</i> and associated <i>connection assets</i> . <i>Customer</i> in respect of the	<i>Transmission Network Service Provider</i> in respect of any <i>network</i> to which the <i>generating unit, facility</i> or <i>network</i> development is connected and, if a

No.	Kind of development or activity	<i>Proponent</i>	<i>Relevant TNSP</i>
	column 1	column 2	column 3
	<i>impact.</i>	<i>facility and associated connection assets.</i> <i>Network Service Provider in respect of the relevant network.</i>	<i>network development, then also the Proponent.</i>
4.	Setting changes are made to any <i>power system</i> stabilisers as a result of a <i>generating unit, facility of a Customer</i> or <i>network development</i> being commissioned, modified or replaced.	<i>Generator</i> in respect of the <i>generating unit.</i> <i>Customer</i> in respect of the <i>facility.</i> <i>Network Service Provider</i> in respect of the relevant <i>network.</i>	<i>Transmission Network Service Provider</i> in respect of any <i>transmission network</i> to which the <i>generating unit, facility</i> or <i>network development</i> is <i>connected.</i>
5.	Setting changes are made to any <i>power system</i> stabilisers as a result of a decision by <i>AEMO</i> , which are not covered by item 4 in this chart.	<i>AEMO.</i>	None.
6.	<i>AEMO</i> determines that a test is required to verify the performance of the <i>power system</i> in light of the results of planning studies or simulations or one or more system incidents.	<i>AEMO.</i>	None.

- (b) A *Registered Participant*, not being a *Transmission Network Service Provider*, determined in accordance with clause 5.7.7(a) to be a *Proponent* for a development or activity detailed in chart 1, may require the *Relevant TNSP* corresponding to that development or activity to undertake on their behalf their obligations as the *Proponent* and, where the *Relevant TNSP* receives a written request to undertake those obligations, the *Relevant TNSP* must do so.

- (c) Where, in this clause 5.7.7, there is a reference to a *Proponent* that reference includes a *Relevant TNSP* required in accordance with clause 5.7.7(b) to undertake the obligations of another *Registered Participant*.
- (d) If a *Relevant TNSP* is required by a *Registered Participant* in respect of a *scheduled generating unit*, a *semi-scheduled generating unit*, a *scheduled load* or a *market network service*, any of which have a *nameplate rating* in excess of 30 MW, to act as a *Proponent* in accordance with clause 5.7.7(b), that *Relevant TNSP* is entitled to recover all reasonable costs incurred from the *Registered Participant* that required the *Relevant TNSP* to act as the *Proponent*.
- (e) A *Registered Participant* wishing to undertake a development or conduct an activity listed in item 1, 2, 3 or 4 of chart 1 must notify *AEMO* not less than 80 *business days* before the *transmission line*, *generating unit*, *facility* or *network* development is planned to be commissioned, modified or replaced, giving details of the development or activity.
- (f) If *AEMO* receives a notice under clause 5.7.7(e), then it must provide a copy of the notice to each *jurisdictional planning representative* and consult with each *jurisdictional planning representative* about the potential impact of the development or activity.
- (g) *AEMO* or the *Relevant TNSP* for a development or activity may notify the *Proponent* of the development or activity that *AEMO* or the *Relevant TNSP* believes an *inter-network test* is required for that development or activity.
- (h) *AEMO* or the *Relevant TNSP* may only give a notice under clause 5.7.7(g) if:
 - (1) *AEMO* or the *Relevant TNSP* considers that the development or activity may have a material impact on the magnitude of the *power transfer capability* of more than one *transmission network* and, in the circumstances, an *inter-network test* is required; or
 - (2) an *inter-network test* is required having regard to guidelines *published* under clause 5.7.7(k) and the surrounding circumstances.
- (i) If the *Relevant TNSP* gives a notice under clause 5.7.7(g), then it must also promptly give a copy of the notice to *AEMO*.
- (j) A *Registered Participant* undertaking a development or activity listed in chart 1 must provide information reasonably requested by *AEMO* or the *Relevant TNSP* for making an assessment under this clause.
- (k) *AEMO* may develop, *publish* and amend from time to time, in accordance with the *Rules consultation procedures*, a set of guidelines to assist

Registered Participants to determine when an *inter-network test* may be required.

- (l) *AEMO* and the *Relevant TNSP* must consider any relevant guidelines in determining whether an *inter-network test* is required.
- (m) If *AEMO* or the *Relevant TNSP* gives notice under clause 5.7.7(g), then the *Proponent* must, in consultation with *AEMO*, prepare a draft *test program* for the *inter-network test* and provide it to *AEMO*, each *jurisdictional planning representative* and the *Relevant TNSP* (if the *Relevant TNSP* gave the notice).
- (n) However, if *AEMO* determines that an *inter-network test* is required for a reason contemplated in item 5 or 6 of chart 1, then it must prepare a draft *test program* for the *inter-network test* in consultation with the *jurisdictional planning representatives* and provide that draft *test program* to each *jurisdictional planning representative*.
- (o) If a *jurisdictional planning representative* considers that any changes should be made to a draft *test program*, the *jurisdictional planning representative* must, within 10 *business days* after being provided with the draft *test program*, make a recommendation to *AEMO* that identifies the changes it proposes should be made to the draft *test program*.
- (p) *AEMO* must:
 - (1) *publish* a copy of the draft *test program* and any relevant changes recommended by any *jurisdictional planning representative* and invite interested *Registered Participants* to make written submissions; and
 - (2) only accept as valid submissions received not later than the closing date for submissions specified in the notice *publishing* the copy of the draft *test program* (not to be less than 14 days after the date of *publication*); and
 - (3) provide the *jurisdictional planning representatives* with copies of all valid submissions and seek any further recommendations they may have.
- (q) *AEMO* must determine and *publish* in accordance with clause 3.13.13 the *test program* for an *inter-network test* after taking into account the recommendations of the *jurisdictional planning representatives* and any valid submissions received from *Registered Participants*.
- (r) In determining the *test program*, *AEMO* must so far as practicable have regard to the following principles:

- (1) *power system security* must be maintained in accordance with Chapter 4; and
 - (2) the variation from the *central dispatch* outcomes that would otherwise occur if there were no *inter-network test* should be minimised; and
 - (3) the duration of the tests should be as short as possible consistently with test requirements and *power system security*; and
 - (4) the test facilitation costs to be borne by the *Proponent* under paragraph (aa) should be kept to the minimum consistent with this paragraph.
- (s) **[Deleted]**
- (t) An *inter-regional test* must not be conducted within 20 *business days* after *AEMO publishes the test program* for the *inter-network test* determined by *AEMO* under clause 5.7.7(r).
- (u) The *Proponent* in respect of an *inter-network test* must seek to enter into agreements with other *Registered Participants* to provide the test facilitation services identified in the *test program* in order to ensure that the *power system* conditions required by the *test program* are achieved.
- (v) If the *Proponent* approaches another *Registered Participant* seeking to enter into an agreement under clause 5.7.7(u) then the *Proponent* and the *Registered Participant* must negotiate in good faith concerning the provision of the relevant test facilitation service.
- (w) If:
- (1) a *Proponent* approaches another *Registered Participant* as described in clause 5.7.7(v); and
 - (2) the *Proponent* and the other *Registered Participant* have not agreed the terms and conditions to be included in the agreement under which the *Registered Participant* will provide the test facilitation service requested within 15 *business days* of the approach,
- then those terms and conditions must be determined in accordance with rule 8.2 and a dispute of this type is deemed to fall within clause 8.2.5(c)(2).
- (x) If the dispute concerns the price which the *Proponent* is to pay for a test facilitation service, then it must be resolved applying the following principles:
- (1) the other *Registered Participant* is entitled to recover the costs it incurs, and a reasonable rate of return on the capital it employs, in

- providing the test facilitation service, determined taking into account the additional costs associated with:
- (i) maintaining the equipment necessary to provide the test facilitation service;
 - (ii) any labour required to operate and maintain the equipment used to provide the test facilitation service; and
 - (iii) any materials consumed when the test facilitation service is utilised; and
- (2) the other *Registered Participant* is entitled to be compensated for any commercial opportunities foregone by providing the test facilitation service.
- (y) When the terms and conditions are determined in accordance with rule 8.2 under this clause 5.7.7, then the *Proponent* and the other *Registered Participant* must enter into an agreement setting out those terms and conditions.
- (z) If *AEMO* is not the *Proponent* in respect of an *inter-network test*, the *Proponent* must:
- (1) prior to the scheduled date of the *inter-network test*, confirm to *AEMO* that the test facilitation services identified in the *test program* will be available to be utilised, who will be providing them and the operational arrangements for utilising them;
 - (2) provide sufficient information to enable *AEMO* to utilise the test facilitation services in conducting the *inter-network test*; and
 - (3) respond promptly to any queries *AEMO* raises with the *Proponent* concerning the availability of the test facilitation services and *AEMO's* ability to utilise those services in conducting the *inter-network tests*.
- (aa) The *Proponent* in respect of an *inter-network test* must bear all of the following costs associated with that *inter-network test*:
- (1) any amounts payable under an agreement under which test facilitation services are provided;
 - (2) the *Proponent's* own costs associated with the *inter-network test* and in negotiating and administering the agreements referred to in clause 5.7.7(u); and
 - (3) if the *Proponent* is not *AEMO* and the amount of *settlements residue* on any *directional interconnector* for a *trading interval* during which

there is an impact on *central dispatch* outcomes as a result of the *inter-network test* is negative, then the *Proponent* must enter into an agreement with *AEMO* to pay that amount to *AEMO*.

- (ab) If the *Proponent* is *AEMO* and the amount of *settlements residue* on any *directional interconnector* for a *trading interval* during which there is an impact on *central dispatch* outcomes as a result of the *inter-network test* is negative, then *AEMO* must adjust that residue to be zero and must recover the amount as provided for in clause 2.11.3(b)(2A).
- (ac) *AEMO* must establish operational conditions to achieve the particular *power transfer* levels for each stage of the *inter-network test* as contemplated by the *test program*:
 - (1) utilizing where practicable and economic to do so the test facilitation services identified in the *test program*; and
 - (2) otherwise, by applying to the minimum extent necessary to fulfil the test requirements, *inter-network testing constraints*.
- (ad) An *inter-network test* must be coordinated by an officer nominated by *AEMO* who has authority to stop the test or any part of it or vary the procedure within pre-approved guidelines determined by *AEMO* if that officer considers any of these actions to be reasonably necessary.
- (ae) Each *Registered Participant* must:
 - (1) cooperate with *AEMO* in planning, preparing for and conducting *inter-regional tests*;
 - (2) act in good faith in respect of, and not unreasonably delay, an *inter-network test*; and
 - (3) comply with any instructions given to it by *AEMO* under clause 5.7.7(af).
- (af) *AEMO* may utilise test facilitation services under agreements entered into by the *Proponent* under this clause 5.7.7 during an *inter-network test* in order to achieve operational conditions on the *power system* which are reasonably required to achieve valid test results.

5.8 Commissioning

5.8.1 Requirement to inspect and test equipment

- (a) A *Registered Participant* must ensure that any of its new or replacement equipment is inspected and tested to demonstrate that it complies with relevant *Australian Standards*, the *Rules* and any relevant *connection*

agreement prior to or within an agreed time after being *connected* to a *transmission network* or *distribution network*, and the relevant *Network Service Provider* is entitled to witness such inspections and tests.

- (b) The *Registered Participant* must produce test certificates on demand by the relevant *Network Service Provider* showing that the equipment has passed the tests and complies with the standards set out in clause 5.8.1(a) before *connection* to a *network*, or within an agreed time thereafter.

5.8.2 Co-ordination during commissioning

A *Registered Participant* seeking to *connect* to a *network* must co-operate with the relevant *Network Service Provider(s)* and *AEMO* to develop procedures to ensure that the commissioning of the *connection* and *connected facility* is carried out in a manner that:

- (a) does not adversely affect other *Registered Participants* or affect *power system security* or quality of *supply* of the *power system*; and
- (b) minimises the threat of damage to any other *Registered Participant's* equipment.

5.8.3 Control and protection settings for equipment

- (a) Not less than 3 months prior to the proposed commencement of commissioning by a *Registered Participant* of any new or replacement equipment that could reasonably be expected to alter performance of the *power system* (other than replacement by identical equipment), the *Registered Participant* must submit to the relevant *Network Service Provider* sufficient design information including proposed parameter settings to allow critical assessment including analytical modelling of the effect of the new or replacement equipment on the performance of the *power system*.
- (b) The *Network Service Provider* must:
 - (1) consult with other *Registered Participants* and *AEMO* as appropriate; and
 - (2) within 20 *business days* of receipt of the design information under clause 5.8.3(a), notify the *Registered Participant* and *AEMO* of any comments on the proposed parameter settings for the new or replacement equipment.
- (c) If the *Network Service Provider's* comments include alternative parameter settings for the new or replacement equipment, then the *Registered Participant* must notify the *Network Service Provider* that it either accepts

or disagrees with the alternative parameter settings suggested by the *Network Service Provider*.

- (d) The *Network Service Provider* and the *Registered Participant* must negotiate parameter settings that are acceptable to them both and if there is any unresolved disagreement between them, the matter must be referred to *AEMO* whose decision must be given within 20 *business days* of referral of the dispute and, once a decision is given, it is to be final.
- (e) The *Registered Participant* and the *Network Service Provider* must co-operate with each other to ensure that adequate grading of protection is achieved so that faults within the *Registered Participant's facility* are cleared without adverse effects on the *power system*.

5.8.4 Commissioning program

- (a) Prior to the proposed commencement of commissioning by a *Registered Participant* of any new or replacement equipment that could reasonably be expected to alter performance of the *power system*, the *Registered Participant* must advise the relevant *Network Service Provider* and *AEMO* in writing of the commissioning program including test procedures and proposed test equipment to be used in the commissioning.
- (b) Notice under clause 5.8.4(a) must be given not less than 3 months prior to commencement of commissioning for a *connection* to a *transmission network* and not less than 1 month prior to commencement of commissioning for a *connection* to a *distribution network*.
- (c) The relevant *Network Service Provider* and *AEMO* must, within 15 *business days* of receipt of such advice under clause 5.8.4(a), notify the *Registered Participant* either that they:
 - (1) agree with the proposed commissioning program; or
 - (2) require changes to it in the interest of maintaining *power system security*, safety or quality of *supply*.
- (d) If the relevant *Network Service Provider* or *AEMO* require changes to the proposed commissioning program, then the parties must co-operate to reach agreement and finalise the commissioning program within a reasonable period.
- (e) A *Registered Participant* must not commence the commissioning until the commissioning program has been finalised and the relevant *Network Service Provider* and *AEMO* must not unreasonably delay finalising a commissioning program.

5.8.5 Commissioning tests

- (a) The relevant *Network Service Provider* and/or *AEMO* has the right to witness commissioning tests relating to new or replacement equipment that could reasonably be expected to alter performance of the *power system* or the accurate *metering of energy*.
- (b) The relevant *Network Service Provider* must, within a reasonable period of receiving advice of commissioning tests, notify the *Registered Participant* whose new or replacement equipment is to be tested under this clause 5.8.5 whether or not it:
 - (1) wishes to witness the commissioning tests; and
 - (2) agrees with the proposed commissioning times.
- (c) A *Registered Participant* whose new or replacement equipment is tested under this clause 5.8.5 must submit to the relevant *Network Service Provider* the commissioning test results demonstrating that a new or replacement item of equipment complies with the *Rules* or the relevant *connection agreement* or both to the satisfaction of the relevant *Network Service Provider*.
- (d) If the commissioning tests conducted in relation to a new or replacement item of equipment demonstrates non-compliance with one or more requirements of the *Rules* or the relevant *connection agreement* then the *Registered Participant* whose new or replacement equipment was tested under this clause 5.8.5 must promptly meet with the *Network Service Provider* to agree on a process aimed at achievement of compliance of the relevant item with the *Rules*.
- (e) On request by a *Network Service Provider*, *AEMO* may direct that the commissioning and subsequent *connection* of the *Registered Participant's* equipment must not proceed if the relevant equipment does not comply with the requirements described in clause 5.8.1(a).

5.9 Disconnection and Reconnection

5.9.1 Voluntary disconnection

- (a) Unless agreed otherwise and specified in a *connection agreement*, a *Registered Participant* must give to the relevant *Network Service Provider* notice in writing of its intention to permanently *disconnect a facility* from a *connection point*.
- (b) A *Registered Participant* is entitled, subject to the terms of the relevant *connection agreement*, to require voluntary permanent *disconnection* of its equipment from a *network* in which case appropriate operating procedures

necessary to ensure that the *disconnection* will not threaten *power system security* must be implemented in accordance with clause 5.9.2.

- (c) The *Registered Participant* must pay all costs directly attributable to the voluntary *disconnection* and *decommissioning*.

5.9.2 Decommissioning procedures

- (a) In the event that a *Registered Participant's facility* is to be permanently *disconnected* from a *network*, whether in accordance with clause 5.9.1 or otherwise, the *Network Service Provider* and the *Registered Participant* must, prior to such *disconnection* occurring, follow agreed procedures for *disconnection*.
- (b) The *Network Service Provider* must notify *AEMO* and any *Registered Participants* with whom it has a *connection agreement* if it believes, in its reasonable opinion, the terms and conditions of such a *connection agreement* will be affected by procedures for *disconnection* or proposed procedures agreed with any other *Registered Participant*. The parties must negotiate any amendments to the procedures for *disconnection* or the *connection agreement* that may be required.
- (c) Any *disconnection* procedures agreed to or determined under clause 5.9.2(a) must be followed by all relevant *Network Service Providers* and *Registered Participants*.

5.9.3 Involuntary disconnection

- (a) *AEMO* may direct a *Network Service Provider* to, or a *Network Service Provider* may (either on its own initiative or in accordance with a direction from *AEMO*), *disconnect* a *Registered Participant's facilities* from a *network*, or a *Registered Participant's market loads*, in the following circumstances:
 - (1) pursuant to a direction for a *disconnection* made by a court under section 62 or 63 of the *National Electricity Law* or pursuant to regulations made under section 44AAG of the Trade Practices Act 1974 (Cth);
 - (2) during an emergency in accordance with clause 5.9.5;
 - (3) in accordance with the *National Electricity Law*; or
 - (4) in accordance with the provisions of the *Registered Participant's connection agreement*.
- (b) In all cases of *disconnection* by a *Network Service Provider* at *AEMO's* direction during an emergency in accordance with clause 5.9.5, *AEMO* must

undertake a review under clause 4.8.15 and *AEMO* must then provide a report to the *Registered Participant*, the *AEMC* and the *AER* advising of the circumstances requiring such action.

- (c) A *Network Service Provider* that has received a direction from *AEMO* under this clause 5.9.3 must comply with that direction promptly.

5.9.4 Direction to disconnect

- (a) Where a *disconnection* is made pursuant to clause 5.9.3(a)(1), neither *AEMO* nor the relevant *Network Service Provider* is liable in any way for any loss or damage suffered or incurred by the *Registered Participant* by reason of the *disconnection* and neither *AEMO* nor the relevant *Network Service Provider* is obliged for the duration of the *disconnection* to fulfil any agreement to convey electricity to or from the *Registered Participant's facility*.
- (b) A *Registered Participant* must not bring proceedings against *AEMO* or a *Network Service Provider* to seek to recover any amount for any loss or damage described in clause 5.9.4(a).
- (c) *Transmission service* charges and *distribution service* charges must be paid by a *Registered Participant* whose *facilities* have been *disconnected* under this clause 5.9.4 as if any *disconnection* had not occurred.
- (d) A *Network Service Provider* that has received a direction from *AEMO* to *disconnect* a *Registered Participant's facilities* in the circumstances described in clause 5.9.3(a)(1) must comply with that direction promptly.

5.9.4A Notification of disconnection

If the *AER* applies to a court for a direction, under section 62 or 63 of the *National Electricity Law* or pursuant to regulations made under section 44AAG of the *Trade Practices Act 1974 (Cth)*, that a *Registered Participant's market loads* be *disconnected*, the *AER* must promptly notify *AEMO* and the *participating jurisdictions* which the *AER* considers may be affected.

5.9.5 Disconnection during an emergency

- (a) Where *AEMO* may direct a *Network Service Provider* to *disconnect* a *Registered Participant's facilities* during an emergency under the *Rules* or otherwise, then *AEMO* may:
 - (1) require the relevant *Registered Participant* to reduce the *power transfer* at the proposed point of *disconnection* to zero in an orderly manner and then direct a *Network Service Provider* to *disconnect* the *Registered Participant's facility* by automatic or manual means; or

- (2) direct a *Network Service Provider* to immediately *disconnect* the *Registered Participant's facilities* by automatic or manual means where, in *AEMO's* reasonable opinion, it is not appropriate to follow the procedure set out in clause 5.9.5(a)(1) because action is urgently required as a result of a threat to safety of persons, hazard to equipment or a threat to *power system security*.
- (b) A *Network Service Provider* that has received a direction from *AEMO* under this clause 5.9.5 must comply with that direction promptly.

5.9.6 Obligation to reconnect

- (a) Either *AEMO* (by directing the *Network Service Provider*) or the relevant *Network Service Provider* (either on its own initiative or in accordance with a direction from *AEMO*) must reconnect a *Registered Participant's facilities* to a *transmission network* or *distribution network* at a reasonable cost to the *Registered Participant* as soon as practicable if:
 - (1) *AEMO* is reasonably satisfied that there no longer exists an emergency due to which the *Registered Participant's facilities* were *disconnected* under clause 5.9.5;
 - (2) *AEMO* is reasonably satisfied that there no longer exists a reason for the *disconnection* under the *National Electricity Law* or the *Registered Participant's connection agreement*;
 - (3) one of the following occurs:
 - (i) a breach of the *Rules* giving rise to the *disconnection* has been remedied;
 - (ii) where the breach is not capable of remedy, compensation has been agreed and paid by the *Registered Participant* to the affected parties or, failing agreement, the amount of compensation payable has been determined in accordance with the dispute resolution procedure in rule 8.2 and that amount has been paid;
 - (iii) where the breach is not capable of remedy and the amount of compensation has not been agreed or determined, assurances for the payment of reasonable compensation have been given to the satisfaction of *AEMO*, the *Network Service Provider* and the parties affected; or
 - (iv) the *Registered Participant* has taken all necessary steps to prevent the re-occurrence of the breach and has delivered binding undertakings to *AEMO* or the *Network Service Provider* that the breach will not re-occur.

- (b) In carrying out its obligations under clause 5.9.6(a), *AEMO* must, to the extent practicable, arrange for the implementation of an equitable sharing of the reconnection of *facilities* across *interconnected regions* up to the *power transfer capability* of the *network* and, in performing these obligations within a *region*, both *AEMO* and the relevant *Network Service Provider* must, to the extent practicable, give priority to reconnection of a *region's sensitive loads*.
- (c) A *Network Service Provider* that has received a direction from *AEMO* under this clause 5.9.6 must comply with that direction promptly.

Schedule 5.1a - System standards

S5.1a.1 Purpose

The purpose of this schedule is to establish *system standards* that:

- (a) are necessary or desirable for the safe and reliable operation of the *facilities of Registered Participants*;
- (b) are necessary or desirable for the safe and reliable operation of equipment;
- (c) could be reasonably considered *good electricity industry practice*; and
- (d) seek to avoid the imposition of undue costs on the industry or *Registered Participants*.

