

## ATTACHMENT C

### Proposed draft rule following AEMO 2022-23 review of the technical requirements for connection

#### Base rules and change-marking

This document is a mark-up of extracts from the National Electricity Rules (NER) showing AEMO's proposed draft amendments in underline for additions and ~~strikeout~~ for deletions. The mark-up is shown against a modified base version of extracts from NER Chapters 4, 5 and 10. The modified base version comprises:

- NER version 206, in effect as at 8 March 2024. Any amendments made in subsequent published NER versions are not shown except as noted below.
- The NER amendments to be introduced on 3 June 2024 by:
  - *National Electricity Amendment (Integrating energy storage systems into the NEM) Rule 2021*, as further amended by the *National Electricity Amendment (Implementing integrated energy storage systems) Rule 2023*
  - *National Electricity Amendment (Clarifying mandatory primary frequency response obligations for bidirectional plant) Rule 2024*.
- The NER amendments to be introduced on 1 July 2024 by *National Electricity Amendment (Calculation of system strength quantity) Rule 2024*.

Change marking is shown in two colours:

- **Red** for NER amendments that AEMO has requested the AEMC to fast-track (the majority).
- **Blue** for NER amendments that AEMO has proposed be consulted on under the AEMC's standard process.

AEMO acknowledges the Traditional Owners of country throughout Australia and recognises their continuing connection to land, waters and culture. We pay respect to Elders past and present.

## CHAPTER 4

### 4. Power System Security

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#### 4.3.5 ~~Market~~ Customer obligations

- (a) All ~~Schedule 5.3 Participants Market Customers~~ having expected peak demands at *connection points* in excess of 10 MW, must provide automatic *interruptible load* of the type described in clause S5.1.10 ~~of schedule 5.1~~. The level of this automatic *interruptible load* must be a minimum of 60% of their expected demand, or such other minimum *interruptible load* level as may be periodically determined by the *Reliability Panel*, to be progressively automatically *disconnected* or *reduced* following the occurrence of a *power system under-frequency* condition described in the *power system security standards*.

##### Note

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (b) ~~Schedule 5.3 Participants Market Customers~~ must provide their *interruptible load* in manageable *blocks* spread over a number of steps within under-frequency bands from 49.0 Hz down to 47.0 Hz as nominated by *AEMO*.

##### Note

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (c) Any *load shedding* capability the subject of an *ancillary services agreement* or *enabled* as a *market ancillary service* can be counted as automatic *interruptible load* provided for the purposes of clause 4.3.5.

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#### 4.14 Acceptance of Performance Standards

- (a) [Deleted]
- (b) [Deleted]
- (c) [Deleted]
- (d) [Deleted]
- (e) [Deleted]
- (f) [Deleted]

**Commented [A1]:** Drafting note - The requirement to make interruptible load available must apply to the owner or operator of the load, who will often not be the Market Customer for the connection point.

**Commented [A2]:** Drafting note - Consistent with the existing definition of *load shedding* and its use in other clauses (e.g. 4.8.4 and 4.8.4A), helps to clarify that fast ramp down capability may be used in addition to disconnection.

**Commented [A3]:** Drafting note - The concept of blocks is still relevant for part loads that are also made available for fast reduction as well as disconnection