A *Registered Participant* should not, by virtue of this schedule, rely on *system standards* being fully complied with at a *connection point* under all circumstances. However, a *Registered Participant* should expect to be reasonably informed of circumstances where the standard of *supply* at its *connection points* will not conform to the *system standards*.

Except for standards of *frequency* and system stability, a *Registered Participant* should have the opportunity to negotiate or renegotiate relevant terms of a *connection agreement* (including relevant charges), to improve the standard of *supply* to the level of the *system standard*.

The *system standards* are set out below.

S5.1a.2 Frequency

The *frequency operating standards* are *system standards* and are as determined by the *Reliability Panel* and *published* by the AEMC.

S5.1a.3 System stability

The *power system* should remain in synchronism and be stable:

- (a) **Transient stability:** following any *credible contingency event*; and
- (b) **Oscillatory stability:** in the absence of any *contingency event*, for any level of *inter-regional* or *intra-regional* power transfer up to the applicable operational limit; and
- (c) **Voltage stability:** stable *voltage* control must be maintained following the most severe *credible contingency event*.

For the purposes of clause S5.1a.3 a *credible contingency event* includes the application of a fault (other than a three-phase fault) to any part of the *power system* and de-energisation of the faulted element within the allowable clearance time applicable to that element according to clause S5.1a.8.

The halving time of any *inter-regional* or *intra-regional* oscillation, being the time for the amplitude of an oscillation to reduce by half, should be less than 10 seconds. To allow for planning and operational uncertainties, the *power system* should be planned and operated to achieve a halving time of 5 seconds.

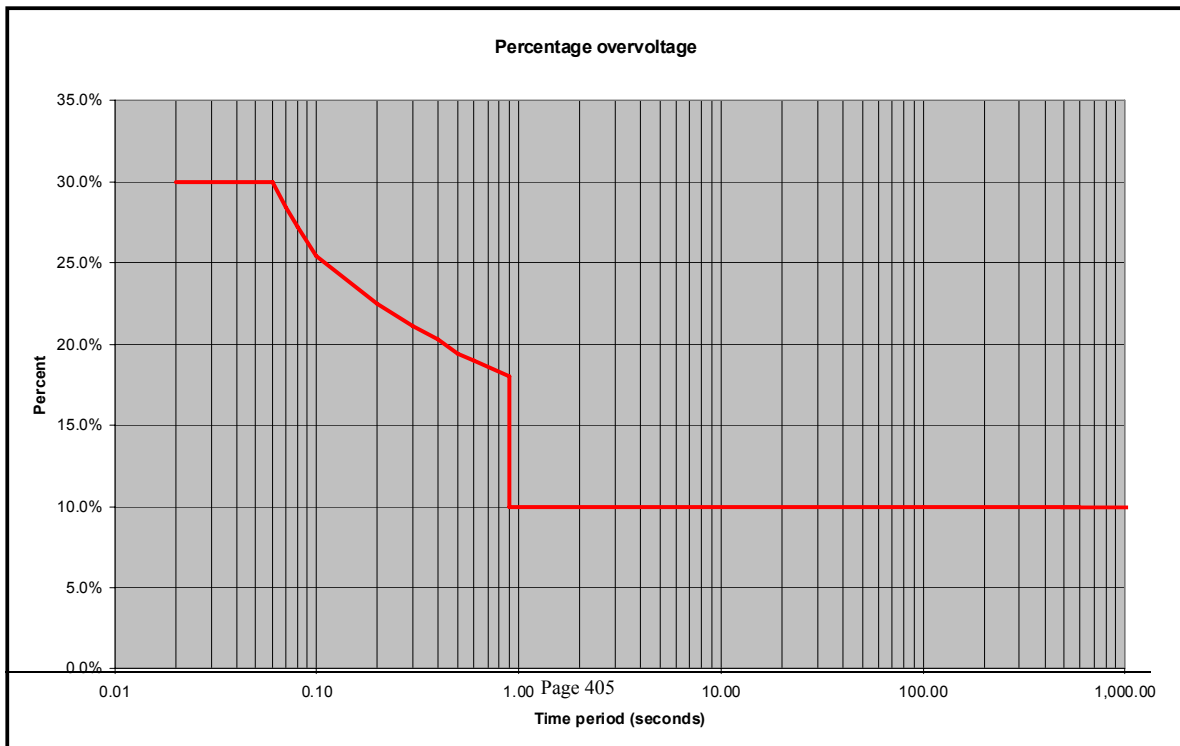
S5.1a.4 Power frequency voltage

Except as a consequence of a *contingency event*, the *voltage of supply* at a *connection point* should not vary by more than 10 percent above or below its *normal voltage*, provided that the *reactive power flow* and the *power factor* at the *connection point* is within the corresponding limits set out in the *connection agreement*.

As a consequence of a *credible contingency event*, the *voltage of supply* at a *connection point* should not rise above its *normal voltage* by more than a given percentage of *normal voltage* for longer than the corresponding period shown in Figure S5.1a.1 for that percentage.

As a consequence of a *contingency event*, the *voltage of supply* at a *connection point* could fall to zero for any period.

Figure S5.1a.1



S5.1a.5 Voltage fluctuations

The *voltage* fluctuation level of *supply* should be less than the "compatibility levels" set out in 1 of *Australian Standard AS/NZS 61000.3.7:2001*. To facilitate the application of this standard *Network Service Providers* must establish "planning levels" for their *networks* as provided for in the *Australian Standard*.

The following principles apply to the use of the shared network:

- (a) the sharing between *Network Users* of the capability of *connection assets* to withstand *voltage* fluctuations is to be managed by *Network Service Providers* in accordance with the provisions of clause S5.1.5 of schedule 5.1; and
- (b) to the extent practicable, the costs of managing or abating the impact of *voltage* fluctuations in excess of the costs which would result from the application of an *automatic access standard* are to be borne by those *Network Users* whose *facilities* cause the *voltage* fluctuations.

S5.1a.6 Voltage waveform distortion

Harmonic *voltage* distortion level of *supply* should be less than the "compatibility levels" defined in Table 1 of *Australian Standard AS/NZS 61000.3.6:2001*. To facilitate the application of this standard *Network Service Providers* must establish "planning levels" for their *networks* as provided for in the *Australian Standard*.

The following principles apply to the use of the shared network:

- (a) the sharing between *Network Users* of the capability of *connection assets* to absorb or mitigate harmonic *voltage* distortion is to be managed by *Network Service Providers* in accordance with the provisions of clause S5.1.6 of schedule 5.1; and
- (b) to the extent practicable, the costs of managing or abating the impact of harmonic distortion in excess of the costs which would result from the application of an *automatic access standard* are to be borne by those *Network Users* whose *facilities* cause the harmonic *voltage* distortion.

S5.1a.7 Voltage unbalance

Except as a consequence of a *contingency event*, the average *voltage* unbalance, measured at a *connection point*, should not vary by more than the amount set out in column 2 of Table S5.1a.1, when determined over a 30-minute averaging period.

As a consequence of a *credible contingency event*, the average *voltage* unbalance, measured at a *connection point*, should not vary by more than the amount set out

in column 3 of Table S5.1a.1, when determined over a 30-minute averaging period.

The average *voltage* unbalance, measured at a *connection point*, should not vary by more than the amount set out in column 4 of Table S5.1a.1 for the relevant nominal *supply voltage*, when determined over a 10-minute averaging period.

The average *voltage* unbalance, measured at a *connection point*, should not vary more often than once per hour by more than the amount set out in column 5 of Table S5.1a.1 for the relevant nominal *supply voltage*, when determined over a 1-minute averaging period.

For the purpose of this clause, *voltage* unbalance is measured as negative sequence voltage.

Table S5.1a.1

Nominal supply voltage (kV)	Maximum negative sequence voltage (% of nominal voltage)			
	Column 2	Column 3	Column 4	Column 5
Column 1	no contingency event	credible contingency event	general	once per hour
	30 minute average	30 minute average	10 minute average	1 minute average
	more than 100	0.5	0.7	1.0
more than 10 but not more than 100	1.3	1.3	2.0	2.5
10 or less	2.0	2.0	2.5	3.0

S5.1a.8 Fault clearance times

- (a) Faults anywhere within the *power system* should be cleared sufficiently rapidly that:
- (1) the *power system* does not become unstable as a result of faults that are *credible contingency events*;
 - (2) *inter-regional* or *intra-regional power transfers* are not unduly constrained; and

- (3) consequential equipment damage is minimised.
- (b) The *fault clearance time* of a primary *protection system* for a *short circuit fault* of any *fault type* anywhere:
- (1) within a *substation*;
 - (2) within *connected plant*; or
 - (3) on at least the half of a power line nearer to the *protection system*,
- should not exceed the relevant time in column 2 of Table S5.1a.2 for the nominal *voltage* that applies at the fault location.
- (c) The *fault clearance time* of a primary *protection system* for a *short circuit fault* of any *fault type* anywhere on the remote portion of a power line for which the near portion is protected by a primary *protection system* under clause S5.1a8(b) should not exceed the relevant time in column 3 of Table S5.1a.2 for the nominal *voltage* that applies at the fault location.
- (d) The *fault clearance time* of a *breaker fail protection system* or similar back-up *protection system* for a *short circuit fault* of any *fault type* should not exceed the relevant time in column 4 of Table S5.1a.2 for the nominal *voltage* that applies at the fault location.
- (e) The owner of the faulted element may require shorter *fault clearance times* to minimise *plant* damage.
- (f) The allowable *fault clearance times* specified in Table S5.1a.2 apply in accordance with the provisions of clause S5.1.9 to *facilities* constructed or modified on or after the *performance standards commencement date*.
- (g) For *facilities* other than those referred to in clause S5.1a.8(f), the applicable allowable *fault clearance times* must be derived by the relevant *Network Service Provider* from the existing capability of each *facility* on the *performance standards commencement date*.

Table S5.1a.2

Nominal voltage at fault location(kV)	Time(milliseconds)		
	Column 2	Column 3	Column 4
400kV and above	80	100	175
at least 250kV but less than 400kV	100	120	250
more than 100kV but less than 250kV	120	220	430

less than or equal 100 kV	As necessary to prevent <i>plant</i> damage and meet stability requirements
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Schedule 5.1 - Network Performance Requirements to be Provided or Co-ordinated by Network Service Providers

S5.1.1 Introduction

This schedule describes the planning, design and operating criteria that must be applied by *Network Service Providers* to the *transmission networks* and *distribution networks* which they own, operate or control. It also describes the requirements on *Network Service Providers* to institute consistent processes to determine the appropriate technical requirements to apply for each *connection* enquiry or *application to connect* processed by the *Network Service Provider* with the objective that all *connections* satisfy the requirements of this schedule.

The criteria and the obligations of *Registered Participants* to implement them, fall into two categories, namely:

- (a) those required to achieve adequate levels of *network power transfer capability* or quality of *supply* for the common good of all, or a significant number of, *Registered Participants*; and
- (b) those required to achieve a specific level of *network service* at an individual *connection point*.

A *Network Service Provider* must:

- (1) fully describe the quantity and quality of *network services* which it agrees to provide to a person under a *connection agreement* in terms that apply to the *connection point* as well as to the *transmission or distribution system* as a whole;
- (2) ensure that the quantity and quality of those *network services* are not less than could be provided to the relevant person if the *national grid* were planned, designed and operated in accordance with the criteria set out in this clause S5.1.1 and recognising that levels of service will vary depending on location of the *connection point* in the *network*; and
- (3) observe and apply the relevant provisions of the *system standards* in accordance with this schedule 5.1.

To the extent that this schedule 5.1 does not contain criteria which are relevant to the description of a particular *network service*, the *Network Service Provider* must describe the *network service* in terms which are fair and reasonable.

This schedule includes provisions for *Network Service Providers* and *Registered Participants* to negotiate the criteria to apply to a *connection* within defined ranges between a lower bound (*minimum access standard*) and an upper bound (*automatic access standard*). All criteria which are intended to apply to a

connection must be recorded in a *connection agreement*. Where it is intended to apply a *negotiated access standard* in accordance with clause 5.3.4A of the *Rules*, the *Network Service Provider* must first be satisfied that the application of the *negotiated access standard* will not adversely affect other *Registered Participants*.

S5.1.2 Network reliability

S5.1.2.1 Credible contingency events

Network Service Providers must plan, design, maintain and operate their *transmission networks* and *distribution networks* to allow the transfer of power from *generating units* to *Customers* with all *facilities* or equipment associated with the *power system* in service and may be required by a *Registered Participant* under a *connection agreement* to continue to allow the transfer of power with certain *facilities* or *plant* associated with the *power system* out of service, whether or not accompanied by the occurrence of certain faults (called “*credible contingency events*”).

The following *credible contingency events* and practices must be used by *Network Service Providers* for planning and operation of *transmission networks* and *distribution networks* unless otherwise agreed by each *Registered Participant* who would be affected by the selection of *credible contingency events*:

- (a) The *credible contingency events* must include the *disconnection* of any single *generating unit* or *transmission line*, with or without the application of a single circuit two-phase-to-ground solid fault on lines operating at or above 220 kV, and a single circuit three-phase solid fault on lines operating below 220 kV. The *Network Service Provider* must assume that the fault will be cleared in primary protection time by the faster of the duplicate protections with installed intertrips available. For existing *transmission lines* operating below 220 kV but above 66 kV a two-phase to earth fault criterion may be used if the modes of operation are such as to minimise the probability of three-phase faults occurring and operational experience shows this to be adequate, and provided that the *Network Service Provider* upgrades performance when the opportunity arises.
- (b) For lines at any *voltage* above 66 kV which are not protected by an overhead earth wire and/or lines with tower footing resistances in excess of 10 ohms, the *Network Service Provider* may extend the criterion to include a single circuit three-phase solid fault to cover the increased risk of such a fault occurring. Such lines must be examined individually on their merits by the relevant *Network Service Provider*.
- (c) For lines at any *voltage* above 66 kV a *Network Service Provider* must adopt operational practices to minimise the risk of slow fault clearance in

case of inadvertent closing on to earths applied to equipment for maintenance purposes. These practices must include but not be limited to:

- (1) Not leaving lines equipped with intertrips alive from one end during maintenance; and
 - (2) *Off-loading* a three terminal (tee connected) line prior to restoration, to ensure switch on to fault *facilities* are operative.
- (d) The *Network Service Provider* must ensure that all *protection systems* for lines at a *voltage* above 66 kV, including associated intertripping, are well maintained so as to be available at all times other than for short periods (not greater than eight hours) while the maintenance of a *protection system* is being carried out.

S5.1.2.2 Network service within a region

The following paragraphs of this section set out minimum standards for certain *network services* to be provided to *Registered Participants* by *Network Service Providers* within a *region*. The amount of *network* redundancy provided must be determined by the process set out in clause 5.6.2 of the *Rules* and is expected to reflect the grouping of *generating units*, their expected capacity factors and availability and the size and importance of *Customer* groups.

The standard of service to be provided at each *connection point* must be included in the relevant *connection agreement*, and must include a *power transfer capability* such as that which follows:

- (a) In the *satisfactory operating state*, the *power system* must be capable of providing the highest reasonably expected requirement for *power transfer* (with appropriate recognition of diversity between individual peak requirements and the necessity to withstand *credible contingency events*) at any time.
- (b) During the most critical single element *outage* the *power transfer* available through the *power system* may be:
 - (1) zero (single element *supply*);
 - (2) the defined capacity of a backup *supply*, which, in some cases, may be provided by another *Network Service Provider*;
 - (3) a nominated proportion of the normal *power transfer capability* (eg 70 percent); or
 - (4) the normal *power transfer capability* of the *power system* (when required by a *Registered Participant*).

In the case of clauses S5.1.2.2(b)(2) and (3) the available capacity would be exceeded sufficiently infrequently to allow maintenance to be carried out on each *network* element by the *Network Service Provider*. A *connection agreement* may state the expected proportion of time that the normal capability will not be available, and the capability at those times, taking account of specific design, locational and seasonal influences which may affect performance, and the random nature of element *outages*.

A *connection agreement* may also state a conditional *power transfer capability* that allows for both circuits of a double circuit line or two closely parallel circuits to be out of service.

S5.1.2.3 Network service between regions

The *power transfer capability* between *regions* must be determined by the process set out in rules 5.6 and 5.6A.

The following paragraphs of this section set out a framework within which *Network Service Providers* must describe to *AEMO* the levels of *network service* that apply for *power transfer* between *regions*. In cases where *power transfer capability* is determined by stability considerations on the *power system* (refer to clause S5.1.8 of this schedule) it is expected that line *outages* within *transmission networks* within a region will weaken the *network* so as to result in reduced *power transfer capability* even in the absence of *outages* of the lines between *regions*.

- (a) In the *satisfactory operating state* the *power transfer capability* between *regions* is defined by a multi-term equation for each *connection* between *regions* which takes account of all *power system* operating conditions which can significantly impact on performance. The majority of these operating conditions are the result of *market* operation and are outside the control of the *Network Service Provider*. In the *satisfactory operating state* the *network* must be planned by the *Network Service Provider* and operated by *AEMO* to withstand the impact of any *single contingency* with severity less than the *credible contingency events* stated in clause S5.1.2.1.
- (b) During critical single element *outages* reduced *power transfer capabilities* will apply. In those cases where *outage* of the remaining element will result in breaking of the *connection* between the *regions* *AEMO* must provide for the effect on *power system frequency* in the separate *transmission systems* following this event when determining the maximum *power transfer*.

S5.1.3 Frequency variations

A *Network Service Provider* must ensure that within the *extreme frequency excursion tolerance limits* all of its *power system* equipment will remain in service unless that equipment is required to be switched to give effect to *load shedding* in accordance with clause S5.1.10, or is required by *AEMO* to be switched for operational purposes.

Sustained operation outside the *extreme frequency excursion tolerance limits* need not be taken into account by *Network Service Providers* in the design of *plant* which may be *disconnected* if this is necessary for the protection of that *plant*.

S5.1.4 Magnitude of power frequency voltage

A *Transmission Network Service Provider* must plan and design its *transmission system* and equipment for control of *voltage* such that the minimum steady state *voltage* magnitude, the maximum steady state *voltage* magnitude and variations in *voltage* magnitude are consistent with the levels stipulated in clause S5.1a.4 of the *system standards*.

- (a) The *Network Service Provider* must determine the *automatic access standard* for the *voltage of supply* at the *connection point* such that the *voltage* may vary in accordance with clause S5.1a.4 of the *system standards*.
- (b) The *Network Service Provider* must determine the *minimum access standard* for the *voltage of supply* at the *connection point* such that the *voltage* may vary:
 - (1) as a consequence of a *credible contingency event* in accordance with clause S5.1a.4; and
 - (2) otherwise, between 95 percent and 105 percent of the target *voltage*.
- (c) For the purposes of clause S5.1.4(b) the target *voltage* must be determined as follows:
 - (1) if the *connection point* is connected to a *transmission line* (but not through a *transformer*), the *Network Service Provider* must determine the target *voltage* in consultation with AEMO taking into account the capability of existing *facilities* that are subject to that *supply voltage*; and
 - (2) otherwise, *Network Users* that share the same *supply voltage* must jointly determine the target *voltage* which may be specified to vary with aggregate *loading level*;

provided that at all times the *supply voltage* remains between 90 percent and 110 percent of the normal voltage determined in accordance with clause S5.1a.4 except as a consequence of a *contingency event*.

- (d) For the purposes of this clause, the *voltage of supply* is measured as the *RMS phase voltage*.

Where the independent control of *voltage* at the *connection point* is possible without adverse impact on *voltage* control at another *connection point*, the *Network Service Provider* must make reasonable endeavors to meet the request.

The target *voltage* and any agreement to a target range of *voltage* magnitude must be specified in the relevant *connection agreement*. The agreement may include a different target range in the *satisfactory operating state* and after a *credible contingency event* (and how these target ranges may be required to vary with *loading*).

A *Network Service Provider* must ensure that each *facility* that is part of its *transmission network* or *distribution network* is capable of continuous uninterrupted operation in the event that variations in *voltage* magnitude occur due to faults external to the *facility*. The design of a *facility* should anticipate the likely time duration and magnitude of variations in the power-frequency phase *voltages* which may arise dependent on the nature and location of the fault.

S5.1.5 Voltage fluctuations

A *Network Service Provider* must use reasonable endeavours to design and operate its *transmission system* or *distribution system* and include conditions in *connection agreements* in relation to the permissible variation with time of the power generated or load taken by a *Network User* to ensure that other *Network Users* are supplied with a power-frequency *voltage* which fluctuates to an extent that is less than the levels stipulated in accordance with the provisions of clause S5.1a.5 of the *system standards* and this clause S5.1.5.

In accordance with AS/NZS 61000.3.7:2001 and guidelines published by *Standards Australia* and applying the assumption that *Customers* will comply with their obligations under schedule 5.3, a *Network Service Provider* must determine “Planning Levels” for *connection points* on their *network* in order to maintain *voltage* fluctuation levels for all supply points to customers supplied from their *network* below the “Compatibility Levels” defined in Table 1 of AS/NZS 61000.3.7:2001.

The *Network Service Provider* must allocate emission limits in response to a *connection* enquiry or an *application to connect* and evaluate the acceptability for *connection* of fluctuating sources as follows:

- (a) *Automatic access standard*: the *Network Service Provider* must allocate emission limits no more onerous than the lesser of the acceptance levels determined in accordance with either of the stage 1 or the stage 2 evaluation procedures defined in AS/NZS 61000.3.7:2001.
- (b) *Minimum access standard*: subject to clause S5.1.5(c), the determination by the *Network Service Provider* of acceptable emission limits must be undertaken in consultation with the party seeking *connection* using the stage 3 evaluation procedure defined in AS/NZS61000.3.7:2001.
- (c) In respect of each new *connection* at a level of performance below the *automatic access standard* the *Network Service Provider* must include provisions in the relevant *connection agreement* requiring the *Network User*

if necessary to meet the *system standards* or allow connection of other *Network Users* to either upgrade to the *automatic access standard* or fund the reasonable cost of the works necessary to mitigate their effect of connecting at a standard below the *automatic access standard*.

- (d) If for existing customer *connections* the level of *voltage* fluctuation is, or may be, exceeded as a result of a proposed new *connection*, the *Network Service Provider* must, if the cause of that excessive level cannot be remedied by enforcing the provisions of existing *connection agreements*, undertake all reasonable works necessary to meet the technical standards in this schedule or to permit the proposed new *connection* within the requirements stated in this clause.

For other than a new *connection* in accordance with the preceding paragraph, the responsibility of a *Network Service Provider* for excursions in *voltage* fluctuations above the levels defined above is limited to *voltage* fluctuations caused by *network plant* and the pursuit of all reasonable measures available under the *Rules* and its *connection agreements*.

S5.1.6 Voltage harmonic or voltage notching distortion

A *Network Service Provider* must use reasonable endeavours to design and operate its *network* and include conditions in *connection agreements* to ensure that the effective harmonic *voltage* distortion at any point in the *network* will be limited to less than the levels stipulated in accordance with the provisions of clause S5.1a.6 of the *system standards* and this clause S5.1.6.

In accordance with AS/NZS 61000.3.6:2001 and guidelines published by *Standards Australia* and applying the assumption that *Customers* will comply with their obligations under schedule 5.3 *Network Service Providers* must determine “Planning Levels” for *connection points* on their *network* in order to maintain harmonic *voltage* distortion for all supply points to customers supplied from their *network* below the “Compatibility Levels” defined in Table 1 of AS/NZS 61000.3.6:2001.