- (g) **[Deleted]**
- (h) **[Deleted]**
- (i) **[Deleted]**
- (j) **[Deleted]**
- (k) **[Deleted]**
- (l) **[Deleted]**
- (m) **[Deleted]**
- (n) AEMO must establish and maintain a register of the *performance standards* applicable to Registered Participants' plant as advised ~~by Registered Participants to AEMO~~ in accordance with clause 5.3.7(g)(1), ~~5.3.8(f), clause 5.3.9(h) or 5.3.12(h), or~~ established in accordance with rule ~~4.16-14~~.
- (n1) By 1 July each year, AEMO must provide to the AER an up-to-date copy of the register of *performance standards* required to be maintained under rule 4.14(n), including a copy of the corresponding *performance standards*.
- (n2) The AER may, at any time, request AEMO to provide:
  - (1) an up-to-date copy of the register of *performance standards* (current as at the date of the AER's request) including a copy of the corresponding *performance standards*; or
  - (2) a copy of the *performance standards* relating to specified *plant*,
 if, in the reasonable opinion of the AER, it is required for the performance or exercise of the AER's functions.
- (n3) Following a request under subparagraph (n2), AEMO must provide the information requested within:
  - (1) 10 *business days* for a request under subparagraph (n2)(1); and
  - (2) 5 *business days* for a request under subparagraph (n2)(2),
 unless the AER agrees otherwise.
- (o) ~~**[Deleted]** AEMO or, in respect of a matter concerning the quality of supply to Network Users, AEMO in consultation with the relevant Network Service Provider, must, when determining the applicable performance standard for a particular requirement based on any provision of schedules 5.1, 5.2, 5.3 and 5.3a, require a Registered Participant to meet or exceed the minimum access standard but must not require the Registered Participant to exceed the relevant automatic access standard for that requirement.~~
- (p) A *performance standard* applicable to a Schedule 5 Participant (whether or not a Registered Participant) may be amended at any time by agreement between ~~AEMO, the relevant Registered Participant and the relevant Schedule 5 Participant, the Network Service Provider~~ and, if the *performance standard* relates to an AEMO advisory matter, AEMO, if:
  - (1) where the *performance standard* was established under a transitional arrangement in rule 4.16 or 4.17, the amendment is consistent with the actual *plant* capability agreed between AEMO, the relevant Schedule 5 Participant ~~Registered Participant~~ and the Network Service Provider,

**Commented [A4]:** Drafting note - Performance standards are determined as part of the connection application process with the NSP under 5.3.4/5.3A.9 and 5.3.4A. AEMO advises on proposed negotiated standards, but they are determined by the connection agreement. If AEMO is proposing changes to performance standards, paragraph (p) covers all applicable requirements and limits

even if it is less than the relevant *minimum access standard* that applied to *applications to connect* at the time of agreement; or

- (2) the amendment satisfies all requirements for *negotiated access standards* under clause 5.3.4A(b); or
- (3) the amendment satisfies all requirements to be an *automatic access standard*.

**Note:**

If clause 5.3.7(g) applied in respect of the *Schedule 5 Participant's connection agreement*, clause 5.3.8(f) will require any updated *performance standards* to be notified to AEMO.

- (q) ~~AEMO must not withhold agreement under rule 4.14(p) on a matter that is not an AEMO advisory matter under clause 5.3.4A(a), unless the proposed amendment would adversely affect power system security.~~
- (r) The *Network Service Provider* may as a condition of considering an amendment proposed under rule 4.14(p) require payment of a fee to meet the reasonable costs anticipated to be incurred by the *Network Service Provider*, other *Network Service Providers* and AEMO, in the assessment of the proposed amendment.
- (s) The *Network Service Provider* must require payment of a fee under rule 4.14(r) if so requested by AEMO.
- (t) On payment of the required fee referred to in rule 4.14(r), the *Network Service Provider* must pay the costs anticipated to be incurred by the other *Network Service Providers* and AEMO, as appropriate.

**Commented [A5]:** Drafting note - The purpose of this note is to draw attention to the notification obligation, which may be missed if the amendment does not require AEMO to agree.