The *Network Service Provider* must allocate emission limits to a connection enquiry or an *application to connect* and must evaluate the acceptability for *connection* of distorting sources as follows:

- (a) *Automatic access standard*: the *Network Service Provider* must allocate emission limits no more onerous than the lesser of the acceptance levels determined in accordance with either of the stage 1 or the stage 2 evaluation procedures defined in AS/NZS 61000.3.6:2001.
- (b) *Minimum access standard*: subject to clause S5.1.6(c), the determination by the *Network Service Provider* of acceptable emission limits must be undertaken in consultation with the party seeking *connection* using the Stage 3 evaluation procedure defined in AS/NZS61000.3.6:2001.

- (c) In respect of each new *connection* at a level of performance below the *automatic access standard* the *Network Service Provider* must include provisions in the relevant *connection agreement* requiring the *Network User* if necessary to meet the *system standards* or allow connection of other *Network Users* to either upgrade to the *automatic access standard* or fund the reasonable cost of the works necessary to mitigate their effect of connecting at a standard below the *automatic access standard*.
- (d) If for existing customer *connections* the level of harmonic *voltage* distortion is, or may be, exceeded as a result of a proposed new *connection*, the *Network Service Provider* must, if the cause of that excessive level cannot be remedied by enforcing the provisions of existing *connection agreements*, undertake all works necessary to meet the technical standards in this schedule or to permit a proposed new *connection* within the *automatic access standard* defined in clause S5.3.8 and the requirements stated in this clause.

For other than a new *connection* in accordance with the preceding paragraph, the responsibility of a *Network Service Provider* for harmonic *voltage* distortion outside the range defined above is limited to harmonic *voltage* distortion caused by *network plant* and the pursuit of all measures available under the *Rules* and its *connection agreements*.

S5.1.7 Voltage unbalance

- (a) A *Transmission Network Service Provider* must balance the effective impedance of the phases of its *network*, and a *Distribution Network Service Provider* must balance the current drawn in each phase at each of its *connection points*, so as to achieve average levels of negative sequence *voltage* at all *connection points* that are equal to or less than the values set out in Table S5.1a.1 as determined in accordance with the accompanying provisions of clause S5.1a.7 of the *system standards*.
- (b) A *Network Service Provider* must include conditions in *connection agreements* to ensure that a *Connection Applicant* will balance the current drawn in each phase at each of its *connection points* so as to achieve:
 - (1) for those *Network Users* listed in clause S5.3(a): the levels permitted in accordance with clause S5.3.6 of schedule 5.3;
 - (2) for *Market Network Service Providers*: the levels permitted in accordance with clause S5.3a.9 of schedule 5.3a;
 - (3) otherwise: the average levels of negative sequence *voltage* at each of its *connection points* that are equal to or less than the values set out in Table S5.1a.1 and the accompanying provisions of clause S5.1a.7 of the *system standards*.

The responsibility of the *Network Service Provider* for *voltage* unbalance outside the ranges defined above is limited to *voltage* unbalance caused by the *network* and the pursuit of all measures available under the *Rules* and its *connection agreements*.

(c) A *Network Service Provider* must include conditions in *connection agreements* to ensure that each *Generator* will balance:

- (1) the *voltage generated* in each phase of its *generating system*; and
- (2) when not generating, the current drawn in each phase,

in order to achieve average levels of negative sequence *voltage* at each of the *generating system connection points* due to phase imbalances within the *generating plant* that are not more than the values determined by the *Network Service Provider* to achieve average levels of negative sequence *voltage* at the *connection points* of other *Network Users* in accordance with clause S5.1a.7.

(d) When including conditions under paragraph (c), the *Network Service Provider* must have regard to the capabilities of the relevant *generating plant* technology.

S5.1.8 Stability

In conforming with the requirements of the *system standards*, the following criteria must be used by *Network Service Providers* for both planning and operation:

For stable operation of the *national grid*, both in a *satisfactory operating state* and following any *credible contingency events* described in clause S5.1.2.1:

- (a) the *power system* will remain in synchronism;
- (b) damping of *power system* oscillations will be adequate; and
- (c) *voltage* stability criteria will be satisfied.

Damping of *power system* oscillations must be assessed for planning purposes according to the design criteria which states that *power system damping* is considered adequate if after the most critical *credible contingency event*, simulations calibrated against past performance indicate that the halving time of the least damped electromechanical mode of oscillation is not more than five seconds.

To assess the damping of *power system* oscillations during operation, or when analysing results of tests such as those carried out under clause 5.7.7 of the *Rules*, the *Network Service Provider* must take into account statistical effects. Therefore, the *power system damping* operational performance criterion is that at a given

operating point, real-time monitoring or available test results show that there is less than a 10 percent probability that the halving time of the least damped mode of oscillation will exceed ten seconds, and that the average halving time of the least damped mode of oscillation is not more than five seconds.

The *voltage* control criterion is that stable *voltage* control must be maintained following the most severe *credible contingency event*. This requires that an adequate *reactive power* margin must be maintained at every *connection point* in a *network* with respect to the *voltage* stability limit as determined from the *voltage/reactive load* characteristic at that *connection point*. Selection of the appropriate margin at each *connection point* is at the discretion of the relevant *Network Service Provider*, subject only to the requirement that the margin (expressed as a capacitive *reactive power* (in MVar)) must not be less than one percent of the maximum fault level (in MVA) at the *connection point*.

In planning a *network* a *Network Service Provider* must consider *non-credible contingency events* such as *busbar* faults which result in tripping of several circuits, uncleared faults, double circuit faults and multiple contingencies which could potentially endanger the stability of the *power system*. In those cases where the consequences to any *network* or to any *Registered Participant* of such events are likely to be severe disruption a *Network Service Provider* and/or a *Registered Participant* must install emergency controls within the *Network Service Provider's* or *Registered Participant's* system or in both, as necessary, to minimise disruption to any *transmission* or *distribution network* and to significantly reduce the probability of cascading failure.

A *Registered Participant* must co-operate with a *Network Service Provider* to achieve stable operation of the *national grid* and must use all reasonable endeavours to negotiate with the *Network Service Provider* regarding the installation of emergency controls as described in the previous paragraph. The cost of installation, maintenance and operation of the emergency controls must be borne by the *Network Service Provider* who is entitled to include this cost when calculating the *Transmission Customer use of system* price.

S5.1.9 Protection systems and fault clearance times

Network Users

- (a) A *Network Service Provider* must determine the *automatic access standard* and *minimum access standard* that applies to the protection zone of each *protection system* in relation to the *connection point* and the *plant* to be *connected*, as follows:
 - (1) The *automatic access standard* for *fault clearance time* for any *fault type* is the lesser of the *system standard* set out in clause S5.1a.8 that applies to the highest nominal *voltage* within the *protection system's* protection zone and the corresponding *minimum access standard*

determined under clause S5.1.9(a)(2) or clause S5.1.9(a)(3) as applicable.

- (2) The *minimum access standard* for *fault clearance time* of a primary *protection system* is:
 - (i) for a *fault type* that constitutes a *credible contingency event* in the relevant protection zone, the longest time such that a *short circuit fault* of that *fault type* that is cleared in that time would not cause the *power system* to become unstable when operating at any level of *inter-regional* or *intra-regional power transfer* that would be permissible (taking into account all other limiting criteria) if the *fault clearance time* for such a *fault* at the *connection point* were the *system standard* set out in clause S5.1a.8 that applies to the nominal *voltage* at the *connection point*; and
 - (ii) for a *fault type* that does not constitute a *credible contingency event* in the relevant protection zone:
 - (A) if a two phase to ground fault in that protection zone constitutes a *credible contingency event*, the corresponding *fault clearance time* for a two phase to ground *short circuit fault* in that protection zone as determined under clause S5.1.9(a)(2)(i); and
 - (B) otherwise, the shortest of the *fault clearance times* for a two phase to ground *short circuit fault* in each adjoining protection zone (excluding *transformer* protection zones and dead zones) as determined under clause S5.1.9(a)(2)(i) or clause S5.1.9(e).
- (3) The *minimum access standard* for *fault clearance time* of a *breaker fail protection system* or similar back-up *protection system* is the longest time such that a *short circuit fault* of any *fault type* that is cleared in that time—would not damage any part of the *power system* (other than the faulted element) while the fault current is flowing or being interrupted.

- (b) The negotiation of access standards in relation to paragraph (a) must involve *AEMO* under clause 5.3.4A(c) of the *Rules*.

Transmission systems and distribution systems

- (c) Subject to clauses S5.1.9(k) and S5.1.9(l), a *Network Service Provider* must provide sufficient primary *protection systems* and back-up *protection systems* (including *breaker fail protection systems*) to ensure that a fault of any *fault type* anywhere on its *transmission system* or *distribution system* is

automatically *disconnected* in accordance with clause S5.1.9(e) or clause S5.1.9(f).

- (d) If the *fault clearance time* determined under clause S5.1.9(e) of a primary *protection system* for a two phase to ground *short circuit fault* is less than 10 seconds, the primary *protection system* must have sufficient redundancy to ensure that it can clear *short circuit faults* of any *fault type* within the relevant *fault clearance time* with any single protection element (including any communications facility upon which the *protection system* depends) out of service.
- (e) The *fault clearance time* of a primary *protection system* of a *Network Service Provider* must not exceed:
 - (1) for any *fault type* that constitutes a *credible contingency event* in the relevant protection zone, the longest time such that a *short circuit fault* of that *fault type* that is cleared in that time would not cause the *power system* to become unstable when operating at any level of *inter-regional* or *intra-regional power transfer* that would be permissible (taking into account all other limiting criteria) if the *fault clearance time* for such a fault in that protection zone were the relevant *system standard* set out in clause S5.1a.8; and
 - (2) for any *fault type* that does not constitute a *credible contingency event* in the relevant protection zone:
 - (i) if a two phase to ground fault in that protection zone is a *credible contingency event*, the corresponding *fault clearance time* for a two phase to ground fault in that protection zone as determined under clause S5.1.9(e)(1); and
 - (ii) otherwise, the shortest of the *fault clearance times* for a two phase to ground fault in each adjoining protection zone (excluding *transformer* protection zones and dead zones) as determined under clauses S5.1.9(a)(2)(i), S5.1.9(e)(1) or S5.1.9(e)(2)(i).
- (f) The *fault clearance time* of each *breaker fail protection system* or similar back-up *protection system* of a *Network Service Provider* must be such that a *short circuit fault* of any *fault type* that is cleared in that time would not damage any part of the *power system* (other than the faulted element) while the fault current is flowing or being interrupted.
- (g) A *Network Service Provider* must demonstrate to AEMO that each *fault clearance time* for a primary *protection system* that is longer than the relevant *system standard* set out in clause S5.1a.8 and is less than 10 seconds would not cause or require an *inter-regional* or *intra-regional power transfer capability* to be reduced.

-
- (h) A *Network Service Provider* must include in each *connection agreement* entered into after the *performance standards commencement date*:
- (1) the *fault clearance times* for each *fault type* of each of its *protection systems* that could reasonably be expected to interrupt *supply* to or from the relevant *connection point*; and
 - (2) an agreement to not increase those *fault clearance times* without the prior written agreement of the other party.
- (i) *Network Service Providers* must coordinate and cooperate with *Network Users* to implement *breaker fail* protection for circuit breakers provided to isolate the *Network User's facility* from the *Network Service Provider's facilities*.
- (j) Where practicable and economic to achieve, new network investment should meet the *system standard* for *fault clearance times* as specified in clause S5.1a.8 for two phase to ground *short circuit faults*.
- (k) A primary *protection system* may clear faults other than *short circuit faults* slower than the relevant *fault clearance time*, provided that such faults would be cleared sufficiently promptly to not adversely impact on *power system security* compared with its operation for the corresponding *short circuit fault*. In the case of a fault within equipment at a station, the corresponding *short circuit fault* is to be taken as a two phase to ground *short circuit fault* at the external connections of the equipment.
- (l) *Protection systems* may rely on *breaker fail protection systems* or other back-up *protection systems* to completely clear faults of any *fault type* that:
- (1) occur within a *substation* between a protection zone and a circuit breaker adjacent to that protection zone that is required to open to clear the fault (a “dead zone”); and
 - (2) remain connected through a power line or *transformer* after operation of a primary *protection system*,
- provided that the relevant *Network Service Provider* assesses that the likelihood of a fault occurring within the dead zone is not greater than the likelihood of a fault occurring on *busbars*.
- (m) For the purposes of this clause S5.1.9, a *credible contingency event* includes any event that clause S5.1.2.1 requires a *Network Service Provider* to consider as a *credible contingency event*.
- (n) The provisions of clause S5.1.9(d) apply to *facilities* constructed or modified on or after the *performance standards commencement date*.

- (o) For *facilities* other than those referred to in clause S5.1.9(n), the requirement for primary *protection system* redundancy must be derived by the *Network Service Provider* from the existing capability of each *facility* on the *performance standards commencement date*.

S5.1.10 Load and network control facilities

S5.1.10.1 General

Each *Network Service Provider* in consultation with *AEMO* must ensure that:

- (a) sufficient *load* is under the control of underfrequency relays where required to ensure that in the event of the sudden, unplanned simultaneous occurrence of multiple *contingency events*, the *power system frequency* does not move outside the *extreme frequency excursion tolerance limits*;
- (b) where determined to be necessary, sufficient *load* is under the control of undervoltage relays to minimize or reduce the risk of voltage collapse on the occurrence of multiple *contingency events*; and
- (c) there is sufficient *load* under manual or automatic control either locally or from remotely located *control centres* to allow the *load shedding procedures* to be implemented on instruction from *AEMO* to enable *AEMO* to maintain *power system security*.

A *Network Service Provider* may require *load shedding* arrangements to be installed to cater for abnormal operating conditions.

Arrangements for *load shedding* must be agreed between *Transmission Network Service Providers* and *connected Distribution Network Service Providers* and may include the opening of circuits in either a *transmission* or *distribution network*.

The *Transmission Network Service Provider* must specify, in the *connection agreement*, control and monitoring requirements to be provided by a *Distribution Network Service Provider* for *load shedding facilities*.

S5.1.10.2 Distribution Network Service Providers

A *Distribution Network Service Provider* must:

- (a) provide, install, operate and maintain *facilities* for *load shedding* in respect of any *connection point* at which the maximum *load* exceeds 10MW in accordance with clause 4.3.5 of the *Rules*;
- (b) in accordance with the provisions of the relevant *connection agreement*, co-operate with the *Transmission Network Service Providers* in conducting periodic functional testing of the *facilities*, which must not require *load* to be *disconnected*;

- (c) apply underfrequency settings to relays as determined by *AEMO* in consultation with the *Network Service Provider*; and
- (d) apply undervoltage settings to relays as notified by the *Transmission Network Service Provider* in accordance with clause S5.1.10.3(b).

S5.1.10.3 Transmission Network Service Providers

Transmission Network Service Providers must:

- (a) conduct periodic functional tests of the *load shedding facilities*; and
- (b) notify *Distribution Network Service Providers* regarding the settings of undervoltage *load shed* relays as determined by *AEMO* in consultation with the *Transmission Network Service Provider*.

S5.1.11 Automatic reclosure of transmission or distribution lines

Where *automatic reclose equipment* is provided on *transmission lines* or *distribution lines*, check or blocking *facilities* must be applied to the *automatic reclose equipment* in those circumstances where there is any possibility of the two ends of the *transmission line* or *distribution line* being *energised* from sources that are not in synchronism.

S5.1.12 Rating of transmission lines and equipment

For operational purposes each *Network Service Provider* must, on reasonable request, advise *AEMO* of the maximum current that may be permitted to flow (under conditions nominated by *AEMO*) through each *transmission line*, *distribution line* or other item of equipment that forms part of its *transmission system* or *distribution system*.

This maximum current is called a “*current rating*” of the *transmission line*, *distribution line* or item of equipment notwithstanding that it may be determined by equipment associated with its *connection* to the *power system* (including switchgear, droppers, current *transformers* and *protection systems*).

AEMO may request for a *transmission line*, *distribution line* or other item of equipment:

- (a) a continuous *current rating*, being the level of current that is permitted to flow in that item of equipment for an indefinite period; and
- (b) one or more short term *current ratings* for a period of time nominated by *AEMO* after consultation with the *Network Service Provider*, being the level of current that is permitted to flow in that item of equipment for that period of time if the current had been less than the corresponding continuous

current rating for a reasonable prior period taking into account the thermal properties of the item of equipment.

The *Network Service Provider* may be required by *AEMO* to advise different *current ratings* to be applied under nominated conditions including, without limitation:

- (a) ambient weather conditions;
- (b) seasons and/or times of *day*;
- (c) ratios of the current during an emergency to the current prior to the emergency (taking into account pre-contingent loading history where applicable); and
- (d) period of loading at the nominated level.

A *Transmission Network Service Provider* is entitled to advise *AEMO* of short term *current ratings* which may apply for nominated periods of time to the relevant *transmission line* or item of equipment provided that these ratings do not materially affect the safety of the *transmission line* or item of equipment, or the safety of persons. Short-term ratings for *transmission lines* or items of equipment may be implemented by a methodology or algorithm in a format agreed with *AEMO*.

S5.1.13 Information to be provided

A *Network Service Provider* must, in response to a *connection* enquiry or an *application to connect* made in accordance with clause 5.3.2 of the *Rules*, provide the *connection applicant* electrical design information relevant to the nominal point of *connection* in accordance with a relevant requirement of schedules 5.2, 5.3 or 5.3a.

Schedule 5.2 - Conditions for Connection of Generators

S5.2.1 Outline of requirements

- (a) This schedule sets out details of additional requirements and conditions that *Generators* must satisfy as a condition of *connection* of a *generating system* to the *power system*.
- (b) This schedule does not apply to any *generating system* that is:
 - (1) subject to an exemption from registration under clause 2.2.1(c); or
 - (2) eligible for exemption under any guidelines issued under clause 2.2.1(c),and which is *connected* or intended for use in a manner the *Network Service Provider* considers is unlikely to cause a material degradation in the quality of *supply* to other *Network Users*.
- (c) This schedule also sets out the requirements and conditions which subject to clause 5.2.5 of the *Rules*, are obligations on *Generators*:
 - (1) to co-operate with the relevant *Network Service Provider* on technical matters when making a new *connection*; and
 - (2) to provide information to the *Network Service Provider* or *AEMO*.
- (d) The equipment associated with each *generating system* must be designed to withstand without damage the range of operating conditions which may arise consistent with the *system standards*.
- (e) *Generators* must comply with the *performance standards* and any attached terms or conditions of agreement agreed with the *Network Service Provider* or *AEMO* in accordance with a relevant provision of schedules 5.1a or 5.1.
- (f) This schedule does not set out arrangements by which a *Generator* may enter into an agreement or contract with *AEMO* to:
 - (1) provide additional services that are necessary to maintain *power system security*; or
 - (2) provide additional services to facilitate management of the *market*.
- (g) This schedule provides for *automatic access standards* and the determination of *negotiated access standards* derived from *minimum access standards* which once determined, must be recorded together with the *automatic access standards* in a *connection agreement* and registered with *AEMO* as *performance standards*.

S5.2.2 Application of Settings

A *Generator* must only apply settings to a *control system* or a *protection system* that are necessary to comply with performance requirements of this schedule 5.2 if the settings have been approved in writing by the relevant *Network Service Provider* and, if the requirement is one that would involve *AEMO* under clause 5.3.4A(c) of the *Rules*, also by *AEMO*. A *Generator* must not allow its *generating unit* to *supply* electricity to the *power system* without such prior approval.

If a *Generator* seeks approval from the *Network Service Provider* to apply or change a setting, approval must not be withheld unless the *Network Service Provider* or, if the requirement is one that would involve *AEMO* under clause 5.3.4A(c) of the *Rules*, *AEMO*, reasonably determines that the changed setting would cause the *generating unit* to not comply with the relevant *performance standard* or cause an *inter-regional* or *intra-regional power transfer capability* to be reduced.

If the *Network Service Provider* or, if the requirement is one that would involve *AEMO* under clause 5.3.4A(c) of the *Rules*, *AEMO*, reasonably determines that a setting of a *generating unit's control system* or *protection system* needs to change to comply with the relevant *performance standard* or to maintain or restore an *inter-regional* or *intra-regional power transfer capability*, the *Network Service Provider* or *AEMO* (as applicable) must consult with the relevant *Generator*, and the *Network Service Provider* may request in writing that a setting be applied in accordance with the determination.

The *Network Service Provider* may also request a test to verify the performance of the relevant *plant* with the new setting. The *Network Service Provider* must provide *AEMO* with a copy of its request to a *Generator* to apply a setting or to conduct a test.

A *Generator* who receives such a request must arrange for the notified setting to be applied as requested and for a test to be conducted as requested. After the test, the *Generator* must, on request, provide both *AEMO* and the *Network Service Provider* with a report of a requested test, including evidence of its success or failure. Such a report of a test is *confidential information*.

A *Generator* must not change a setting requested by the *Network Service Provider* without its prior written agreement. If the *Network Service Provider* requires a *Generator* to change a setting within 18 months of a previous request, the *Network Service Provider* must pay the *Generator* its reasonable costs of changing the setting and conducting the tests as requested.

S5.2.3 Technical matters to be coordinated

- (a) A *Generator* and the relevant *Network Service Provider* must use all reasonable endeavours to agree upon relevant technical matters in respect of

each new or altered *connection* of a *generating system* to a *network* including:

- (1) design at the *connection point*;
- (2) physical layout adjacent to the *connection point*;
- (3) primary protection and backup protection (clause S5.2.5);
- (4) control characteristics (clause S5.2.5);
- (5) communications *facilities* (clause S5.2.6);
- (6) insulation co-ordination and lightning protection (paragraph (b));
- (7) fault levels and fault clearance (clause S5.2.8);
- (8) switching and *isolation* facilities (clause S5.2.8);
- (9) interlocking and *synchronising* arrangements; and
- (10) *metering installations*.

(b) A *Generator* must ensure that in designing a *generating system's* electrical *plant*, including any *substation* for the *connection* of the *generating system* to the *network*, to operate at the same *nominal voltage* as at the *connection point*:

- (1) the *plant* complies with the relevant *Australian Standards* unless a provision of these *Rules* allows or requires otherwise;
- (2) the earthing of the *plant* complies with the ENA EG1-2006: Substation Earthing Guide to reduce step and touch potentials to safe levels;
- (3) the *plant* is capable of withstanding, without damage the *voltage* impulse levels specified in the *connection agreement*;
- (4) the insulation levels of the *plant* are co-ordinated with the insulation levels of the *network* to which the *generating system* is *connected* as specified in the *connection agreement*; and
- (5) safety provisions in respect of the *plant* comply with requirements applicable to the *participating jurisdiction* in which the *generating system* is located, as notified by the *Network Service Provider*.

(c) If no relevant *Australian Standard* exists for the purposes of paragraph (b)(1), the *Generator* must agree with the *Network Service Provider* for the *Generator* to comply with another relevant standard.