**Commented [A6]:** Drafting note - AEMO agreement not required on a non-AEMO advisory matter, aligning with the process for establishing initial performance standards

## CHAPTER 5

### 5. Network Connection Access, Planning and Expansion

#### Part A Introduction

#### 5.1 Introduction to Chapter 5

##### 5.1.1 Structure of this Chapter

- (a) This Chapter deals with matters relating to *networks*.
- (b) It is divided into the following Parts:
  - (1) this Part is introductory;
  - (2) Part B provides a framework for *connection* and access to a *transmission network* or a *distribution network* and to the *national grid*;
  - (3) Part C addresses the *network* related issues following the negotiation of a *connection agreement* under Part B, namely the design of *connected* equipment, inspection and testing, commissioning and *disconnection* and reconnection; and
  - (4) Part D deals with the planning and expansion of *networks* and the *national grid*.

##### 5.1.2 Overview of Part B and connection and access under the Rules

- (a) Rule 5.1A sets out the purpose, application and principles for Part B.
- (b) Rule 5.2 sets out the obligations of *Registered Participants* under Part B and other relevant Parts of this Chapter 5.
- (c) Rule 5.2A sets out obligations and principles relevant to *connection* and access to *transmission networks* and *designated network assets*. This includes the classification of certain services relating to assets relevant to *connection* as *prescribed transmission services*, *negotiated transmission services* and *non-regulated transmission services*. Rule 5.2A does not apply to the *declared transmission system* of an *adoptive jurisdiction*.
- (d) Rules 5.3, 5.3A and 5.3AA and Chapter 5A set out processes by which *Connection Applicants* can negotiate for connection and access to the *national grid* from a *Network Service Provider*. The process applicable will depend on the nature of the ~~application~~ proposed connection and the applicant. For illustrative purposes only, the table below sets out an overview of the relevant processes:

|   | Type of connection or access sought  | Process  |
|---|--|--|
| 1 | Connection to a transmission network (other than a declared shared network) of any plant, including another network, a generating system, an integrated resource system, a synchronous condenser system or a load.   | Rule 5.3 applies<br><br>If connecting to part of a transmission network which is a designated network asset, then rule 5.3 applies subject to the relevant access policy (see clause 5.2A.8) |
| 2 | Connection to a declared shared network of any plant, including another network, a generating system, an integrated resource system, a synchronous condenser system or a load.   | Rule 5.3, as modified by clause 5.1A.1(d) to (g), and rule 5.3B apply  |
| 3 | Connection to a distribution network of a schedule 5.3a plant or another distribution network (including an embedded network), where the Connection Applicant: <ul style="list-style-type: none"> <li>is a Registered Participant or intends to become a Registered Participant; or</li> <li>intends to apply for an exemption from a requirement to register under Chapter 2 (and is not eligible for an automatic exemption)</li> </ul>  | Rule 5.3 applies   |
| 4 | Connection to a distribution network of a generating system, an integrated resource system, a synchronous condenser system or a large inverter based load, where the Connection Applicant: <ul style="list-style-type: none"> <li>is a Registered Participant or intends to become a Registered Participant (and is not acting as the agent of a retail customer);</li> <li>intends to apply for an exemption from a requirement to register under Chapter 2 (and is not eligible for an automatic exemption);</li> <li>is a non-registered DER provider who has made an election for rule 5.3A to apply instead of Chapter 5A; or</li> <li>intends to connect a synchronous condenser system or large inverter based load.</li> </ul> | Rule 5.3A applies, subject to clause 5.3.1A  |

**Commented [A7]:** Drafting note - this extends the application of rule 5.3 to all plant seeking to connect to transmission (generation, IRS, load and HVDC), consistent with 5.2A.3

**Commented [A9]:** Drafting note - This reflects the current rule for these connections but, from the perspective of the DNSP processing the application, it may be more appropriate for rule 5.3A to apply