S5.2.4 Provision of information

- (a) A *Generator* or person who is negotiating a *connection agreement* with a *Network Service Provider* must promptly on request by *AEMO* or the *Network Service Provider* provide all data in relation to that *generating system* specified in schedule 5.5.
- (b) A *Generator*, or person required under the *Rules* to register as the *Generator* in respect of a *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more, by the earlier of:
 - (1) the day on which an *application to connect* is made under clause 5.3.4(a);
 - (2) the day on which amendments to *performance standards* are submitted under rule 4.14(p) or clause 5.3.9(b);
 - (3) three months before commissioning of a *generating system* or planned alteration to a *generating system*; or
 - (4) 5 *business days* before commissioning of a *generating system* alteration that is repairing *plant* after a *plant failure*, if *plant* performance after the alteration will differ from performance prior to the *plant failure*,

must provide:

- (5) to *AEMO* and the relevant *Network Service Providers* (including the relevant *Transmission Network Service Provider* in respect of an *embedded generating unit*) the following information about the *control systems* of the *generating system*:
 - (i) a set of functional block diagrams, including all functions between feedback signals and *generating system* output;
 - (ii) the parameters of each functional block, including all settings, gains, time constants, delays, deadbands and limits; and
 - (iii) the characteristics of non-linear elements,with sufficient detail for *AEMO* and *Network Service Providers* to perform load flow and dynamic simulation studies;
- (6) to *AEMO*, model source code associated with the model in subparagraph (5) in an unencrypted form suitable for at least one of the software simulation products nominated by *AEMO* and in a form that would allow conversion for use with other software simulation products by *AEMO*;

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- (7) **[Deleted]**
- (8) to *AEMO* and the relevant *Network Service Providers* (including the relevant *Transmission Network Service Provider* in respect of an *embedded generating unit*) a *releasable user guide*.
- (c) The information provided under paragraph (b) must:
- (1) encompass all *control systems* that respond to *voltage* or *frequency* disturbances on the *power system*, and which are either integral to the *generating units* or otherwise part of the *generating system*, including those applying to *reactive power* equipment that forms part of the *generating system*; and
 - (2) conform with the applicable models developed in accordance with the *Generating System Model Guidelines*, or an alternative model agreed with *AEMO* to be necessary to adequately represent the *generating plant* to carry out load flow and dynamic simulations.
- (d) The *Generator* must provide to *AEMO* information that updates the information provided under clause S5.2.4(b) and must provide to the relevant *Network Service Providers* information that updates the information provided under clause S5.2.4(b)(5):
- (1) within 3 months after commissioning tests or other tests undertaken in accordance with clause 5.7.3 are completed;
 - (2) when the *Generator* becomes aware that the information is incomplete, inaccurate or out of date; or
 - (3) on request by *AEMO* or the relevant *Network Service Provider*, where *AEMO* or the relevant *Network Service Provider* considers that the information is incomplete, inaccurate or out of date.
- (d1) A *Generator* is only required to provide new information under clause S5.2.4(d) to the extent that it is different to the information previously provided under clause S5.2.4(b).
- (e) For the purposes of clause S5.2.4(e1), a *Connection Applicant* must be registered as an *Intending Participant* in accordance with rule 2.7.
- (e1) For the purposes of clause 5.3.2(f), the technical information that a *Network Service Provider* must, if requested, provide to a *Connection Applicant* in respect of a proposed *connection* for a *generating system* includes:
- (1) the highest expected single phase and three phase fault levels at the *connection point* with the *generating system* not connected;

- (2) the clearing times of the existing *protection systems* that would clear a fault at the location at which the new *connection* would be *connected* into the existing *transmission system* or *distribution system*;
- (3) the expected limits of *voltage* fluctuation, harmonic *voltage* distortion and *voltage* unbalance at the *connection point* with the *generating system* not *connected*;
- (4) technical information relevant to the *connection point* with the *generating system* not *synchronised* including equivalent source impedance information, sufficient to estimate fault levels, *voltage* fluctuations, harmonic *voltage* distortion (for harmonics relevant to the *generating system*) and *voltage* unbalance; and
- (5) information relating to the performance of the *national grid* that is reasonably necessary for the *Connection Applicant* to prepare an *application to connect*, including:
 - (i) a model of the *power system*, including relevant *considered projects* and the range of expected operating conditions, sufficient to carry out load flow and dynamic simulations; and
 - (ii) information on *inter-regional* and *intra-regional power transfer capabilities* and relevant *plant ratings*.
- (f) All information provided under this clause S5.2.4 must be treated as *confidential information*.

S5.2.5 Technical requirements

S5.2.5.1 Reactive power capability

Automatic access standard

- (a) The *automatic access standard* is a *generating system* operating at:
 - (1) any level of *active power* output; and
 - (2) any *voltage* at the *connection point* within the limits established under clause S5.1a.4 without a *contingency event*,

must be capable of supplying and absorbing continuously at its *connection point* an amount of *reactive power* of at least the amount equal to the product of the *rated active power* of the *generating system* and 0.395.

Minimum access standard

- (b) The *minimum access standard* is no capability is required to supply or absorb *reactive power* at the *connection point*.

Negotiated access standard

- (c) When negotiating a *negotiated access standard*, the *Generator* and the *Network Service Provider*:

- (1) must subject to any agreement under paragraph (d)(4), ensure that the *reactive power capability* of the *generating system* is sufficient to ensure that all relevant *system standards* are met before and after *credible contingency events* under normal and planned *outage* operating conditions of the *power system*, taking into account at least existing projects and *considered projects*;
- (2) may negotiate either a range of *reactive power* absorption and supply, or a range of *power factor*, at the *connection point*, within which the *plant* must be operated; and
- (3) may negotiate a limit that describes how the *reactive power capability* varies as a function of *active power* output due to a design characteristic of the *plant*.

- (d) If the *generating system* is not capable of the level of performance established under paragraph (c)(1) the *Generator*, depending on what is reasonable in the circumstances, must:

- (1) pay compensation to the *Network Service Provider* for the provision of the deficit of *reactive power* (supply and absorption) from within the *network*;
- (2) install additional equipment *connecting* at the *generating system's connection point* or another location, to provide the deficit of *reactive power* (supply and absorption), and such equipment is deemed to be part of the *generating system*;
- (3) reach a commercial arrangement with a *Registered Participant* to provide the deficit of *reactive power* (supply and absorption); or
- (4) if the inability to meet the performance level only occurs for particular operating conditions, agree to and document as part of the proposed *negotiated access standard*, operational arrangements by which the *plant* can achieve an agreed level of performance for those operating conditions.

- (e) The *Generator* may select one or more options referred to in paragraph (d).

General requirements

- (f) An *access standard* must record the agreed value for *rated active power* and where relevant the method of determining the value.
- (g) An *access standard* for consumption of *energy* by a *generating system* when not supplying or absorbing *reactive power* under an *ancillary services agreement* is to be established under clause S5.3.5 as if the *Generator* were a *Market Customer*.

S5.2.5.2 Quality of electricity generated

- (a) For the purpose of this clause S5.2.5.2 in respect of a *synchronous generating unit*, AS 1359.101 and IEC 60034-1 are *plant standards* for harmonic *voltage* distortion.

Automatic access standard

- (b) The *automatic access standard* is a *generating system* when generating and when not generating must not produce at any of its *connection points* for *generation*:
 - (1) *voltage* fluctuation greater than the limits allocated by the *Network Service Provider* under clause S5.1.5(a);
 - (2) harmonic *voltage* distortion greater than the emission limits specified by a *plant standard* under paragraph (a) or allocated by the *Network Service Provider* under clause S5.1.6(a); and
 - (3) *voltage* unbalance greater than the limits allocated by the *Network Service Provider* in accordance with clause S5.1.7(c).

Minimum access standard

- (c) The *minimum access standard* is a *generating system* when generating and when not generating must not produce at any of its *connection points* for *generation*:
 - (1) *voltage* fluctuations greater than limits determined under clause S5.1.5(b);
 - (2) harmonic *voltage* distortion more than the lesser of the emission limits determined by the relevant *Network Service Provider* under clause S5.1.6(b) and specified by a *plant standard* under paragraph (a); and
 - (3) *voltage* unbalance more than limits determined under clause S5.1.7(c).

Negotiated access standard

- (d) A *negotiated access standard* negotiated under this clause S5.2.5.2 must not prevent the *Network Service Provider* meeting the *system standards* or contractual obligations to existing *Network Users*.

S5.2.5.3 Generating unit response to frequency disturbances

- (a) For the purposes of this clause S5.2.5.3:

normal operating frequency band, operational frequency tolerance band, or extreme frequency excursion tolerance limits are references to the widest range specified for those terms for any condition (including an “island” condition) in the *frequency operating standards* that apply to the *region* in which the *generating unit* is located.

stabilisation time and recovery time mean the longest times allowable for *system frequency* to remain outside the operational frequency tolerance band and the normal operating frequency band, respectively, for any condition (including an “island” condition) in the *frequency operating standards* that apply to the region in which the *generating unit* is located.

transient frequency limit and transient frequency time mean the values of 47.5 Hz and 9 seconds respectively, or such other values determined by the *Reliability Panel*.

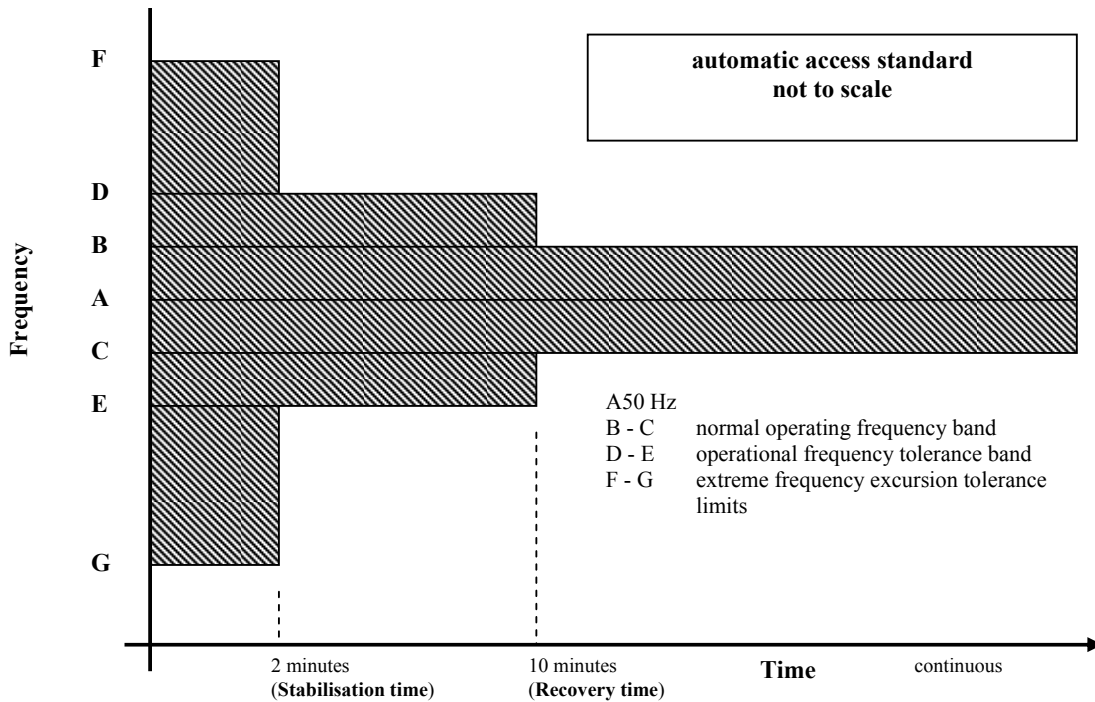
Automatic access standard

- (b) The *automatic access standard* is a *generating system* and each of its *generating units* must be capable of *continuous uninterrupted operation* for *frequencies* in the following ranges:
- (1) the lower bound of the extreme frequency excursion tolerance limits to the lower bound of the operational frequency tolerance band for at least the stabilisation time;
 - (2) the lower bound of the operational frequency tolerance band to the lower bound of the normal operating frequency band, for at least the recovery time including any time spent in the range under subparagraph (1);
 - (3) the normal operating frequency band for an indefinite period;
 - (4) the upper bound of the normal operating frequency band to the upper bound of the operational frequency tolerance band, for at least the recovery time including any time spent in the range under subparagraph (5); and

- (5) the upper bound of the operational frequency tolerance band to the upper bound of the extreme frequency excursion tolerance limits for at least the stabilisation time,

unless the rate of change of *frequency* is outside the range of -4 Hz to 4 Hz per second for more than 0.25 seconds or such other range as determined by the *Reliability Panel* from time to time.

Note: The automatic access standard is illustrated in the following diagram. To the extent of any inconsistency between the diagram and paragraph (b), paragraph (b) prevails.



Minimum access standard

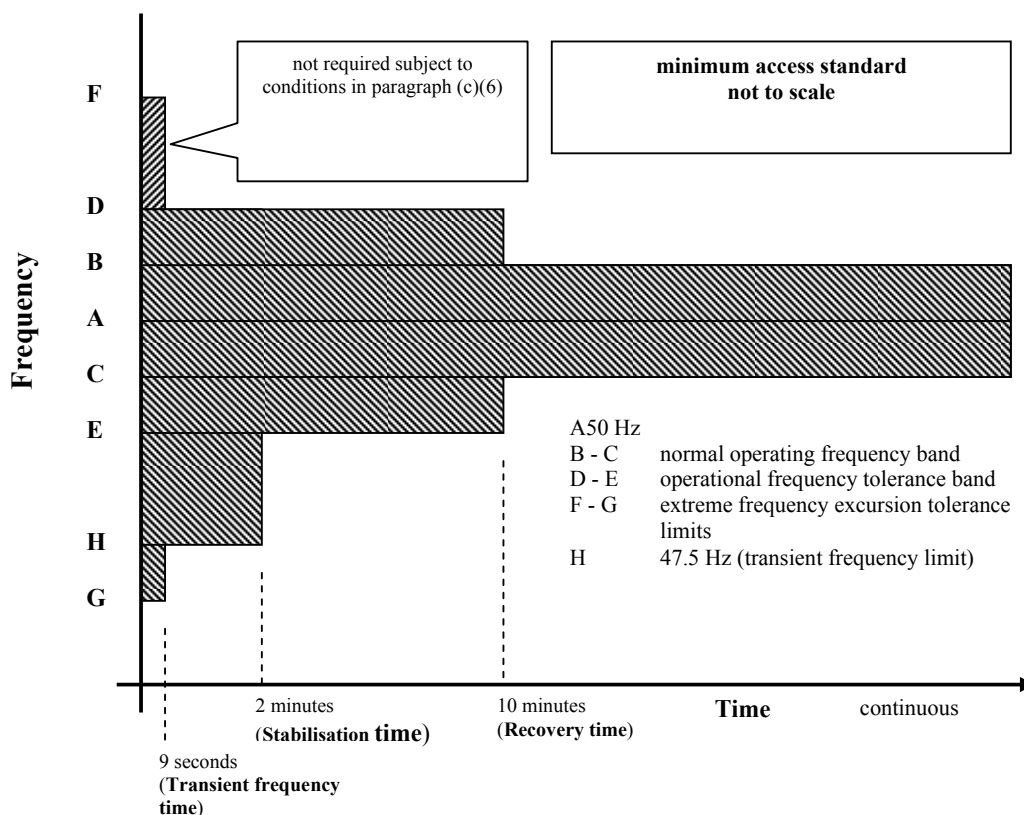
- (c) The *minimum access standard* is a *generating system* and each of its *generating units* must be capable of *continuous uninterrupted operation* for *frequencies* in the following ranges:
- (1) the lower bound of the extreme frequency excursion tolerance limits to the transient frequency limit for at least the transient frequency time;

- (2) the transient frequency limit to the lower bound of the operational frequency tolerance band for at least the stabilisation time;
- (3) the lower bound of the operational frequency tolerance band to the lower bound of the normal operating frequency band for at least the recovery time including any time spent in the ranges under subparagraphs (1) and (2);
- (4) the normal operating frequency band for an indefinite period;
- (5) the upper bound of the normal operating frequency band to the upper bound of the operational frequency tolerance band for at least the recovery time including any time spent in the ranges under subparagraph (6) unless the *generating system* has a *protection system* to trip a *generating unit* if the *frequency* exceeds a level agreed with *AEMO*; and
- (6) in respect of a *generating system*:
 - (i) of 30 MW or more; and
 - (ii) that does not have a *protection system* to trip the *generating unit* if the *frequency* exceeds a level agreed with *AEMO*,

the upper bound of the operational frequency tolerance band to the upper bound of the extreme frequency excursion tolerance limits (including an “island” condition) for at least the transient frequency time,

unless the rate of change of *frequency* is outside the range of -1 Hz to 1 Hz per second for more than one second or such other range as determined by the *Reliability Panel* from time to time.

Note: The minimum access standard is illustrated in the following diagram. To the extent of any inconsistency between the diagram and paragraph (c), paragraph (c) prevails.



Negotiated access standard

- (d) A negotiated access standard can be accepted by the Network Service Provider provided that AEMO and the Network Service Provider agree that:
- (1) the negotiated access standard is as close as practicable to the automatic access standard while respecting the need to protect the plant from damage;
 - (2) the frequency would be unlikely to fall below the lower bound of the operational frequency tolerance band as a result of over-frequency tripping of generating units; and
 - (3) there would be no material adverse impact on quality of supply to other Network Users or power system security.
- (e) AEMO must advise on matters relating to negotiated access standards under this clause S5.2.5.3.

S5.2.5.4 Generating system response to voltage disturbances

Automatic access standard

- (a) The *automatic access standard* is a *generating system* and each of its *generating units* must be capable of *continuous uninterrupted operation* where a *power system* disturbance causes the *voltage* at the *connection point* to vary within the following ranges:
- (1) *voltages* over 110% for the durations permitted under clause S5.1a.4;
 - (2) 90% to 110% of *normal voltage* continuously;
 - (3) 80% to 90% of *normal voltage* for a period of at least 10 seconds; and
 - (4) 70% to 80% of *normal voltage* for a period of at least 2 seconds.

Minimum access standard

- (b) The *minimum access standard* is a *generating system* including all operating *generating units* must be capable of *continuous uninterrupted operation* where a *power system* disturbance causes the *voltage* at the *connection point* to vary in the range of 90% to 110% of *normal voltage*, provided that the ratio of *voltage* to *frequency* (as measured at the *connection point* and expressed as percentage of *normal voltage* and a percentage of 50 Hz) does not exceed:
- (1) a value of 1.15 for more than two minutes; or
 - (2) a value of 1.10 for more than 10 minutes.

Negotiated access standard

- (c) In negotiating a *negotiated access standard*, a *generating system* and each of its operating *generating units* must be capable of *continuous uninterrupted operation* for the range of *voltages* specified in the *automatic access standard* except where *AEMO* and the *Network Service Provider* agree that:
- (1) the *negotiated access standard* is as close as practicable to the *automatic access standard* while respecting the need to protect the *plant* from damage;
 - (2) the *generating plant* that would be tripped as a result of any *voltage* excursion within levels specified by the *automatic access standard*, is not more than 100 MW or a greater limit based on what *AEMO* and the *Network Service Provider* both consider to be reasonable in the circumstances; and

- (3) there would be no material adverse impact on the quality of *supply* to other *Network Users* or *power system security*.
- (d) In carrying out assessments of proposed *negotiated access standards* under this clause S5.2.5.4, *AEMO* and the *Network Service Provider* must at a minimum, take into account:
 - (1) the expected performance of existing *networks* and *considered projects*;
 - (2) the expected performance of existing *generating plant* and other relevant projects; and
 - (3) any corresponding *performance standard* (or where no *performance standard* has been registered, the *access standard*) that allows *generating plant* to trip for *voltage* excursions in ranges specified under the *automatic access standards*.
- (e) *AEMO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.4.

General requirement

- (f) The *access standard* must include any operational arrangements necessary to ensure the *generating system* and each of its *generating units* will meet its agreed performance levels under abnormal *network* or *generating system* conditions.

S5.2.5.5 Generating system response to disturbances following contingency events

- (a) In this clause S5.2.5.5 a fault includes:
 - (1) a fault of the relevant type having a metallic conducting path; and
 - (2) a fault of the relevant type resulting from reclosure onto a fault by the operation of *automatic reclose equipment*.

Automatic access standard

- (b) The *automatic access standard* is:
 - (1) a *generating system* and each of its *generating units* must remain in *continuous uninterrupted operation* for a disturbance caused by an event that is:
 - (i) a *credible contingency event* other than a fault referred to in subparagraph (iv);

- (ii) a three phase fault in a *transmission system* cleared by all relevant primary *protection systems*;
- (iii) a two phase to ground, phase to phase or phase to ground fault in a *transmission system* cleared in:
 - (A) the longest time expected to be taken for a relevant *breaker fail protection system* to clear the fault; or
 - (B) if a *protection system* referred to in subparagraph (A) is not installed, the greater of the time specified in column 4 of Table S5.1a.2 (or if none is specified, 430 milliseconds) and the longest time expected to be taken for all relevant primary *protection systems* to clear the fault; and
- (iv) a three phase, two phase to ground, phase to phase or phase to ground fault in a *distribution network* cleared in:
 - (A) the longest time expected to be taken for the *breaker fail protection system* to clear the fault; or
 - (B) if a *protection system* referred to in subparagraph (A) is not installed, the greater of 430 milliseconds and the longest time expected to be taken for all relevant primary *protection systems* to clear the fault,

provided that the event is not one that would *disconnect* the *generating unit* from the *power system* by removing *network elements* from service; and

- (2) subject to any changed *power system* conditions or energy source availability beyond the *Generator's* reasonable control, a *generating system* and each of its *generating units*, in respect of the types of fault described in subparagraphs (1)(ii) to (iv), must supply to or absorb from the *network*:
 - (i) to assist the maintenance of *power system voltages* during the application of the fault, capacitive reactive current of at least the greater of its pre-disturbance reactive current and 4% of the maximum continuous current of the *generating system* including all operating *generating units* (in the absence of a disturbance) for each 1% reduction (from its pre-fault level) of *connection point voltage* during the fault;
 - (ii) after *disconnection* of the faulted element, *reactive power* sufficient to ensure that the *connection point voltage* is within the range for *continuous uninterrupted operation* under clause S5.2.5.4; and

- (iii) from 100 milliseconds after *disconnection* of the faulted element, *active power* of at least 95% of the level existing just prior to the fault.

Minimum access standard

(c) The *minimum access standard* is:

(1) a *generating system* and each of its *generating units* must remain in *continuous uninterrupted operation* for the disturbance caused by an event that is:

(i) a *credible contingency event* other than a fault referred to in subparagraph (iii);

(ii) a single phase to ground, phase to phase or two phase to ground fault in a *transmission system* cleared in the longest time expected to be taken for all relevant primary *protection systems* to clear the fault unless *AEMO* and the *Network Service Provider* agree that:

(A) the total reduction of *generation* in the *power system* due to that fault would not exceed 100 MW;

(B) there is unlikely to be an adverse impact on quality of *supply* to other *Network Users*; and

(C) there is unlikely to be a material adverse impact on *power system security*; and

(iii) a single phase to ground, phase to phase or two phase to ground fault in a *distribution network*, cleared in the longest time expected to be taken for all relevant primary *protection systems* to clear the fault, unless *AEMO* and the *Network Service Provider* agree that:

(A) the total reduction of *generation* in the *power system* due to that fault would not exceed 100 MW;

(B) there is unlikely to be a material adverse impact on quality of *supply* to other *Network Users*; and

(C) there is unlikely to be a material adverse impact on *power system security*,

provided that the event is not one that would *disconnect* the *generating unit* from the *power system* by removing *network elements* from service; and

- (2) subject to any changed *power system* conditions or energy source availability beyond the *Generator's* reasonable control after *disconnection* of the faulted *element*, each *generating system* must, in respect of the types of fault described in subparagraphs (1)(ii) and (iii), deliver to the *network*, *active power* and supply or absorb leading or lagging *reactive power*, sufficient to ensure that the *connection point voltage* is within the range for *continuous uninterrupted operation* agreed under clause S5.2.5.4.