**Commented [A8]:** Drafting note - also covers deemed exemptions by the AER from NSP registration

**Commented [A10]:** Drafting note - assumes DNSP 5.3A connection process (and schedules 5.4/5.5) will apply to standalone synchronous condensers and large inverter-based loads

|    | Type of connection or access sought  | Process  |
|----|--|--|
| 5  | Alteration of a <i>generating system, integrated resource system</i> or <i>synchronous condenser</i> by a <i>Schedule 5.2 Participant</i> .  | Clause 5.3.9 applies if the conditions in that clause are met  |
| 6  | Alteration of <i>plant</i> : <ul style="list-style-type: none"> <li>• that includes an <i>inverter based resource</i> by a <i>Schedule 5.3 Participant</i>; or</li> <li>• a <i>schedule 5.3a plant</i> by a <i>Schedule 5.3a Participant</i>.</li> </ul>   | Clause 5.3.12 applies if the conditions in that clause are met   |
| 7  | Access to a <i>prescribed transmission service</i> or <i>negotiated transmission service</i> not requiring establishment or modification of a <i>connection</i>  | Rule 5.3 applies, subject to modification as provided in clause 5.2A.3(c)  |
| 8  | <i>Distribution network user access</i> sought by an applicant who: <ul style="list-style-type: none"> <li>• is a <i>Registered Participant</i> or intends to become a <i>Registered Participant</i> (and is not acting as the agent of a <i>retail customer</i>); or</li> <li>• is a <i>non-registered DER provider</i> who has made an election for rule 5.3A to apply instead of Chapter 5A.</li> </ul>   | Rule 5.3 or 5.3A (as applicable) and rule 5.3AA apply<br>The election is not available where <i>connecting to a regulated SAPS</i> |
| 9  | A <i>load connecting to a distribution network</i> where the <i>Connection Applicant</i> is not a <i>Registered Participant</i> and is not intending to become a <i>Registered Participant</i> (unless it is acting as the agent of a <i>retail customer</i> ) and is not <i>connecting a large inverter based resource</i> .<br><br>Any <i>load</i> or <i>non-registered DER provider</i> connecting to a <i>regulated SAPS</i> .<br><br>A <i>non-registered DER provider</i> who does not make an election for rule 5.3A to apply instead of Chapter 5A. | Chapter 5A applies, subject to clause 5.3.1A(d)  |
| 13 | A <i>retail customer</i> (or a <i>retailer</i> or <i>Small Resource Aggregator</i> on behalf of that customer) seeking a <i>micro DER connection</i>   | Chapter 5A applies   |

| - | <b>Connection Applicant</b>  | <b>Process</b>   |
|---|--|--|
| 1 | <i>A Registered Participant or a person intending to become a Registered Participant for a generating system or integrated resource system connecting to a transmission network</i>  | Rule 5.3 applies<br>If the person is connecting to part of a transmission network which is a designated network asset, then rule 5.3 applies subject to the relevant access policy (see clause 5.2A.8) |
| 2 | <i>A Registered Participant or a person intending to become a Registered Participant (or a person pursuant to clause 5.1A.1(e)) for a source of load connecting to a transmission network</i>  | Rule 5.3 applies<br>If the person is connecting to part of a transmission network which is a designated network asset, then rule 5.3 applies subject to the relevant access policy (see clause 5.2A.8) |
| 3 | <i>A source of load connecting to a distribution network where the Connection Applicant is a Registered Participant or a person intending to become a Registered Participant (and is not acting as the agent of a retail customer)</i>   | Rule 5.3 applies   |
| 4 | <i>A distribution network (including an embedded network) connecting to another distribution network or to a transmission network where the Connection Applicant is a Registered Participant, intending to become a Registered Participant or will obtain an exemption from registration</i> | Rule 5.3 applies   |
| 5 | <i>A Market Network Service Provider or person intending to register as one seeking connection to a distribution network or a transmission network</i>   | Rule 5.3 applies   |
| 6 | <i>A distribution connected unit connecting to a distribution network where the Connection Applicant is:</i>   | Rules 5.3 and 5.3A apply (see clause 5.3.1A for the interaction)   |