Negotiated access standard

- (d) In carrying out assessments of proposed *negotiated access standards* under this clause S5.2.5.5, the *Network Service Provider* and *AEMO* must take into account, without limitation:
 - (1) the expected performance of:
 - (i) existing *networks* and *considered projects*;
 - (ii) existing *generating plant* and other relevant projects; and
 - (iii) *control systems* and *protection systems*, including auxiliary systems and *automatic reclose equipment*; and
 - (2) the expected range of *power system* operating conditions.
- (e) A proposed *negotiated access standard* may be accepted if the *connection* of the *plant* at the proposed access level would not cause other *generating plant* or *loads* to trip as a result of an event, when they would otherwise not have tripped for the same event.
- (f) *AEMO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.5.

General requirement

- (g) The *access standard* must include any operational arrangements to ensure the *generating system* including all operating *generating units* will meet its agreed performance levels under abnormal *network* or *generating system* conditions.

S5.2.5.6 Quality of electricity generated and continuous uninterrupted operation

Minimum access standard

The *minimum access standard* is a *generating system* including each of its operating *generating units* and *reactive plant*, must not *disconnect* from the *power system* as a result of *voltage* fluctuation, harmonic *voltage* distortion and *voltage*

unbalance conditions at the *connection point* within the levels specified in clauses S5.1a.5, S5.1a.6 and S5.1a.7.

S5.2.5.7 Partial load rejection

- (a) For the purposes of this clause S5.2.5.7 **minimum load** means minimum *sent out generation* for continuous stable operation.
- (b) This clause S5.2.5.7 does not apply to an *asynchronous generating unit*.

Automatic access standard

- (c) The *automatic access standard* is a *generating unit* must be capable of *continuous uninterrupted operation* during and following a *power system load* reduction of 30% from its predisturbance level or equivalent impact from separation of part of the *power system* in less than 10 seconds, provided that the *loading level* remains above minimum load.

Minimum access standard

- (d) The *minimum access standard* is a *generating unit* must be capable of *continuous uninterrupted operation* during and following a *power system load* reduction of 5% or equivalent impact from separation of part of the *power system* in less than 10 seconds provided that the *loading level* remains above minimum load.

Negotiated access standard

- (e) If in accordance with clause 5.3.4A the *Generator* and the *Network Service Provider* determine a *negotiated access standard* is to apply, the *Network Service Provider* must consult AEMO to ensure that the *negotiated access standard* does not materially adversely affect *power system security*.
- (f) AEMO must advise on matters relating to *negotiated access standards* under this clause S5.2.5.7.

General requirements

- (g) The actual partial load rejection performance must be recorded in the *access standards*.

S5.2.5.8 Protection of generating systems from power system disturbances

Minimum access standard

- (a) The *minimum access standard* is:

- (1) subject to subparagraph (2) and paragraph (e), for a *generating system* or any of its *generating units* that is required by a *Generator* or *Network Service Provider* to be automatically *disconnected* from the *power system* in response to abnormal conditions arising from the *power system*, the relevant *protection system* or *control system* must not *disconnect* the *generating system* for:
 - (i) conditions for which it must remain in *continuous uninterrupted operation*; or
 - (ii) conditions it must withstand under the *Rules*; and
- (2) a *generating system* with a *nameplate rating* of 30MW or more, or *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more, *connected* to a *transmission system* must have *facilities* to automatically and rapidly reduce its *generation*:
 - (i) by at least half, if the *frequency* at the *connection point* exceeds a level nominated by *AEMO* (not less than the upper limit of the *operational frequency tolerance band*) and the duration above this *frequency* exceeds a value nominated by *AEMO* where the reduction may be achieved:
 - (A) by reducing the output of the *generating system* within 3 seconds, and holding the output at the reduced level until the *frequency* returns to within the *normal operating frequency band*; or
 - (B) by disconnecting the *generating system* from the *power system* within 1 second; or
 - (ii) in proportion to the difference between the *frequency* at the *connection point* and a level nominated by *AEMO* (not less than the upper limit of the *operational frequency tolerance band*), such that the *generation* is reduced by at least half, within 3 seconds of the *frequency* reaching the upper limit of the *extreme frequency excursion tolerance limits*.

Negotiated access standard

- (b) *AEMO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.8.

General requirements

- (c) *AEMO* or the *Network Service Provider* may require that an *access standard* include a requirement for the *generating system* to be automatically *disconnected* by a local or remote control scheme whenever the part of the

network to which it is *connected* has been *disconnected* from the *national grid*, forming an island that *supplies* a *Customer*.

- (d) The *access standard* must include specification of conditions for which the *generating unit* or *generating system* must trip and must not trip.
- (e) Notwithstanding clauses S5.2.5.3, S5.2.5.4, S5.2.5.5, S5.2.5.6 and S5.2.5.7, a *generating system* may be automatically *disconnected* from the *power system* under any of the following conditions:
 - (1) in accordance with an *ancillary services agreement* between the *Generator* and *AEMO*;
 - (2) where a *load* that is not part of the *generating system* has the same *connection point* as the *generating system* and *AEMO* and the *Network Service Provider* agree that the *disconnection* would in effect be under-frequency *load shedding*;
 - (3) where the *generating system* is automatically *disconnected* under paragraph (a) or clause S5.2.5.9;
 - (4) where the *generating system* is automatically *disconnected* under clause S5.2.5.10 due to a failure of the *generating plant*; or
 - (5) in accordance with an agreement between the *Generator* and a *Network Service Provider* (including an agreement in relation to an emergency control scheme under clause S5.1.8) to provide a service that *AEMO* agrees is necessary to maintain or restore *power system security* in the event of a specified *contingency event*.
- (f) The *Network Service Provider* is not liable for any loss or damage incurred by the *Generator* or any other person as a consequence of a fault on either the *power system*, or within the *Generator's facility*.

S5.2.5.9 Protection systems that impact on power system security

Automatic access standard

- (a) The *automatic access standard* is:
 - (1) subject to clauses S5.1.9(k) and S5.1.9(l), primary *protection systems* must be provided to *disconnect* from the *power system* any faulted element in a *generating system* and in protection zones that include the *connection point* within the applicable *fault clearance time* determined under clause S5.1.9(a)(1);
 - (2) each primary *protection system* must have sufficient redundancy to ensure that a faulted element within its protection zone is *disconnected*

from the *power system* within the applicable *fault clearance time* with any single protection element (including any communications *facility* upon which that *protection system* depends) out of service; and

- (3) *breaker fail protection systems* must be provided to clear faults that are not cleared by the circuit breakers controlled by the primary *protection system* within the applicable *fault clearance time* determined under clause S5.1.9(a)(1).
- (b) In relation to an *automatic access standard* under this clause S5.2.5.9, the *Generator* must provide redundancy in the primary *protection systems* under paragraph (a)(2) and provide *breaker fail protection systems* under paragraph (a)(3) if *AEMO* or the *Network Service Provider* consider that a lack of these *facilities* could result in:
- (1) a material adverse impact on *power system security* or quality of supply to other *Network Users*; or
 - (2) a reduction in *inter-regional* or *intra-regional power transfer capability*,

through any mechanism including:

- (3) consequential tripping of, or damage to, other *network* equipment or *facilities* of other *Network Users*, that would have a *power system security* impact; or
- (4) instability that would not be detected by other *protection systems* in the *network*.

Minimum access standard

- (c) The *minimum access standard* is:
- (1) subject to clauses S5.1.9(k) and S5.1.9(l), *protection systems* must be provided to *disconnect* from the *power system* any faulted element within a *generating system* and in protection zones that include the *connection point* within the applicable *fault clearance time* determined under clause S5.1.9(a)(2); and
 - (2) if a *fault clearance time* determined under clause S5.1.9(a)(2) for a protection zone is less than 10 seconds, a *breaker fail protection system* must be provided to clear from the *power system* any fault within that protection zone that is not cleared by the circuit breakers controlled by the primary *protection system* within the applicable *fault clearance time* determined under clause S5.1.9(a)(3).

Negotiated access standard

- (d) *AEMO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.9.

General requirements

- (e) The *Network Service Provider* and the *Generator* must cooperate in the design and implementation of *protection systems* to comply with this clause S5.2.5.9, including cooperation on:
 - (1) the use of *current transformer* and *voltage transformer* secondary circuits (or equivalent) of one party by the *protection system* of the other;
 - (2) tripping of one party's circuit breakers by a *protection system* of the other party; and
 - (3) co-ordination of *protection system* settings to ensure inter-operation.
- (f) The *protection system* design referred to in paragraphs (a) and (c) must:
 - (1) be coordinated with other *protection systems*;
 - (2) avoid consequential *disconnection* of other *Network Users' facilities*; and
 - (3) take into account existing obligations of the *Network Service Provider* under *connection agreements* with other *Network Users*.

S5.2.5.10 Protection to trip plant for unstable operation

Automatic access standard

- (a) The *automatic access standard* is:
 - (1) a *synchronous generating unit* must have a *protection system* to *disconnect* it promptly when a condition that would lead to pole slipping is detected in order to prevent pole slipping or other conditions where a *generating unit* causes *active power*, *reactive power* or *voltage* at the *connection point* to become unstable as assessed in accordance with the *power system* stability guidelines established under clause 4.3.4(h); and
 - (2) an *asynchronous generating unit* must have a *protection system* to *disconnect* it promptly for conditions where the *active power*, *reactive power* or *voltage* at the *connection point* becomes unstable as assessed in accordance with the guidelines for *power system* stability established under clause 4.3.4(h).

Minimum access standard

- (b) The *minimum access standard* is a *generating unit* must not cause a *voltage disturbance* at the *connection point* due to sustained unstable behaviour of more than the maximum level specified in Table 7 of *Australian Standard AS/NZS 61000.3.7:2001*.

Negotiated access standard

- (c) If the *Network Service Provider* and the *Generator* agree, a *protection system* may also trip any other part of the *generating system* in order to cease the instability.
- (d) Notwithstanding paragraph (c), a *protection system* must be provided in the *access standard* to trip the affected *generating unit* where:
 - (1) the *Network Service Provider* considers it necessary to prevent consequential tripping of, or damage to, other *generating units*, *network equipment* or other *Network Users' facilities*, or
 - (2) *AEMO* considers it necessary to prevent unstable operation having an adverse impact on *power system security*.
- (e) *AEMO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.10

S5.2.5.11 Frequency control

- (a) For the purpose of this clause S5.2.5.11:

maximum operating level means in relation to:

- (1) a *non-scheduled generating unit*, the maximum *sent out generation* consistent with its *nameplate rating*;
- (2) a *scheduled generating unit* or *semi-scheduled generating unit*, the maximum *sent out generation* (but not *emergency generation*) consistent with its *registered bid and offer data*;
- (3) a *non-scheduled generating system*, the combined maximum *sent out generation* consistent with the *nameplate ratings* of its in-service *generating units*; and
- (4) a *scheduled generating system* or *semi-scheduled generating system*, the combined maximum *sent out generation* (but not *emergency generation*) of its in-service *generating units*, consistent with its *registered bid and offer data*.

minimum operating level means in relation to:

- (1) a *non-scheduled generating unit*, its minimum *sent out generation* for continuous stable operation;
- (2) a *scheduled generating unit* or *semi-scheduled generating unit*, its minimum *sent out generation* for continuous stable operation consistent with its *registered bid and offer data*;
- (3) a *non-scheduled generating system*, the combined *minimum operating level* of its in-service *generating units*; and
- (4) a *scheduled generating system* or *semi-scheduled generating system*, the combined minimum *sent out generation* of its in-service *generating units*, consistent with its *registered bid and offer data*.

pre-disturbance level means in relation to a *generating unit* and a *frequency disturbance*, the *generating unit's* level of output just before the *system frequency* first exceeds the upper or lower limit of the *normal operating frequency band* during the *frequency disturbance*.

system frequency means the *frequency* of the *transmission system* or *distribution system* to which the *generating unit* or *generating system* is *connected*.

Automatic access standard

- (b) The *automatic access standard* is:
 - (1) a *generating system's active power* transfer to the *power system* must not:
 - (i) increase in response to a rise in system frequency; or
 - (ii) decrease in response to a fall in system frequency;
 - (2) a *generating system* must be capable of automatically reducing its *active power* transfer to the *power system*:
 - (i) whenever the system frequency exceeds the upper limit of the *normal operating frequency band*;
 - (ii) by an amount that equals or exceeds the least of:
 - (A) 20% of its maximum operating level times the *frequency difference* between system frequency and the upper limit of the *normal operating frequency band*;
 - (B) 10% of its maximum operating level; and

- (C) the difference between the *generating unit's* pre-disturbance level and minimum operating level, but zero if the difference is negative; and
- (iii) sufficiently rapidly for the *Generator* to be in a position to offer measurable amounts of lower services to the *spot market* for *market ancillary services*; and
- (3) a *generating system* must be capable of automatically increasing its *active power* transfer to the *power system*:
 - (i) whenever the system frequency falls below the lower limit of the *normal operating frequency band*;
 - (ii) by the amount that equals or exceeds the least of:
 - (A) 20% of its maximum operating level times the percentage *frequency* difference between the lower limit of the *normal operating frequency band* and system frequency;
 - (B) 5% of its maximum operating level; and
 - (C) one third of the difference between the *generating unit's* maximum operating level and pre-disturbance level, but zero if the difference is negative; and
 - (iii) sufficiently rapidly for the *Generator* to be in a position to offer measurable amounts of raise services to the *spot market* for *market ancillary services*.

Minimum access standard

- (c) The *minimum access standard* is a *generating system* under relatively stable input energy, *active power* transfer to the *power system* must not:
 - (1) increase in response to a rise in system frequency; and
 - (2) decrease more than 2% per Hz in response to a fall in system frequency.

Negotiated access standard

- (d) A *Generator* proposing a *negotiated access standard* in respect of paragraph (c)(2) must demonstrate to *AEMO* that the proposed increase and decrease in *active power* transfer to the *power system* are as close as practicable to the *automatic access standard* for that *plant*.
- (e) The *negotiated access standard* must record the agreed values for maximum operating level and minimum operating level, and where relevant the

method of determining the values and the values for a *generating system* must take into account its in-service *generating units*.

- (f) *AEMO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.11.

General requirements

- (g) Each *control system* used to satisfy this clause S5.2.5.11 must be *adequately damped*.
- (h) The amount of a relevant *market ancillary service* for which the *plant* may be registered must not exceed the amount that would be consistent with the *performance standard* registered in respect of this requirement.

S5.2.5.12 Impact on network capability

Automatic access standard

- (a) The *automatic access standard* is a *generating system* must have *plant capabilities* and *control systems* that are sufficient so that when *connected* it does not reduce any *inter-regional* or *intra-regional power transfer capability* below the level that would apply if the *generating system* were not *connected*.

Minimum access standard

- (b) The *minimum access standard* is a *generating system* must have *plant capabilities*, *control systems* and operational arrangements sufficient to ensure there is no reduction in:
 - (1) the ability to *supply Customer load* as a result of a reduction in *power transfer capability*; and
 - (2) *power transfer capabilities* into a region by more than the combined *sent out generation* of its *generating units*.

Negotiated access standard

- (c) In carrying out assessments of proposed *negotiated access standards* under this clause S5.2.5.12, the *Network Service Provider* and *AEMO* must take into account:
 - (1) the expected performance of:
 - (i) existing *networks* and *considered projects*;
 - (ii) existing *generating plant* and other relevant projects; and

- (iii) *control systems* and *protection systems*, including *automatic reclose equipment*; and
- (2) the expected range of *power system* operating conditions.
- (d) The *negotiated access standard* must include:
 - (1) *control systems* to minimise any reduction in *power transfer capabilities*; and
 - (2) operational arrangements, including curtailment of the *generating system's* output if necessary to ensure that the *generating plant* is operated in a way that meets at least the *minimum access standard* under abnormal *network* and *generating system* conditions, so that *power system security* can be maintained.
- (e) A *negotiated access standard* under this clause S5.2.5.12 must detail the *plant capabilities*, *control systems* and operational arrangements that will be maintained by the *Generator*, notwithstanding that change to the *power system*, but not changes to the *generating system*, may reduce the efficacy of the *plant capabilities*, *control systems* and operational arrangements over time.
- (f) *AEMO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.12.

General requirement

- (g) If a *Network Service Provider* considers that *power transfer capabilities* of its *network* would be increased through provision of additional *control system facilities* to a *generating system* (such as a *power system stabiliser*), the *Network Service Provider* and the *Generator* may negotiate for the provision of such additional *control system facilities* as a commercial arrangement.

S5.2.5.13 Voltage and reactive power control

- (a) For the purpose of this clause S5.2.5.13:

rise time means in relation to a step response test or simulation of a *control system*, the time taken for an output quantity to rise from 10% to 90% of the maximum change induced in that quantity by a step change of an input quantity.

settling time means in relation to a step response test or simulation of a *control system*, the time measured from initiation of a step change in an input quantity to the time when the magnitude of error between the output quantity and its final settling value remains less than 10% of:

- (1) if the sustained change in the quantity is less than half of the maximum change in that output quantity, the maximum change induced in that output quantity; or
- (2) the sustained change induced in that output quantity.

static excitation system means in relation to a *synchronous generating unit*, an *excitation control system* that does not use rotating machinery to produce the field current.

Automatic access standard

- (b) The *automatic access standard* is:
 - (1) a *generating system* must have *plant capabilities* and *control systems* sufficient to ensure that:
 - (i) *power system* oscillations, for the frequencies of oscillation of the *generating unit* against any other *generating unit*, are *adequately damped*;
 - (ii) operation of the *generating system* does not degrade the damping of any critical mode of oscillation of the *power system*; and
 - (iii) operation of the *generating system* does not cause instability (including hunting of *tap-changing transformer control systems*) that would adversely impact other *Registered Participants*;
 - (2) a *control system* must have:
 - (i) for the purposes of disturbance monitoring and testing, permanently installed and operational, monitoring and recording *facilities* for key variables including each input and output; and
 - (ii) *facilities* for testing the *control system* sufficient to establish its dynamic operational characteristics;
 - (3) a *synchronous generating system* must have an *excitation control system* that:
 - (i) regulates *voltage* at the *connection point* or another agreed location in the *power system* (including within the *generating system*) to within 0.5% of the setpoint;
 - (ii) is able to operate the stator continuously at 105% of *nominal voltage* with *rated active power* output;

- (iii) regulates *voltage* in a manner that helps to support *network voltages* during faults and does not prevent the *Network Service Provider* from achieving the requirements of clause S5.1a.3 and S5.1a.4;
- (iv) allows the *voltage* setpoint to be continuously controllable in the range of at least 95% to 105% of *normal voltage* at the *connection point* or the agreed location, without reliance on a *tap-changing transformer*;
- (v) has limiting devices to ensure that a *voltage* disturbance does not cause the *generating unit* to trip at the limits of its operating capability;
- (vi) has an excitation ceiling *voltage* of at least:
 - (A) for a static excitation system, 2.3 times; or
 - (B) for other *excitation control systems*, 1.5 times, the excitation required to achieve *generation* at the *nameplate rating* for rated *power factor*, rated speed and *nominal voltage*;
- (vii) has *settling times* for a step change of *voltage* setpoint or *voltage* at the location agreed under subparagraph (i) of:
 - (A) generated *voltage* less than 2.5 seconds for a 5% *voltage* disturbance with the *generating unit* not *synchronised*;
 - (B) *active power*, *reactive power* and *voltage* less than 5.0 seconds for a 5% *voltage* disturbance with the *generating unit* *synchronised*, from an operating point where the *voltage* disturbance would not cause any limiting device to operate; and
 - (C) in respect of each limiting device, *active power*, *reactive power* and *voltage* less than 7.5 seconds for a 5% *voltage* disturbance with the *generating unit* *synchronised*, when operating into a limiting device from an operating point where a *voltage* disturbance of 2.5% would just cause the limiting device to operate;
- (viii) is able to increase field *voltage* from rated field *voltage* to the excitation ceiling *voltage* in less than:
 - (A) 0.05 second for a static excitation system; or
 - (B) 0.5 second for other *excitation control systems*;

- (ix) has a *power system* stabiliser with sufficient flexibility to enable damping performance to be maximised, with characteristics as described in paragraph (c); and
 - (x) has reactive current compensation settable for boost or droop; and
- (4) a *generating system*, other than one comprised of *synchronous generating units*, must have a *voltage control system* that:
- (i) regulates *voltage* at the *connection point* or an agreed location in the *power system* (including within the *generating system*) to within 0.5% of its setpoint;
 - (ii) regulates *voltage* in a manner that helps to support *network voltages* during faults and does not prevent the *Network Service Provider* from achieving the requirements of clauses S5.1a.3 and S5.1a.4;
 - (iii) allows the *voltage* setpoint to be continuously controllable in the range of at least 95% to 105% of *normal voltage* at the *connection point* or agreed location in the *power system*, without reliance on a *tap changing transformer*;
 - (iv) has limiting devices to ensure that a *voltage* disturbance does not cause the *generating unit* to trip at the limits of its operating capability;
 - (v) with the *generating system connected* to the *power system*, has *settling times* for *active power*, *reactive power* and *voltage* due to a step change of *voltage* setpoint or *voltage* at the location agreed under clause subparagraph (i), of less than:
 - (A) 5.0 seconds for a 5% *voltage* disturbance with the *generating system connected* to the *power system*, from an operating point where the *voltage* disturbance would not cause any limiting device to operate; and
 - (B) 7.5 seconds for a 5% *voltage* disturbance with the *generating system connected* to the *power system*, when operating into any limiting device from an operating point where a *voltage* disturbance of 2.5% would just cause the limiting device to operate;
 - (vi) has *reactive power* rise time, for a 5% step change in the *voltage* setpoint, of less than 2 seconds;

- (vii) has a *power system* stabiliser with sufficient flexibility to enable damping performance to be maximised, with characteristics as described in paragraph (c); and
 - (viii) has reactive current compensation.
- (c) A *power system* stabiliser provided under paragraph (b) must have:
- (1) for a *synchronous generating unit*, measurements of rotor speed and *active power* output of the *generating unit* as inputs, and otherwise, measurements of *power system frequency* and *active power* output of the *generating unit* as inputs;
 - (2) two washout filters for each input, with ability to bypass one of them if necessary;
 - (3) sufficient (and not less than two) lead-lag transfer function blocks (or equivalent number of complex poles and zeros) with adjustable gain and time-constants, to compensate fully for the phase lags due to the *generating plant*;
 - (4) an output limiter, which for a *synchronous generating unit* is continually adjustable over the range of -10% to $+10\%$ of stator *voltage*;
 - (5) monitoring and recording *facilities* for key variables including inputs, output and the inputs to the lead-lag transfer function blocks; and
 - (6) *facilities* to permit testing of the *power system* stabiliser in isolation from the *power system* by injection of test signals, sufficient to establish the transfer function of the *power system* stabiliser.

Minimum access standard

- (d) The *minimum access standard* is:
- (1) a *generating system* must have *plant* capabilities and *control systems*, including, if appropriate, a *power system* stabiliser, sufficient to ensure that:
 - (i) *power system* oscillations, for the frequencies of oscillation of the *generating unit* against any other *generating unit*, are *adequately damped*;
 - (ii) operation of the *generating unit* does not degrade:
 - (A) any mode of oscillation that is within 0.3 nepers per second of being unstable, by more than 0.01 nepers per second; and

- (B) any other mode of oscillation to within 0.29 nepers per second of being unstable; and
 - (iii) operation of the *generating unit* does not cause instability (including hunting of *tap-changing transformer control systems*) that would adversely impact other *Registered Participants*;
- (2) a *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more must have *facilities* for testing its *control systems* sufficient to establish their dynamic operational characteristics;
- (3) a *generating unit* or *generating system* must have *facilities*:
- (i) where the *connection point nominal voltage* is 100 kV or more, to regulate *voltage* in a manner that does not prevent the *Network Service Provider* from achieving the requirements of clauses S5.1a.3 and S5.1a.4; or
 - (ii) where the *connection point nominal voltage* is less than 100 kV, to regulate *voltage* or *reactive power* or *power factor* in a manner that does not prevent the *Network Service Provider* from achieving the requirements of clauses S5.1a.3 and S5.1a.4,
- and sufficient to achieve the performance agreed in respect of clauses S5.2.5.1, S5.2.5.2, S5.2.5.3, S5.2.5.4, S5.2.5.5, S5.2.5.6 and S5.2.5.12;
- (4) a *synchronous generating unit*, that is part of a *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more, must have an *excitation control system* that:
- (i) regulates *voltage*, *power factor* or *reactive power* as agreed with the *Network Service Provider* and AEMO;
 - (ii) has excitation ceiling *voltage* of at least 1.5 times the excitation required to achieve *generation* at the *nameplate rating* for rated *power factor*, rated speed and *nominal voltage*;
 - (iii) subject to co-ordination under paragraph (i), has a *settling time* of less than 5.0 seconds for a 5% *voltage* disturbance with the *generating unit* synchronised, from an operating point where such a *voltage* disturbance would not cause any limiting device to operate; and
 - (iv) has over and under excitation limiting devices sufficient to ensure that a *voltage* disturbance does not cause the *generating unit* to trip at the limits of its operating capability; and

- (5) a *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more and which are *asynchronous generating units*, must have a *control system* that:
- (i) regulates *voltage*, *power factor* or *reactive power* as agreed with the *Network Service Provider* and *AEMO*;
 - (ii) subject to co-ordination under subparagraph (i), has a settling time less than 7.5 seconds for a 5% *voltage* disturbance with the *generating unit* electrically connected to the *power system* from an operating point where such a *voltage* disturbance would not cause any limiting device to operate; and
 - (iii) has limiting devices to ensure that a *voltage* disturbance would not cause the *generating unit* to trip at the limits of its operating capability.

Negotiated access standard

- (e) If a *generating system* cannot meet the *automatic access standard*, the *Generator* must demonstrate to the *Network Service Provider* why that standard could not be reasonably achieved and propose a *negotiated access standard*.
- (f) The *negotiated access standard* proposed by the *Generator* under paragraph (e) must be the highest level that the *generating system* can reasonably achieve, including by installation of additional dynamic *reactive power* equipment, and through optimising its *control systems*.
- (g) *AEMO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.13.

General requirements

- (h) A limiting device provided under paragraphs (b) and (c) must:
 - (1) not detract from the performance of any *power system* stabiliser; and
 - (2) be co-ordinated with all *protection systems*.
- (i) The *Network Service Provider* may require that the design and operation of the *control systems* of a *generating unit* or *generating system* be coordinated with the existing *voltage control systems* of the *Network Service Provider* and of other *Network Users*, in order to avoid or manage interactions that would adversely impact on the *Network Service Provider* and other *Network Users*.
- (j) Any requirements imposed by the *Network Service Provider* under paragraph (i) must be recorded in the *access standard*.

- (k) The assessment of impact of the *generating units* on *power system* stability and damping of *power system* oscillations shall be in accordance with the guidelines for *power system* stability established under clause 4.3.4(h).

S5.2.5.14 Active power control

- (a) The *automatic access standard* is a *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more must have an *active power control system* capable of:
 - (1) for a *scheduled generating unit* or a *scheduled generating system*:
 - (i) maintaining and changing its *active power* output in accordance with its *dispatch instructions*; and
 - (ii) ramping its *active power* output linearly from one level of *dispatch* to another;
 - (2) subject to energy source availability, for a *non-scheduled generating unit* or *non-scheduled generating system*:
 - (i) automatically reducing or increasing its *active power* output within 5 minutes, at a constant rate, to or below the level specified in an instruction electronically issued by a *control centre*, subject to subparagraph (ii);
 - (ii) automatically limiting its *active power* output, to below the level specified in subparagraph (i); and
 - (iii) not changing its *active power* output within 5 minutes by more than the raise and lower amounts specified in an instruction electronically issued by a *control centre*; and
 - (3) subject to energy source availability, for a *semi-scheduled generating unit* or a *semi-scheduled generating system*:
 - (i) automatically reducing or increasing its *active power* output within 5 minutes at a constant rate, to or below the level specified in an instruction electronically issued by a *control centre*;
 - (ii) automatically limiting its *active power* output, to or below the level specified in subparagraph (i);
 - (iii) not changing its *active power* output within 5 minutes by more than the raise and lower amounts specified in an instruction electronically issued by a *control centre*; and

- (iv) ramping its *active power* output linearly from one level of *dispatch* to another.

Minimum access standard

- (b) The *minimum access standard* is a *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more must have an *active power control system* capable of:
 - (1) for a *scheduled generating unit* or a *scheduled generating system*, maintaining and changing its *active power* output in accordance with its *dispatch instructions*;
 - (2) for a *non-scheduled generating system*:
 - (i) reducing its *active power* output, within 5 minutes, to or below the level required to manage *network* flows that is specified in a verbal instruction issued by the *control centre*;
 - (ii) limiting its *active power* output, to or below the level specified in subparagraph (i);
 - (iii) subject to energy source availability, ensuring that the change of *active power* output in a 5 minute period does not exceed a value specified in a verbal instruction issued by the *control centre*; and
 - (iv) being upgraded to receive electronic instructions from the *control centre* and fully implement them within 5 minutes; and
 - (3) for a *semi-scheduled generating unit* or a *semi-scheduled generating system*, maintaining and changing its *active power* output in accordance with its *dispatch instructions*.

Negotiated access standard

- (c) A *negotiated access standard* may provide that if the number or frequency of verbal instructions becomes difficult for a *control centre* to manage, *AEMO* may require the *Generator* to upgrade its *facilities* to receive electronic instructions and fully implement them within 5 minutes.
- (d) The *negotiated access standard* must document to *AEMO's* satisfaction any operational arrangements necessary to manage *network* flows that may include a requirement for the *generating system* to be operated in a manner that prevents its output changing within 5 minutes by more than an amount specified by a *control centre*.
- (e) *AEMO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.14.

General requirements

- (f) Each *control system* used to satisfy the requirements of paragraphs (a) and (b) must be *adequately damped*.

S5.2.6 Monitoring and control requirements

S5.2.6.1 Remote Monitoring

Automatic access standard

- (a) The *automatic access standard* is a:
 - (1) *scheduled generating unit*;
 - (2) *scheduled generating system*;
 - (3) *non-scheduled generating unit* with a *nameplate rating* of 30 MW or more;
 - (4) *non-scheduled generating system* with a combined *nameplate rating* of 30 MW or more;
 - (5) *semi-scheduled generating unit*; or
 - (6) *semi-scheduled generating system*,

must have *remote monitoring equipment* to transmit to *AEMO's control centres* in real time in accordance with rule 4.11 the quantities that *AEMO* reasonably requires to discharge its *market* and *power system security* functions set out in Chapters 3 and 4.

- (b) The quantities referred to under paragraph (a) that *AEMO* may request include:
 - (1) in respect of a *generating unit* with a *nameplate rating* of 30 MW or more:
 - (i) *current, voltage, active power* and *reactive power* in respect of *generating unit* stators or power conversion systems (as applicable);
 - (ii) the status of all switching devices that carry the *generation*; and
 - (iii) *tap-changing transformer* tap position;
 - (2) in respect of a *generating system* that includes a *generating unit* with a *nameplate rating* of less than 30 MW:

- (i) its connected status, *tap-changing transformer* tap position and *voltages*;
 - (ii) *active power* and *reactive power* aggregated for groups of identical *generating units*;
 - (iii) either the number of identical *generating units* operating or the operating status of each non-identical *generating unit*; and
 - (iv) *active power* and *reactive power* for the *generating system*;
- (3) in respect of an auxiliary supply system with a capacity of 30 MW or more associated with a *generating unit* or *generating system*, *active power* and *reactive power*;
 - (4) in respect of *reactive power* equipment that is part of a *generating system* but not part of a particular *generating unit*, its *reactive power*;
 - (5) in respect of a wind farm type of *generating system*:
 - (i) wind speed;
 - (ii) wind direction;
 - (iii) ambient temperature; and
 - (6) any other quantity that *AEMO* reasonably requires to discharge its *market* and *power system security* functions as set out in Chapters 3 and 4.

Minimum access standard

- (c) The *minimum access standard* is a:
 - (1) *scheduled generating unit*;
 - (2) *scheduled generating system*;
 - (3) *non-scheduled generating system* with a combined *nameplate rating* of 30 MW or more;
 - (4) *semi-scheduled generating unit*; or
 - (5) *semi-scheduled generating system*,must have *remote monitoring equipment* to transmit to *AEMO's control centres* in real time:
 - (6) the *active power* output of the *generating unit* or *generating system* (as applicable);

- (7) if *connected to a transmission system*, the *reactive power output* of the *generating unit* or *generating system* (as applicable); and
- (8) if a wind farm type of *generating system*:
 - (i) number of units operating;
 - (ii) wind speed; and
 - (iii) wind direction,

in accordance with rule 4.11.

Negotiated access standard

- (d) *AEMO* may advise on matters relating to *negotiated access standards* under this clause S5.2.6.1.

S5.2.6.2 Communications equipment

Automatic access standard

- (a) The *automatic access standard* is a *Generator* must:
 - (1) provide and maintain two separate telephone *facilities* using independent telecommunications service providers, for the purposes of operational communications between the *Generator's* responsible operator under clause 4.11.3(a) and *AEMO's control centre*; and
 - (2) provide electricity supplies for *remote monitoring equipment* and *remote control equipment* installed in relation to its *generating system* capable of keeping such equipment available for at least 3 hours following total loss of *supply* at the *connection point* for the relevant *generating unit*.

Minimum access standard

- (b) The *minimum access standard* is a *Generator* must:
 - (1) provide and maintain a telephone facility for the purposes of operational communications between the *Generator's* responsible operator under clause 4.11.3(a) and *AEMO's control centre*; and
 - (2) provide electricity supplies for *remote monitoring equipment* and *remote control equipment* installed in relation to its *generating system* capable of keeping such equipment available for at least 1 hour following total loss of *supply* at the *connection point* for the relevant *generating unit*.

Negotiated access standard

- (c) A *negotiated access standard* must include, where the *Network Service Provider* or *AEMO* reasonably require, a back-up telephone facility be independent of commercial telephone service providers, and the *Network Service Provider* must provide and maintain the separate facility on a cost-recovery basis only through the charge for *connection*.
- (d) A *negotiated access standard* must include that a *Generator* must provide communications paths (with appropriate redundancy) from the *remote monitoring equipment* or *remote control equipment* installed for each of its *generating systems* as appropriate, to a communications interface in a location reasonably acceptable to the *Network Service Provider* at the relevant *generation* facility.
- (e) Communications systems between the communications interface under paragraph (d) and the *control centre* must be the responsibility of the *Network Service Provider* unless otherwise agreed by the *Generator* and the *Network Service Provider*.
- (f) A *negotiated access standard* must include that the *Generator* provide accommodation and secure power supplies for communications *facilities* provided by the *Network Service Provider* under this clause S5.2.6.2.
- (g) *AEMO* may advise on matters relating to *negotiated access standards* under this clause S5.2.6.2.

S5.2.7 Power station auxiliary supplies

In cases where a *generating system* takes its auxiliary supplies via a *connection point* through which its *generation* is not transferred to the *network*, the *access standards* must be established under clause S5.3.5 as if the *Generator* were a *Market Customer*.

S5.2.8 Fault current

Automatic access standard

- (a) The *automatic access standard* is:
 - (1) the contribution of the *generating system* to the fault current on the *connecting network* through its *connection point* must not exceed the contribution level that will ensure that the total fault current can be safely interrupted by the circuit breakers of the *connecting network* and safely carried by the *connecting network* for the duration of the applicable *breaker fail protection system fault clearance times*, as specified for the relevant *connection point* by the *Network Service Provider*;

- (2) a *generating system's connected plant* must be capable of withstanding fault current through the *connection point* up to the higher of:
 - (i) the level specified in clause S5.2.4(e1)(1) ; and
 - (ii) the highest level of current at the *connection point* that can be safely interrupted by the circuit breakers of the *connecting network* and safely carried by the *connecting network* for the duration of the applicable *breaker fail protection system fault clearance times*, as specified by the *Network Service Provider*; and
- (3) a circuit breaker provided to isolate a *generating unit* or *generating system* from the *network* must be capable of breaking, without damage or restrike, the maximum fault currents that could reasonably be expected to flow through the circuit breaker for any fault in the *network* or in the *generating unit* or *generating system*, as specified in the *connection agreement*.

Minimum access standard

- (b) The *minimum access standard* is:
 - (1) the *generating system* does not need to limit fault current contribution;
 - (2) a *generating system's connected plant* must be capable of withstanding fault current through the *connection point* up to the level specified in clause S5.2.4(e1)(1) ; and
 - (3) a circuit breaker provided to isolate a *generating unit* or *generating system* from the *network* must be capable of breaking, without damage or restrike, the maximum fault currents that could reasonably be expected to flow through the circuit breaker for any fault in the *network* or in the *generating unit* or *generating system*, as specified in the *connection agreement*.

Negotiated access standard

- (c) In negotiating a *negotiated access standard*, the *Network Service Provider* must consider alternative *network* configurations in the determination of the applicable fault current level and must prefer those options that maintain an equivalent level of service to other *Network Users* and which, in the opinion of the *Generator*, impose the least obligation on the *Generator*.
- (d) In carrying out assessments of proposed *negotiated access standards* under this clause S5.2.8, the *Network Service Provider* must take into account, without limitation:

- (1) the expected performance of existing *networks* and *considered projects*;
- (2) the expected performance of existing *generating plant* and other relevant projects; and
- (3) the expected range of *power system* operating conditions.

Schedule 5.3 - Conditions for Connection of Customers

S5.3.1a Introduction to the schedule

- (a) This schedule applies to the following classes of *Network User*:
 - (1) a *First-Tier Customer* in respect of its *first-tier load*;
 - (2) a *Second-Tier Customer* in respect of its *second-tier load*;
 - (3) a *Market Customer* in respect of its *market load*;
 - (4) a *Non-Registered Customer* in respect of *supply* it takes from a *network*; and
 - (5) a *Distribution Network Service Provider* in respect of its *distribution network*.
- (b) For the purposes of this schedule 5.3 the term “*Network Service Provider*” must be interpreted to mean the *Network Service Provider* with whom the *Connection Applicant* has sought, or is seeking, a *connection* in accordance with clause 5.3.2 of the *Rules*.
- (c) All *Network Users* must comply with the requirements for the establishment of *performance standards* in accordance with provisions contained in schedule 5.1a for *system standards* or schedule 5.1 for *Network Service Providers* and this schedule 5.3 for *Customers*.
- (d) If the *Connection Applicant* is a *Registered Participant* in relation to the proposed *connection*, the *Network Service Provider* may include as terms and conditions of the *connection agreement* any provision of this schedule that is expressed as an obligation on a *Network User*. If the *Connection Applicant* is not a *Registered Participant* in relation to the proposed *connection*, the *Network Service Provider* must include as terms and conditions of the *connection agreement*:
 - (1) each provision of this schedule that is expressed as an obligation on a *Network User*; and
 - (2) each agreed *performance standard* and an obligation to comply with it.
- (e) The purpose of this schedule is to:
 - (1) describe the information that must be exchanged for the *connection enquiry* and *application to connect* processes described in rule 5.3 of the *Rules*;

- (2) establish the *automatic access standards* and *minimum access standards* that will apply to the process of negotiating access standards under clause 5.3.4A of the *Rules*; and
- (3) establish obligations to apply prudent design standards for the *plant* to be *connected*.

S5.3.1 Information

- (a) Before a *Network User* connects any new or additional equipment to a *network*, the *Network User* must submit the following kinds of information to the *Network Service Provider*:
 - (1) a single line diagram with the protection details;
 - (2) *metering system* design details for any metering equipment being provided by the *Network User*;
 - (3) a general arrangement locating all the equipment on the site;
 - (4) a general arrangement for each new or altered *substation* showing all exits and the position of all electrical equipment;
 - (5) type test certificates for all new switchgear and *transformers*, including measurement *transformers* to be used for *metering* purposes in accordance with Chapter 7 of the *Rules*;
 - (6) earthing details;
 - (7) the proposed methods of earthing cables and other equipment to comply with the regulations of the relevant *participating jurisdiction*;
 - (8) *plant* and earth grid test certificates from approved test authorities;
 - (9) a secondary injection and trip test certificate on all circuit breakers;
 - (10) certification that all new equipment has been inspected before being *connected* to the *supply*; and
 - (11) operational arrangements.
- (b) For the purposes of clause 5.3.2(f) of the *Rules*, the technical information that a *Network Service Provider* must, if requested, provide to a *Connection Applicant* in respect of the proposed *connection* includes:
 - (1) the highest expected single phase and three phase fault levels at the *connection point* without the proposed *connection*;

- (2) the clearing times of the existing *protection systems* that would clear a fault at the location at which the new *connection* would be connected into the existing *transmission system* or *distribution system*;
- (3) the expected limits of *voltage* fluctuation, harmonic *voltage* distortion and *voltage* unbalance at the *connection point* without the proposed *connection*;
- (4) technical information relevant to the *connection point* without the proposed *connection* including equivalent source impedance information, sufficient to estimate fault levels, *voltage* fluctuations, harmonic *voltage* distortion and *voltage* unbalance; and
- (5) any other information or data not being *confidential information* relating to the performance of the *Network Service Provider's facilities* that is reasonably necessary for the *Connection Applicant* to prepare an *application to connect*;

except where the *Connection Applicant* agrees the *Network Service Provider* may provide alternative or less detailed technical information in satisfaction of this clause S5.3.1.(b).

S5.3.2 Design standards

A *Network User* must ensure that:

- (a) the electrical *plant* in its *facility* complies with the relevant *Australian Standards* as applicable at the time of first installation of that electrical *plant* in the *facility*;
- (b) circuit breakers provided to isolate the *Network User's facilities* from the *Network Service Provider's facilities* are capable of breaking, without damage or restrike, fault currents nominated by the *Network Service Provider* in the relevant *connection agreement*; and
- (c) new equipment including circuit breakers provided to isolate the *Network User's facilities* from the *Network Service Provider's facilities* is capable of withstanding, without damage, power *frequency voltages* and impulse levels nominated by the *Network Service Provider* to apply at the *connection point* in accordance with the relevant provisions of the *system standards* and recorded in the relevant *connection agreement*.

S5.3.3 Protection systems and settings

A *Network User* must ensure that all *connections* to the *network* are protected by protection devices which effectively and safely *disconnect* any faulty circuit automatically within a time period specified by the *Network Service Provider* in accordance with the following provisions:

- (a) The *automatic access standard* is:
- (1) Primary *protection systems* must be provided to *disconnect* any faulted element from the *power system* within the applicable *fault clearance time* determined under clause S5.1.9(a)(1), but subject to clauses S5.1.9(k) and S5.1.9(l).
 - (2) Each primary *protection system* must have sufficient redundancy to ensure that a faulted element within its protection zone is *disconnected* from the *power system* within the applicable *fault clearance time* with any single protection element (including any communications facility upon which that *protection system* depends) out of service.
 - (3) *Breaker fail protection systems* must be provided to clear faults that are not cleared by the circuit breakers controlled by the primary *protection system*, within the applicable *fault clearance time* determined under clause S5.1.9(a)(1).
- (b) The *minimum access standard* is:
- (1) Primary *protection systems* must be provided to *disconnect* from the *power system* any faulted element within their respective protection zones within the applicable *fault clearance time* determined under clause S5.1.9(a)(2), but subject to clauses S5.1.9(k) and S5.1.9(l).
 - (2) If a *fault clearance time* determined under clause S5.1.9(a)(2) for a protection zone is less than 10 seconds, a *breaker fail protection system* must be provided to clear from the *power system* any fault within that protection zone that is not cleared by the circuit breakers controlled by the primary *protection system*, within the applicable *fault clearance time* determined under clause S5.1.9(a)(3).
- (c) The *Network Service Provider* and the *Network User* must cooperate in the design and implementation of *protection systems* to comply with this clause, including cooperation with regard to:
- (1) the use of *current transformer* and *voltage transformer* secondary circuits (or equivalent) of one party by the *protection system* of the other;
 - (2) tripping of one party's circuit breakers by a *protection system* of the other party; and
 - (3) co-ordination of *protection system* settings to ensure inter-operation.

Before the *Network User's* installation is *connected* to the *Network Service Provider's* transmission or distribution system the *Network User's* protection system must be tested and the *Network User* must submit the appropriate test certificate to the *Network Service Provider*.

The application of settings of the protection scheme must be undertaken in accordance with clause S5.3.4.

S5.3.4 Settings of protection and control systems

A *Network User* must only apply settings to a *control system* or a *protection system* that are necessary to comply with performance requirements of this schedule 5.3 if the settings have been approved in writing by the *Network Service Provider* and, if the requirement is one that would involve *AEMO* under clause 5.3.4A(c) of the *Rules*, also by *AEMO*. A *Network User* must not allow its *plant* to take *supply* of electricity from the *power system* without such prior approval.

If a *Network User* seeks approval from the *Network Service Provider* to apply or change a setting, approval must not be withheld unless the *Network Service Provider* or, if the requirement is one that would involve *AEMO* under clause 5.3.4A(c) of the *Rules*, *AEMO*, reasonably determines that the changed setting would cause the *plant* to not comply with the relevant *performance standard* or cause an *inter-regional* or *intra-regional power transfer capability* to be reduced.

If the *Network Service Provider* or, if the requirement is one that would involve *AEMO* under clause 5.3.4A(c) of the *Rules*, *AEMO*, reasonably determines that a setting of a *control system* or *protection system* of the *plant* needs to change to comply with the relevant *performance standard* or to maintain or restore an *inter-regional* or *intra-regional power transfer capability*, the *Network Service Provider* or *AEMO* (as applicable) must consult with the *Network User*, and the *Network Service Provider* may request in writing that a setting be applied in accordance with the determination.

The *Network Service Provider* may also request a test to verify the performance of the relevant *plant* with the new setting.