|         | <b>Connection Applicant</b>  | <b>Process</b>  |
|---------|--|---|
| -       | <ul style="list-style-type: none"> <li>• <del>a Registered Participant or a person intending to become a Registered Participant; or</del></li> <li>• <del>a non-registered DER provider who makes an election for rule 5.3A to apply instead of Chapter 5A.</del></li> </ul>   | <p>between the two rules)</p> <p>The election is not available where connecting to a regulated SPS</p> <p>-</p> |
| 7       | [Deleted]  | [Deleted]   |
| 8       | A Generator or Integrated Resource Provider wishing to alter a generating system or an integrated resource system in the circumstances set out in clause 5.3.9   | Clause 5.3.9 applies  |
| 8A<br>- | A Network User wishing to alter connected plant in the circumstances set out in clause 5.3.12  | Clause 5.3.12 applies   |
| 9       | A Connection Applicant for prescribed transmission services or negotiated transmission services that do not require the establishment or modification of a connection or alteration of a generating system or integrated resource system in the circumstances set out in clause 5.3.9 or alteration of connected plant in the circumstances set out in clause 5.3.12 | Rule 5.3 applies as modified by clause 5.2A.3(e)  |
| 10      | A Distribution Connected Resource Provider or non-registered DER provider who makes an election for rule 5.3A to apply instead of Chapter 5A, or Market Network Service Provider, in each case who is applying for distribution network user access.   | Rule 5.3 or 5.3A (as applicable) and rule 5.3AA apply   |
| 11      | A generating system, integrated resource system, or source of load connecting to a declared shared network   | Rule 5.3 as modified by clause 5.1A.1(d) to (g) and rule 5.3B apply   |
| 12      | A source of load connecting to a distribution network where the Connection Applicant is not a Registered Participant and is not intending to become a Registered Participant (unless it is acting as the agent of a retail customer) and is not connecting a large inverter based resource<br>Any load connecting to a regulated SPS                                 | Chapter 5A applies  |

|    | <b>Connection Applicant</b>  | <b>Process</b>     |
|----|--|--------------------|
| -  | <del>A non-registered DER provider who does not make an election for Rule 5.3A to apply instead of Chapter 5A or is connecting to a regulated SAPS</del> |                    |
| 13 | <del>A retail customer (or a retailer or Small Resource Aggregator on behalf of that customer) seeking a micro DER connection</del>                      | Chapter 5A applies |

- (e) In addition to the rules referred to in paragraph (d), in relation to *connection* and access to a *distribution network*:
- (1) a *Distribution Network Service Provider* must comply with its *negotiating framework* and *Negotiated Distribution Service Criteria* when *negotiating the terms and conditions of access to negotiated distribution services*;
  - (2) disputes relating to the *terms and conditions of access to a direct control service* or to a *negotiated distribution service, access charges* or matters referred to in clause 5.3AA(f) or 5.3AA(h) may be referred to the AER in accordance with Part L of Chapter 6;
  - (3) Part G of Chapter 5A provides for dispute resolution by the AER for certain disputes under Chapter 5A; and
  - (4) other disputes relating to *connection* and access may be subject to dispute resolution under rule 8.2.
- (f) In addition to the rules referred to in paragraph (d), in relation to *connection* and access to a *transmission network*:
- (1) schedule 5.11 sets out the negotiating principles which apply to negotiations between a *Transmission Network Service Provider* and a *Connection Applicant* for *negotiated transmission services*;
  - (2) rule 5.4 provides a framework for *Connection Applicants* and *Transmission Network Service Providers* to appoint an *Independent Engineer* to provide advice on certain technical matters; and
  - (3) rule 5.5 provides for commercial arbitration of disputes between a *Transmission Network Service Provider* and a *Connection Applicant* as to *terms and conditions of access* for the provision of *prescribed transmission services* or for the provision of *negotiated transmission services*.
- (g) Part B also provides for an owner of a *designated network asset* to have an *access policy* for a *designated network asset* and for commercial arbitration under rule 5.5 to apply to a *DNA services access dispute*.