A *Network User* who receives such a request must arrange for the notified setting to be applied as requested and for a test to be conducted as requested. After the test, the *Network User* must, on request, provide both *AEMO* and the *Network Service Provider* with a report of a requested test, including evidence of its success or failure. Such a report of a test is *confidential information*.

A *Network User* must not change a setting requested by the *Network Service Provider* without its prior written agreement. If the *Network Service Provider* requires a *Network User* to change a setting within 18 months of a previous request, the *Network Service Provider* must pay the *Network User* its reasonable costs of changing the setting and conducting the tests as requested.

S5.3.5 Power factor requirements

Automatic access standard: For loads equal to or greater than 30 percent of the maximum demand at the connection point the power factors for Network Users and for distribution networks connected to another transmission network or distribution network are shown in Table S5.3.1:

Table S5.3.1

Permissible Range	
Supply Voltage (nominal)	Power Factor Range
> 400 kV	0.98 lagging to unity
250 kV - 400 kV	0.96 lagging to unity
50 kV - 250 kV	0.95 lagging to unity
1 kV < 50 kV	0.90 lagging to 0.90 leading

For load less than 30 percent of the maximum demand at the connection point a Network Service Provider may accept a power factor outside the range stipulated in Table S5.3.1 provided this does not cause the system standards to be violated.

Minimum access standard: A Network Service Provider may permit a lower lagging or leading power factor where the Network Service Provider is advised by AEMO that this will not detrimentally affect power system security or reduce intra-regional or inter-regional power transfer capability.

General:

If the power factor falls outside the relevant performance standard over any critical loading period nominated by the Network Service Provider, the Network User must, where required by the Network Service Provider in order to maintain satisfactory voltage levels at the connection point or to restore intra-regional or inter-regional power transfer capability, take action to ensure that the power factor falls within range as soon as reasonably practicable. This may be achieved by installing additional reactive plant or reaching a commercial agreement with the Network Service Provider to install, operate and maintain equivalent reactive plant as part of the connection assets or by alternative commercial arrangements with another party.

A Registered Participant who installs shunt capacitors to comply with power factor requirements must comply with the Network Service Provider's reasonable requirements to ensure that the design does not severely attenuate audio frequency signals used for load control or operations, or adversely impact on harmonic voltage levels at the connection point.

S5.3.6 Balancing of load currents

A *Network Service Provider* may require a *connected Registered Participant's load* to be balanced across all phases in order to maintain the negative sequence voltage at each *connection point* at less than or equal to the limits set out in Table S5.1a.1 of the *system standards* for the applicable nominal *supply voltage* level.

Automatic access standard: A *Network User* must ensure that:

- (a) for *connections* at 30 kV or higher *voltage*, the current in any phase is not greater than 102 percent or less than 98 percent of the average of the currents in the three phases; and
- (b) for *connections* at *voltages* less than 30 kV, that the current in any phase is not greater than 105 percent or less than 95 percent of the average of the currents in the three phases.

Minimum access standard: Where agreed with the relevant *Network Service Provider* and subject to any specific conditions imposed, a *Network User* may cause current unbalance greater than that specified in the *automatic access standard* provided the *Network User* does not cause the limits specified in clause S5.1a.7 to be exceeded at any point in the *network*.

General:

The limit to *load* current unbalance must be included in the *connection agreement* and is subject to verification of compliance by the *Network Service Provider*.

Where these requirements cannot be met the *Registered Participant* may enter into a commercial arrangement with the *Network Service Provider* for the installation of equipment to correct the phase unbalance. Such equipment must be considered as part of the *connection assets* for the *Registered Participant*.

The limit to *load* current unbalance must be included in the *connection agreement* and is subject to verification of compliance by the *Network Service Provider*.

S5.3.7 Voltage fluctuations

- (a) *Automatic access standard:* The *voltage* fluctuations caused by variations in *loading level* at the *connection point*, including those arising from *energisation*, de-energisation or other operation of *plant*, must not exceed the limits determined under clause S5.1.5(a).
- (b) *Minimum access standard:* The *voltage* fluctuations caused by variations in *loading level* at the *connection point*, including those arising from *energisation*, de-energisation or other operation of *plant*, must not exceed the limits determined under clause S5.1.5(b).

The *voltage* fluctuation emission limits and any specified conditions must be included in the *connection agreement*, and are subject to verification of compliance by the *Network Service Provider*.

S5.3.8 Harmonics and voltage notching

- (a) *Automatic access standard*: The harmonic *voltage* distortion caused by non-linearity, commutation of power electronic equipment, harmonic resonance and other effects within the *plant*, must not exceed the limits determined under clause S5.1.6(a).
- (b) *Minimum access standard*: The harmonic *voltage* distortion caused by non-linearity, commutation of power electronic equipment, harmonic resonance and other effects within the *plant*, must not exceed the limits determined under clause S5.1.6(b).

The harmonic *voltage* distortion emission limits and any special conditions must be included in the *connection agreement*, and is subject to verification of compliance by the *Network Service Provider*.

S5.3.9 Design requirements for Network Users' substations

A *Network User* must comply with the following requirements applicable to the design, station layout and choice of equipment for a *substation*:

- (a) safety provisions must comply with requirements applicable to the *participating jurisdiction* notified by the *Network Service Provider*;
- (b) where required by the *Network Service Provider*, appropriate interfaces and accommodation must be incorporated for communication *facilities*, remote monitoring and control and protection of *plant* which is to be installed in the *substation*;
- (c) a *substation* must be capable of continuous uninterrupted operation with the levels of *voltage*, harmonics, unbalance and *voltage* fluctuation specified in the *system standards* as modified in accordance with the relevant provisions of schedule 5.1;
- (d) earthing of primary *plant* in the *substation* must be in accordance with the Electricity Supply Association of Australia Safe Earthing Guide and must reduce step and touch potentials to safe levels;
- (e) *synchronisation facilities* or reclose blocking must be provided if a *generating unit* is *connected* through the *substation*;
- (f) secure electricity supplies of adequate capacity must be provided for *plant* performing communication, monitoring, control and protection functions;

- (g) *plant* must be tested to ensure that the *substation* complies with the approved design and specifications as included in a *connection agreement*;
- (h) the protection equipment required would normally include protection schemes for individual items of *plant*, back-up arrangements, auxiliary DC supplies and instrumentation *transformers*; and
- (i) insulation levels of *plant* in the *substation* must co-ordinate with the insulation levels of the *network* to which the *substation* is *connected* as nominated in the *connection agreement*.

S5.3.10 Load shedding facilities

Network Users who are *Market Customers* and who have expected peak demands in excess of 10MW must provide automatic *interruptible load* in accordance with clause 4.3.5 of the *Rules*.

Load shedding procedures may be applied by *AEMO* in accordance with the provisions of clause 4.3.2 of the *Rules* for the shedding of all *loads* including *sensitive loads*.

Schedule 5.3a - Conditions for connection of Market Network Services

S5.3a.1a Introduction to the schedule

This schedule sets out obligations of *Market Network Service Providers* who *connect* to either a *transmission network* or a *distribution network*. It represents the requirements to be met for access to a *network*. Particular provisions may be varied by the *Network Service Provider* under the provisions of the *Rules* for the application of *minimum access standards* and *automatic access standards*.

This schedule includes specific provisions for the determination of *automatic access standards* and *negotiated access standards* derived from *minimum access standards* which, once determined, must be recorded together with the *automatic access standards* in a *connection agreement* and registered with AEMO as *performance standards*.

In this schedule, the term "*Network Service Provider*" applies only to the *Network Service Provider* with whom the *Market Network Service Provider* has lodged, or is considering lodging, an *application to connect*.

- (a) The schedule includes, in respect of each *market network service*, provisions regarding the capability to:
 - (1) automatically control the transfer of real power at the *connection point* for any given set of *system* conditions within the limits permitted under the *Rules*;
 - (2) respond to control requirements under expected normal and abnormal conditions;
 - (3) comply with general requirements to meet quality of *supply* obligations in accordance with clauses S5.3a.9, S5.3a.10 and S5.3a.11 and to maintain security of *supply* to other *Registered Participants*; and
 - (4) automatically *disconnect* itself when necessary to prevent any damage to the *market network service facilities* or threat to *power system security*.
- (b) This schedule also sets out the requirements and conditions, which (subject to clause 5.2.3 of the *Rules*) are obligations of *Market Network Service Providers* to:
 - (1) co-operate with the relevant *Network Service Provider* on technical matters when making a new *connection*;
 - (2) provide information to the *Network Service Provider* or AEMO; and

- (3) observe and apply the relevant provisions of the *system standards* contained in schedule 5.1a in relation to the planning, design and operation of its *market network service facilities*.
- (c) This schedule does not set out arrangements by which a *Market Network Service Provider* may enter into an agreement or contract with *AEMO* to:
 - (1) provide additional services that are necessary to maintain *power system security*; or
 - (2) provide additional service to facilitate management of the *market*.

S5.3a.1 Provision of Information

- (a) Before a *Market Network Service Provider* connects any new or additional equipment to a *network*, the *Market Network Service Provider* must submit the following kinds of information to the *Network Service Provider*:
 - (1) a single line diagram with the protection details;
 - (2) *metering system* design details for any metering equipment being provided by the *Market Network Service Provider*;
 - (3) a general arrangement locating all relevant equipment on the site;
 - (4) a general arrangement for each new or altered *substation* showing all exits and the position of all electrical equipment;
 - (5) type test certificates for all new switchgear and *transformers*, including measurement *transformers* to be used for *metering* purposes in accordance with Chapter 7 of the *Rules*;
 - (6) earthing details;
 - (7) the proposed methods of earthing cables and other equipment to comply with the regulations of the relevant *participating jurisdiction*;
 - (8) *plant* and earth grid test certificates from approved test authorities;
 - (9) a secondary injection and trip test certificate on all circuit breakers;
 - (10) certification that all new equipment has been inspected before being *connected* to the *supply*; and
 - (11) operational arrangements.
- (b) For the purposes of clause 5.3.2(f) of the *Rules*, the technical information that a *Network Service Provider* must, if requested, provide to a *Connection*

Applicant in respect of the proposed *connection* of a *market network service facility* includes:

- (1) the highest expected single phase and three phase fault levels at the *connection point* without the proposed *connection*;
- (2) the clearing times of the existing *protection systems* that would clear a fault at the location at which the new *connection* would be connected into the existing *transmission system* or *distribution system*;
- (3) the expected limits of *voltage* fluctuation, harmonic *voltage* distortion and *voltage* unbalance at the *connection point* without the proposed *connection*;
- (4) technical information relevant to the *connection point* without the proposed *connection* including equivalent source impedance information, sufficient to estimate fault levels, *voltage* fluctuations, harmonic *voltage* distortion and *voltage* unbalance; and
- (5) any other information or data not being *confidential information* relating to the performance of the *Network Service Provider's facilities* that is reasonably necessary for the *Connection Applicant* to prepare an *application to connect*;

except where the *Connection Applicant* agrees the *Network Service Provider* may provide alternative or less detailed technical information in satisfaction of this clause S5.3a.1(b).

S5.3a.2 Application of settings

A *Market Network Service Provider* must only apply settings to a *control system* or a *protection system* that are necessary to comply with performance requirements of this schedule 5.3a if the settings have been approved in writing by the *Network Service Provider* and, if the requirement is one that would involve *AEMO* under clause 5.3.4A(c) of the *Rules*, also by *AEMO*. A *Market Network Service Provider* must not allow its *market network service facilities* to take electricity from the *power system* without such prior approval.

If a *Market Network Service Provider* seeks approval from the *Network Service Provider* to apply or change a setting, approval must not be withheld unless the *Network Service Provider* or, if the requirement is one that would involve *AEMO* under clause 5.3.4A(c) of the *Rules*, *AEMO*, reasonably determines that the changed setting would cause the *market network service facilities* to not comply with the relevant *performance standard* or cause an *inter-regional* or *intra-regional power transfer capability* to be reduced.

If the *Network Service Provider* or, if the requirement is one that would involve *AEMO* under clause 5.3.4A(c) of the *Rules*, *AEMO*, reasonably determines that a

setting of a *market network service facility's control system or protection system* needs to change to comply with the relevant *performance standard* or to maintain or restore an *inter-regional or intra-regional power transfer capability*, the *Network Service Provider* or *AEMO* (as applicable) must consult with the *Market Network Service Provider*, and may request in writing that a setting be applied in accordance with the determination.

The *Network Service Provider* may also request a test to verify the performance of the relevant *plant* with the new setting. The *Network Service Provider* must provide *AEMO* with a copy of its request to a *Market Network Service Provider* to apply a setting or to conduct a test.

A *Market Network Service Provider* who receives such a request must arrange for the notified setting to be applied as requested and for a test to be conducted as requested. After the test, the *Market Network Service Provider* must, on request, provide both *AEMO* and the *Network Service Provider* with a report of a requested test, including evidence of its success or failure. Such a report of a test is *confidential information*.

A *Market Network Service Provider* must not change a setting requested by the *Network Service Provider* without its prior written agreement. If the *Network Service Provider* requires a *Market Network Service Provider* to change a setting within 18 months of a previous request, the *Network Service Provider* must pay the *Market Network Service Provider* its reasonable costs of changing the setting and conducting the tests as requested.

S5.3a.3 Technical matters to be co-ordinated

A *Market Network Service Provider* and the relevant *Network Service Provider* must use all reasonable endeavours to agree upon the following matters in respect of each new or altered *connection* of a *market network service facility* to a *network*:

- (a) design at the *connection point*;
- (b) physical layout adjacent to the *connection point*;
- (c) primary protection and backup protection (clause S5.3a.6);
- (d) control characteristics (clause S5.3a.4);
- (e) communications and alarms (clause S5.3a.4);
- (f) insulation co-ordination and lightning protection;
- (g) fault levels and *fault clearance times*;
- (h) switching and *isolation facilities*;

- (i) interlocking arrangements; and
- (j) *metering installations* as described in Chapter 7 of the *Rules*.

S5.3a.4 Monitoring and control requirements

S5.3a.4.1 Remote Monitoring

- (a) *Automatic access standard:*
 - (1) Each *market network service facility* must have *remote monitoring equipment* to transmit to *AEMO's control centres* in real time, the quantities that *AEMO* reasonably requires to discharge its *market and power system security* functions as set out in Chapters 3 and 4 of the *Rules* respectively.
 - (2) The quantities may include such data as current, *voltage*, *active power*, *reactive power*, operational limits and critical temperatures in respect of *connection points* and power conversion systems.
- (b) *Minimum access standard:*
 - (1) Each *market network service facility* must have *remote monitoring equipment* to transmit to *AEMO's control centres* in real time:
 - (A) *connection point active power* flow, *reactive power* flow and *voltage*;
 - (B) *active power*, *reactive power* and *voltage* for AC power lines, *transformers* and *busbars*, and power and *voltage* (or alternatively current) for DC power lines; and
 - (C) the status of circuit breakers.
- (c) The negotiation of access standards in relation to this clause S5.3a.4.1 must involve *AEMO* under clause 5.3.4A(c) of the *Rules*.

S5.3a.4.2 [Deleted]

S5.3a.4.3 Communications equipment

A *Market Network Service Provider* must provide electricity *supplies* for *remote monitoring equipment* and *remote control equipment* installed in relation to its *market network service facilities* capable of keeping such equipment available for at least three hours following total loss of *supply* at the *connection point* for the relevant *market network service facility*.

A *Market Network Service Provider* must provide communications paths (with appropriate redundancy) from the *remote monitoring equipment* or *remote control equipment* installed at any of its *market network service facilities* to a communications interface in a location reasonably acceptable to the *Network Service Provider* at the relevant *connection point*. Communications systems between this communications interface and the *control centre* are the responsibility of the *Network Service Provider* unless otherwise agreed by the *Market Network Service Provider* and the *Network Service Provider*.

Telecommunications between *Network Service Providers* and *Market Network Service Providers* for *operational communications* must be established in accordance with the requirements set down below.

(a) Primary Speech Facility

The relevant *Network Service Provider* must provide and maintain equipment by means of which routine and emergency control telephone calls may be established between the *Market Network Service Provider's* responsible Engineer/Operator and AEMO.

The *facilities* to be provided, including the interface requirement between the *Network Service Provider's* equipment and the *Market Network Service Provider's* equipment, must be specified by the *Network Service Provider*.

The costs of the equipment must be recovered by the *Network Service Provider* only through the charge for *connection*.

(b) Back-up Speech Facility

Where the *Network Service Provider* or AEMO reasonably determines that a back-up speech *facility* to the primary *facility* is required, the *Network Service Provider* must provide and maintain a separate telephone link or radio installation on a cost-recovery basis only through the charge for *connection*.

The *Network Service Provider* is responsible for radio system planning and for obtaining all necessary radio licences.

S5.3a.5 Design standards

A *Market Network Service Provider* must ensure that:

- (a) the electrical *plant* in its *facility* complies with the relevant *Australian Standards* as applicable at the time of first installation of that electrical *plant* in the *facility*;

- (b) circuit breakers provided to isolate the *Market Network Service Provider's facilities* from the *Network Service Provider's facilities* are capable of breaking, without damage or restrike, fault currents nominated by the *Network Service Provider* in the relevant *connection agreement*; and
- (c) all new equipment including circuit breakers provided to isolate the *Market Network Service Provider's facilities* from the *Network Service Provider's facilities* is capable of withstanding, without damage, power *frequency voltages* and impulse levels nominated by the *Network Service Provider* in accordance with the relevant provisions of the *system standards* and recorded in the relevant *connection agreement*.

S5.3a.6 Protection systems and settings

A *Market Network Service Provider* must ensure that all *connections* to the *network* are protected by protection devices which effectively and safely *disconnect* any faulty circuit automatically within a time period specified by the *Network Service Provider* in accordance with the following provisions:

- (a) The *automatic access standard* is:
 - (1) *Primary protection systems* must be provided to *disconnect* any faulted element from the *power system* within the applicable *fault clearance time* determined under clause S5.1.9(a)(1), but subject to clauses S5.1.9(k) and S5.1.9(l).
 - (2) Each *primary protection system* must have sufficient redundancy to ensure that a faulted element within its protection zone is *disconnected* from the *power system* within the applicable *fault clearance time* with any single protection element (including any communications facility upon which that *protection system* depends) out of service.
 - (3) *Breaker fail protection systems* must be provided to clear faults that are not cleared by the circuit breakers controlled by the *primary protection system*, within the applicable *fault clearance time* determined under clause S5.1.9(a)(1).
- (b) The *minimum access standard* is:
 - (1) *Primary protection systems* must be provided to *disconnect* from the *power system* any faulted element within their respective protection zones within the applicable *fault clearance time* determined under clause S5.1.9(a)(2), but subject to clauses S5.1.9(k) and S5.1.9(l).
 - (2) If a *fault clearance time* determined under clause S5.1.9(a)(2) for a protection zone is less than 10 seconds, a *breaker fail protection system* must be provided to clear from the *power system* any fault within that protection zone that is not cleared by the circuit breakers

controlled by the primary *protection system*, within the applicable *fault clearance time* determined under clause S5.1.9(a)(3).

- (c) The *Network Service Provider* and the *Market Network Service Provider* must cooperate in the design and implementation of *protection systems* to comply with this clause, including cooperation with regard to:
- (1) the use of *current transformer* and *voltage transformer* secondary circuits (or equivalent) of one party by the *protection system* of the other;
 - (2) tripping of one party's circuit breakers by a *protection system* of the other party; and
 - (3) co-ordination of *protection system* settings to ensure inter-operation.

The *Market Network Service Provider* must ensure that the protection settings of its protective equipment grade with the *Network Service Provider's transmission system* or *distribution system* protection settings. Similarly the grading requirements of fuses must be co-ordinated with the *Network Service Provider*. The *Market Network Service Provider* must provide details of the protection scheme implemented by the *Market Network Service Provider* to the *Network Service Provider* and must liaise with the *Network Service Provider* when determining gradings and settings.

The application of settings of the protection scheme must be undertaken in accordance with clause S5.3a.2.

Before the *Market Network Service Provider's* installation is *connected* to the *Network Service Provider's transmission or distribution system* the *Market Network Service Provider's protection system* must be tested and the *Market Network Service Provider* must submit the appropriate test certificate to the *Network Service Provider*.

S5.3a.7 [Deleted]

S5.3a.8 Reactive power capability

Subject to the access standards stated in this clause S5.3a.8, if additional *reactive support* is required as a result of the *connection* or operation of the *network elements* which provide a *market network service* then the requisite *reactive support* must be supplied or paid for by the *Market Network Service Provider*.

Additional reactive support is required if, at rated power output as measured at the *connection point* of the *market network service* the *market network service* has a lagging power factor of less than 0.9 or a leading power factor of less than 0.95.

Automatic access standard: For power export, at rated power output and target *network voltage* as determined in accordance with clause S5.1a.4 of the *system standards* when measured at the *connection point* of the *market network service*, the *market network service* must be capable of operation in the range from a lagging power factor of 0.9 to a leading power factor of 0.95. For power import, the power factor must satisfy the requirements of clause S5.3.5 of schedule 5.3.

Minimum access standard: With the agreement of *AEMO* and the *Network Service Provider*, a power factor capability less than that defined by the *automatic access standard* may be provided if the requirements of the *system standards* are satisfied under all operating conditions of the *market network service*.

S5.3a.9 Balancing of load currents

A *Network Service Provider* may require a *Market Network Service Provider's* *power transfer* to be balanced at a *connection point* in order to maintain the negative sequence *voltage* at each connection point at less than or equal to the limits set out in Table S5.1a.1 of the *system standards* for the applicable nominal *supply voltage* level.

Automatic access standard: A *Market Network Service Provider* must ensure that for *connections* at 11kV or higher *voltage*, the current in any phase drawn by its equipment from the *Network Service Provider's* *network* is not greater than 102 percent or less than 98 percent of the average of the currents in the three phases.

Minimum access standard: Where agreed with the relevant *Network Service Provider* and subject to any specific conditions imposed, a *Market Network Service Provider* may cause current unbalance greater than that specified in the *automatic access standard* provided the *Market Network Service Provider* does not cause the limits specified in clause S5.1a.7 of the *system standards* to be exceeded at any point in the *network*.

Where these requirements cannot be met the *Market Network Service Provider* may enter into a commercial arrangement with the *Network Service Provider* for the installation of equipment to correct the phase unbalance. Such equipment must be considered as part of the *connection assets* for the *Market Network Service Provider*.

The limit to *power transfer* current unbalance must be included in the *connection agreement* and is subject to verification of compliance by the *Network Service Provider*.

S5.3a.10 Voltage fluctuations

- (a) *Automatic access standard:* The *voltage* fluctuations caused by variations in *loading level* at the *connection point*, including those arising from

energisation, de-energisation or other operation of *plant*, must not exceed the limits determined under clause S5.1.5(a).

- (b) *Minimum access standard*: The *voltage* fluctuations caused by variations in *loading level* at the *connection point*, including those arising from *energisation*, de-energisation or other operation of *plant*, must not exceed the limits determined under clause S5.1.5(b).

The *voltage* fluctuation emission limits and any specified conditions must be included in the *connection agreement*, and are subject to verification of compliance by the *Network Service Provider*.

S5.3a.11 Harmonics and voltage notching

- (a) *Automatic access standard*: The harmonic *voltage* distortion caused by non-linearity, commutation of power electronic equipment, harmonic resonance and other effects within the *plant*, must not exceed the limits determined under clause S5.1.6(a).
- (b) *Minimum access standard*: The harmonic *voltage* distortion caused by non-linearity, commutation of power electronic equipment, harmonic resonance and other effects within the *plant*, must not exceed the limits determined under clause S5.1.6(b).

A *Market Network Service Provider* must ensure that all of its *plant connected* to a *transmission network* or *distribution network* is capable of withstanding the effects of harmonic levels produced by that *plant* plus those imposed from the *network*.

The harmonic *voltage* distortion emission limits and any special conditions must be included in the *connection agreement*, and are subject to verification of compliance by the *Network Service Provider*.

S5.3a.12 Design requirements for Market Network Service Providers' substations

A *Market Network Service Provider* must comply with the following requirements applicable to the design, station layout and choice of equipment for a *substation*:

- (a) safety provisions must comply with requirements applicable to the *participating jurisdiction* notified by the *Network Service Provider*;
- (b) where required by the *Network Service Provider*, appropriate interfaces and accommodation must be incorporated for communication *facilities*, remote monitoring and control and protection of *plant* which is to be installed in the *substation*;

- (c) a *substation* must be capable of continuous uninterrupted operation with the levels of *voltage*, harmonics, unbalance and *voltage* fluctuation specified in the *system standards* as modified in accordance with the relevant provisions of schedule 5.1;
- (d) earthing of primary *plant* in the *substation* must be in accordance with the Electricity Supply Association of Australia Safe Earthing Guide and must reduce step and touch potentials to safe levels;
- (e) *synchronisation facilities* or reclose blocking must be provided if necessary;
- (f) secure electricity supplies of adequate capacity must be provided for *plant* performing communication, monitoring, control and protection functions;
- (g) *plant* must be tested to ensure that the *substation* complies with the approved design and specifications as included in a *connection agreement*;
- (h) the protection equipment required would normally include protection schemes for individual items of *plant*, back-up arrangements, auxiliary DC supplies and instrumentation *transformers*; and
- (i) insulation levels of *plant* in the *substation* must co-ordinate with the insulation levels of the *network* to which the *substation* is *connected* as nominated in the *connection agreement*.

S5.3a.13 Market network service response to disturbances in the power system

- (a) Each *market network service* must be capable of continuous uninterrupted operation during the occurrence of:
 - (1) *power system frequency* within the *frequency operating standards*; or
 - (2) the range of *voltage* variation conditions permitted by the *system standards*.
- (b) The equipment associated with each *market network service* must be designed to withstand without damage or reduction in life expectancy the harmonic distortion and *voltage* unbalance conditions determined to apply in accordance with the provisions of schedule 5.1, clauses S5.1.6 and S5.1.7, respectively, at the *connection point*.

S5.3a.14 Protection of market network services from power system disturbances

- (a) *Minimum access standard*: If a *Connection Applicant* requires that its *market network service facility* be automatically *disconnected* from the *power system* in response to abnormal conditions arising from the *power*

system, the relevant *protection system* or *control system* must not *disconnect* the *facility* for conditions under which it must continuously operate or must withstand under a provision of the *Rules*.

- (b) There is no *automatic access standard* for this technical requirement.
- (c) For the purposes of this clause S5.3a.14, the abnormal conditions include:
 - (1) *frequency* outside the *extreme frequency excursion tolerance limits*;
 - (2) sustained and uncontrollable DC current beyond a short term current rating for the period assigned to that rating;
 - (3) DC *voltage* above the *voltage* maximum rating or sustained below any lower limit for stable operation;
 - (4) *voltage* to *frequency* ratio beyond a *transformer* magnetic flux based *voltage* to *frequency* rating;
 - (5) sustained *voltage* fluctuations at the *connection point* beyond the level determined under clause S5.1.5(a);
 - (6) sustained harmonic *voltage* distortion at the *connection point* beyond the level determined under clause S5.1.6(a);
 - (7) sustained negative phase sequence *voltage* at the *connection point* beyond the level determined under clause S5.1.7(a); and
 - (8) any similar condition agreed between the *Market Network Service Provider* and *AEMO* after consultation with each relevant *Network Service Provider*.
- (d) The negotiation of access standards in relation to this clause S5.3a.14 must involve *AEMO* under clause 5.3.4A(c) of the *Rules*.
- (e) The *Network Service Provider* is not liable for any loss or damage incurred by the *Market Network Service Provider* or any other person as a consequence of a fault on either the *power system*, or within the *Market Network Service Provider's facility*.

Schedule 5.4 - Information to be Provided with Preliminary Enquiry

The following items of information are required to be submitted with a preliminary enquiry for *connection* or modification of an existing *connection*:

- (a) Type of *plant* - (eg. gas turbine *generating unit*, rolling mill, etc.).
- (b) Preferred site location - (listing any alternatives in order of preference as well).
- (c) Maximum power *generation* or demand of whole *plant* - (maximum MW and/or MVA, or average over 15 minutes or similar).
- (d) Expected *energy* production or consumption (MWh per month).
- (e) *Plant* type and configuration - (eg. number and type of *generating units* or number of separate production lines).
- (f) Nature of any disturbing *load* (size of disturbing component MW/MVA_r, duty cycle, nature of power electronic *plant* which may produce harmonic distortion).
- (g) Technology of proposed *generating unit* (e.g. *synchronous generating unit*, induction generator, photovoltaic array, etc).
- (h) When *plant* is to be in service - (eg. estimated date for each *generating unit*).
- (i) Name and address of enquirer, and, if relevant, of the party for whom the enquirer is acting.
- (j) Other information may be requested by the *Network Service Provider*, such as amount and timing of power required during construction or any auxiliary power requirements.

Schedule 5.5 - Technical Details to Support Application for Connection and Connection Agreement

S5.5.1 Introduction to the schedule

Various sections of the *Rules* require that *Registered Participants* submit technical data to the *Network Service Provider*. This schedule lists the range of data which may be required. The actual data required will be advised by the *Network Service Provider*, and will form part of the technical specification in the *connection agreement*. These data will also be made available to *AEMO* and to other *Network Service Providers* by the *Network Service Provider* at the appropriate time.

S5.5.2 Categories of data

Data is coded in categories, according to the stage at which it is available in the build-up of data during the process of forming a *connection* or obtaining access to a *network*, with data acquired at each stage being carried forward, or enhanced in subsequent stages, eg. by testing.

Preliminary system planning data

Preliminary system planning data is required for submission with the *application to connect*, to allow the *Network Service Provider* to prepare an offer of terms and conditions for a *connection agreement* and to assess the requirement for, and effect of, *network augmentation* or *extension* options. Such data is normally limited to the items denoted as Standard Planning Data (S) in the *Generating System Model Guidelines*, *Generating System Design Data Sheet*, *Generating System Setting Data Sheet* and in schedules 5.5.3 to 5.5.5.

The *Network Service Provider* may, in cases where there is reasonable doubt as to the viability of a proposal, require the submission of other data before making an offer to *connect* or to amend a *connection agreement*.

Registered system planning data

Registered system planning data is the class of data which will be included in the *connection agreement* signed by both parties. It consists of the preliminary system planning data plus those items denoted in the attached schedules as Detailed Planning Data (D). The latter must be submitted by the *Registered Participant* in time for inclusion in the *connection agreement*.

Registered data

Registered Data consists of data validated and agreed between the *Network Service Provider* and the *Registered Participant*, such data being:

- (a) prior to actual *connection* and provision of access, data derived from manufacturers' data, detailed design calculations, works or site tests etc. (R1); and
- (b) after connection, data derived from on-system testing (R2).

All of the data will, from this stage, be categorised and referred to as Registered Data; but for convenience the schedules omit placing a higher ranked code next to items which are expected to already be valid at an earlier stage.

S5.5.3 Review, change and supply of data

Data will be subject to review at reasonable intervals to ensure its continued accuracy and relevance. The *Network Service Provider* must initiate this review. A *Registered Participant* may *change* any data item at a time other than when that item would normally be reviewed or updated by submission to the *Network Service Provider* of the revised data, together with authentication documents, eg. test reports.

The *Network Service Provider* must supply data relating to its system to other *Network Service Providers* for planning purposes and to other *Registered Participants* and *AEMO* as specified in the various sections of the *Rules*, including through the *statement of opportunities*.

S5.5.4 Data Requirements

Schedules 5.5.3 to 5.5.5 cover the following data areas:

- (a) schedule 5.5.3 - Network Plant Technical Data. This comprises fixed electrical parameters.
- (b) schedule 5.5.4 - Plant and Apparatus Setting Data. This comprises settings which can be varied by agreement or by direction of the *Network Service Provider* or *AEMO*.
- (c) schedule 5.5.5 - *Load Characteristics*. This comprises the estimated design parameters of *loads*.

The documents and schedules applicable to each class of *Registered Participant* are as follows:

- (a) *Generators*: the *Generating System Model Guidelines*, *Generating System Design Data Sheet* and *Generating System Setting Data Sheet*;
- (b) *Customers* and *Network Service Providers*: schedules 5.5.3 and 5.5.4; and
- (c) *Customers*: schedule 5.5.5.

S5.5.5 Asynchronous generating unit data

A *Generator* that connects a *generating system*, that is an *asynchronous generating unit*, must be given exemption from complying with those parts of the *Generating System Model Guidelines*, *Generating System Design Data Sheet* and *Generating System Setting Data Sheet* that are determined by the *Network Service Provider* to be not relevant to such *generating systems*, but must comply with those parts of schedules 5.5.3, 5.5.4, and 5.5.5 that are relevant to such *generating systems*, as determined by the *Network Service Provider*.

S5.5.6 Generating units equal to or smaller than 30MW data

A *Generator* that connects a *generating unit* equal to or smaller than 30 MW or a number of *generating units* totalling less than 30 MW to a *connection point* to a *distribution network* will usually be required to submit less registered system planning data and less registered data than is indicated in the *Generating System Model Guidelines*, *Generating System Design Data Sheet* and *Generating System Setting Data Sheet*. In general these data will be limited to confirmation of the preliminary system planning data, marked (S), but other data must be supplied if reasonably required by the *Network Service Provider* or AEMO.

Codes:

S = Standard Planning Data

D = Detailed Planning Data

R = Registered Data (R1 pre-connection, R2 post-connection)

S5.5.7 Generating System Design Data Sheet, Generating System Setting Data Sheet and Generating System Model Guidelines

- (a) NEMMCO must, subject to paragraph (b), develop and *publish* by 1 March 2008, in accordance with the *Rules consultation procedures*:
- (1) a *Generating System Design Data Sheet* describing, for relevant technologies, the *generating system* design parameters of *generating units* and *generating systems* including *plant* configurations, impedances, time constants, non-linearities, ratings and capabilities, to be provided under clauses S5.2.4 and this schedule 5.5;
 - (2) a *Generating System Setting Data Sheet* describing, for relevant *generation* and *control system* technologies, the *protection system* and *control system* settings of *generating units* and *generating systems* including configurations, gains, time constants, delays, deadbands, non-linearities and limits, to be provided under clauses S5.2.4 and this schedule 5.5; and

- (3) *Generating System Model Guidelines* describing, for relevant *generation* and *control system* technologies, *NEMMCO's* requirements when developing mathematical models for *generating units* and *generating systems*, including the impact of their *control systems* and *protection systems* on *power system security*,

and there must be a *Generating System Design Data Sheet*, *Generating System Setting Data Sheet* and *Generating System Model Guidelines* in place at all times after that date.

- (b) When developing and *publishing* the *Generating System Design Data Sheet*, *Generating System Setting Data Sheet* and *Generating System Model Guidelines* under paragraph (a), *NEMMCO* must have regard to the purpose of developing and *publishing* the sheets and guidelines which is to:

- (1) allow *generating units* and *generating systems* to be mathematically modelled by *NEMMCO* in load flow and dynamic stability assessments with sufficient accuracy to permit:

- (i) the *power system* operating limits for ensuring *power system security* to be quantified with the lowest practical safety margins;
- (ii) proposed *access standards* and *performance standards* of *generating units* and *generating systems* to be assessed; and
- (iii) settings of *control systems* and *protection systems* of *generating units*, *generating systems* and *networks* to be assessed and quantified for maximum practical performance of the *power system*; and

- (2) identify for each type of data its category in terms of clause S5.5.2.

- (c) Any person may submit a request (with written reasons) to *AEMO* to amend the *Generating System Design Data Sheet*, *Generating System Setting Data Sheet* or the *Generating System Model Guidelines* and *AEMO* must conduct the *Rules consultation procedures* in relation to the request.
- (d) *AEMO* can make amendments requested under paragraph (c) or otherwise to the *Generating System Design Data Sheet*, *Generating System Setting Data Sheet* or the *Generating System Model Guidelines* without conducting the *Rules consultation procedures* if the amendment is minor or administrative in nature.
- (e) *AEMO* may at the conclusion of the *Rules consultation procedures* under paragraph (c) or otherwise under paragraph (d), amend the relevant data sheet or guidelines (if necessary).

Schedule 5.5.1 - [Deleted]

Schedule 5.5.2 - [Deleted]

Schedule 5.5.3 - Network and plant technical data of equipment at or near connection point

Data Description	Units	Data Category
Voltage Rating		
Nominal <i>voltage</i>	kV	S, D
Highest <i>voltage</i>	kV	D
Insulation Co-ordination		
Rated lightning impulse withstand <i>voltage</i>	kVp	D
Rated short duration power <i>frequency</i> withstand <i>voltage</i>	kV	D
Rated Currents		
Circuit maximum current	kA	S, D
Rated Short Time Withstand Current	kA for seconds	D
Ambient conditions under which above current applies	Text	S,D
Earthing		
System Earthing Method	Text	S, D
Earth grid rated current	kA for seconds	D
Insulation Pollution Performance		
Minimum total creepage	mm	D
Pollution level	Level of IEC 815	D
Controls		
Remote control and data transmission	Text	D

Data Description	Units	Data Category
arrangements		

Metering Provided by Customer

Measurement <i>transformer</i> ratios:		D
<i>Current transformers</i>	A/A	D
<i>Voltage transformers</i>	V/kV	D
Measurement <i>Transformer</i> Test Certification details	Text	R1

Network Configuration

Operation Diagrams showing the electrical circuits of the existing and proposed main <i>facilities</i> within the <i>Registered Participant's</i> ownership including <i>busbar</i> arrangements, phasing arrangements, earthing arrangements, switching <i>facilities</i> and operating <i>voltages</i> .	Single line Diagrams	S, D, R1
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Network Impedance

For each item of <i>plant</i> : details of the positive, negative and zero sequence series and shunt impedance, including mutual coupling between physically adjacent elements.	% on 100 MVA base	S, D, R1
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Short Circuit Infeed to the Network

Maximum generator 3-phase short circuit infeed including infeeds from <i>generating units connected</i> to the <i>Registered Participant's system</i> , calculated by method of AS 3851 (1991).	kA symmetric al	S, D, R1
The total infeed at the instant of fault (including contribution of induction motors).	kA	D, R1
Minimum zero sequence impedance of <i>Registered Participant's network</i> at <i>connection point</i> .	% on 100 MVA base	D, R1
Minimum negative sequence impedance of <i>Registered Participant's network</i> at <i>connection point</i> .	% on 100 MVA base	D, R1

Data Description	Units	Data Category
Load Transfer Capability:		
Where a <i>load</i> , or group of <i>loads</i> , may be fed from alternative <i>connection points</i> :		
<i>Load</i> normally taken from <i>connection point X</i>	MW	D, R1
<i>Load</i> normally taken from <i>connection point Y</i>	MW	D, R1
Arrangements for transfer under planned or fault <i>outage</i> conditions	Text	D
Circuits Connecting Embedded Generating Units to the Network:		
For all <i>generating units</i> , all connecting lines/cables, <i>transformers</i> etc.		
Series Resistance	% on 100 MVA base	D, R
Series Reactance	% on 100 MVA base	D, R
Shunt Susceptance	% on 100 MVA base	D, R
Normal and short-time emergency ratings	MVA	D,R
Technical Details of <i>generating units</i> and <i>generating systems</i> as per the <i>Generating System Design Data Sheet</i> , <i>Generating System Setting Data Sheet</i> and the <i>Generating System Model Guidelines</i> where such details are not <i>confidential information</i>		
Transformers at connection points:		
Saturation curve	Diagram	R
Equipment associated with DC Links		
Number of poles	MVA	D,R
Converters per station	Quantity	D,R
Reactive Power consumption of converters	MCAr	D,R
Location and Rating of A.C. Filters	MVAr	D,R
Location and Rating of Shunt Capacitors	MVAr	D,R

Data Description	Units	Data Category
Location and Rating of Smoothing <i>Reactor</i>	MVAr	D,R
Location and Rating of DC Filter	MVAr	D,R

Schedule 5.5.4 - Network Plant and Apparatus Setting Data

Data Description	Units	Data Category
Protection Data for Protection relevant to Connection Point:		
Reach of all protections on <i>transmission lines</i> , or cables	ohms or % on 100 MVA base	S, D
Number of protections on each item	Text	S, D
Total fault clearing times for near and remote faults	ms	S, D, R1
Line reclosure sequence details	Text	S, D, R1
Tap Change Control Data:		
Time delay settings of all <i>transformer</i> tap changers.	Seconds	D, R1
Reactive Compensation:		
Location and Rating of individual <i>shunt reactors</i>	MVAr	D, R1
Location and Rating of individual <i>shunt capacitor banks</i>	MVAr	D, R1
<i>Capacitor bank</i> capacitance	microfarads	D
Inductance of switching <i>reactor</i> (if fitted)	millihenries	D
Resistance of capacitor plus <i>reactor</i>	Ohms	D
Details of special controls (e.g. Point-on-wave switching)	Text	D
For each shunt reactor or capacitor bank:		
Method of switching	Text	S
Details of automatic control logic such that	Text	D, R1

Data Description	Units	Data Category
operating characteristics can be determined		
FACTS Installation:		
Data sufficient to enable static and dynamic performance of the installation to be modelled	Text, diagrams control settings	S, D, R1
Transmission line flow control device	Text, diagrams	D
Details of the operation of the control device under normal operation conditions (including startup and shutdown of the line) and during a fault (close up and remote)		
Models for the control device and transmission line appropriate for load flow, small signal stability and transient stability analysis	Text, diagrams	D
Capability of the line flow control device	KA, MVA, MW	D
Details of the rate of change of flow capability of the control device	Text	D
Details of the capability of the control device to provide frequency and voltage control	Text	D
Description of possible failure modes of control device	Text	D
Details of performance of the control device under disturbance conditions including changes in AC frequency, variations in AC system voltages and Ac system waveform distortion.	Text	D
For DC control devices, contribution to the AC system short circuit level	KA, MVA	D

Schedule 5.5.5 - Load Characteristics at Connection Point

Data Description	Units	Data Category
For all Types of Load		
Type of <i>Load</i>	Text	S

Data Description	Units	Data Category
eg controlled rectifiers or large motor drives		
For Fluctuating Loads		
Cyclic variation of <i>active power</i> over period	Graph MW/time	S
Cyclic variation of <i>reactive power</i> over period	Graph MVA _r /time	S
Maximum rate of change of <i>active power</i>	MW/s	S
Maximum rate of change of <i>reactive power</i>	MVA _r /s	S
Shortest Repetitive time interval between fluctuations in active and <i>reactive power</i> reviewed annually	s	S
Largest Step Change:		
In <i>active power</i>	MW	S
In <i>reactive power</i>	MVA _r	S

Schedule 5.6 - Terms and Conditions of Connection agreements

The *connection agreements* must contain the specific conditions that have been agreed to for *connection* and access to the *transmission* or *distribution network*, including but not limited to:

- (a) details of the *connection point* including the *distribution network coupling points* where appropriate;
- (b) *metering* arrangements and adjustments for losses where the point of *metering* is significantly different to the *connection point*;
- (c) authorised demand which may be taken or supplied at the *connection point* (under specified conditions);
- (c1) details of each *access standard* agreed between the *Network Service Provider* and the *Registered Participant* and all related conditions of agreement resulting from the application of any access provisions contained in schedule 5.1 for *Network Service Providers*, or schedule 5.2 for *Generators*, or schedule 5.3 for *Customers*, or schedule 5.3a for *Market Network Service Providers*;
- (d) *connection service* charges;
- (e) payment conditions;
- (f) duration and termination conditions of the *connection agreement*;
- (g) terms, conditions and *constraints* that have been agreed to for *connection* to the *network* to protect the legitimate interest of the *Network Service Providers* including rights to *disconnect* the *Registered Participant* for breach of commercial undertakings;
- (h) details of any agreed standards of *reliability* of *transmission service* or *distribution service* at the *connection points* or within the *network*;
- (i) testing intervals for *protection systems* associated with the *connection point*;
- (j) agreed protocols for maintenance co-ordination;
- (k) where an expected *load*, to be connected to a *network*, has a *peak load* requirement in excess 10 MW, the provision, installation, operation and maintenance of automatic *load* shedding facilities for 60 percent of the *load* at anytime; and
- (l) terms and conditions of access to the *metering installation* for the *Metering Provider*.

The *connection agreements* may include other technical, commercial and legal conditions governing works required for the *connection* or *extension* to the *network* which the parties have negotiated and agreed to. The circumstances under which the terms of the *connection agreement* would require renegotiation may also be included.

Schedule 5.7 - Annual Forecast Information for Planning Purposes

This schedule sets out the information in respect of each *connection point* that must be provided to the relevant *Network Service Provider* by each *Registered Participant* that has a *connection point* to a *transmission network* of that *Network Service Provider*.

Data Description	Units	Time Scale	Data Category
<i>At each connection point to a transmission network, a forecast of:</i>			
Annual Maximum <i>Active power</i> - Winter	MW	years 1-10	Annual
Coincident <i>Reactive Power</i> - Winter	MVAr	years 1-10	Annual
Annual Maximum <i>Active power</i> - Summer	MW	years 1-10	Annual
Coincident <i>Reactive Power</i> - Summer	MVAr	years 1-10	Annual
Forecast <i>load diversity</i> between each <i>connection point</i> to the <i>network</i> (winter and summer)	%	years 1-5	Annual
<i>Load Profiles:</i>			
The following forecast daily <i>profiles</i> of <i>connection point</i> half-hourly average active and reactive <i>loads</i> are required, net of all <i>generating plant</i> :			
<i>Day of the peak summer and winter MW peak load at connection point</i>	MW and MVAr	years 1-5	Annual
<i>Day of network peak summer and winter MW load (as specified)</i>	MW and MVAr	years 1-5	Annual

Data Description	Units	Time Scale	Data Category
Each July, October, January, April under average conditions representing:			
(a) weekdays	MW and MVA _r	years 1-5	Annual
(b) Saturdays	MW and MVA _r	years 1-5	Annual
(c) Sundays/holidays	MW and MVA _r	years 1-5	Annual
<i>Day of the network</i> minimum demand (as specified)	MW and MVA _r	years 1-5	Annual
Undispatched <i>generation</i> :			
For each <i>connection point</i> to the <i>network</i> the following information is required:			
No. of <i>generating units</i>	No.	years 1-5	Annual
Capacity of each <i>generating unit</i>	MW (<i>sent out</i>)	years 1-5	Annual
Daily/Seasonal Operating characteristics	Text	years 1-5	Annual
Expected output at time of peak <i>network</i> Winter <i>load</i> (as specified)	MW	years 1-5	Annual
Expected output at time of peak <i>network</i> Summer <i>load</i> (as specified)	MW	years 1-5	Annual