### 5.1.3 Application of this chapter to a connection to a regulated SAPS

The following provisions do not apply to or in respect of a *connection* or proposed *connection to a regulated SAPS*:

- (a) rules 5.3 and 5.3A; and

- (b) Part C.

## Part B Network Connection and Access

### 5.1A Introduction to Part B

#### 5.1A.1 Purpose and Application

- (a) This Part B:
- (1) ~~[Deleted]~~
  - (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 ~~*connections* a *connection*~~ to a *network* ~~by *Registered Participants* and, for certain types of plant, by other persons, and~~ ~~or~~ for altering ~~*certain types of plant 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 ~~applied under~~ ~~of~~ this Part B to facilitate management of the *national grid*.
- (b) ~~[Deleted].~~
- (c) ~~[Deleted]. If a person who is not a *Registered Participant* or a person intending to become a *Registered Participant* requests *connection* of a *load* to a *transmission network* and agrees to comply with this Part B as if that person was a *Registered Participant*, the relevant *Transmission Network Service Provider* must comply with this Part B as if that person was a *Registered Participant*.~~
- (d) Subject to paragraphs (e) and (g), the following *Rules* apply in the application of this Part B 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 5.2.6;

Commented [A11]: See drafting note on next clause

- (3) clause 5.3A.12;
  - (4) clause 5.7.6;
  - (5) clause 5.7.7 (except clause 5.7.7(c));
  - (6) rule 5.11;
  - (7) clause 5.12.1;
  - (8) clause 5.12.2 (except clause 5.12.2(c)(2));
  - (9) clause 5.14.1;
  - (10) schedule 5.1, clause S5.1.2.3;
  - (11) schedule 5.3, clause S5.3.5.
- (f) Subject to clause (f1) a reference in:
- (1) the definition of *RIT-T proponent* in clause 5.10.2;
  - (2) clause 5.14.3;
  - (3) clause 5.16.4;
  - (3A) clause 5.16A.4;
  - (4) rule 5.16B;
  - (5) rule 5.18;
  - (6) rule 5.19;
  - (7) rule 5.20B;
  - (8) rule 5.20C; and
  - (9) clause 5.22.6(d),
- 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*.
- (f1) A reference in:
- (1) the definition of *RIT-T proponent* in clause 5.10.2;
  - (2) clause 5.16.4; and
  - (2A) clause 5.16A.4; and
  - (3) rule 5.16B,
- to a *Transmission 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* where:
- (4) the relevant *RIT-T project* is to address an *identified need* that arises from the retirement or de-rating of *network assets*; and
  - (5) a *credible option* for that *RIT-T project* is replacement of *network assets*.
- (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).

### 5.1A.2 Principles

This Part B is based on the following principles relating to *connection* to the national grid for the types of connection to which this Chapter 5 applies:

- (a) all ~~Registered Participants~~ Connection Applicants 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*, except that if the *connection* is to a part of a *network* that is a *designated network asset* then that *connection* and access will be subject to the relevant *access policy* for that *designated network asset*;
- (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~~ each Connection Applicant;
- (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) **[Deleted]**
- (e) the operation of the *Rules* should result in the achievement of:
  - (1) ~~[deleted] 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 all Registered Participants

- (a) All *Registered Participants* must ~~maintain and operate (or ensure their authorised representatives maintain and operate)~~ ensure that all plant and equipment that is part of their facilities is provided, maintained and operated in accordance with:

**Commented [A12]:** Drafting note - as the principles are currently expressed to apply to Registered Participants, consequential amendments are proposed to extend to the range of connection types covered by Chapter 5 as appropriate

**Commented [A13]:** Drafting note - suggested deletion as this is covered by the NEO

**Commented [A14]:** Drafting note- AEMO suggests these obligations should be civil penalty provisions. 5.2.1 includes obligations on all registered participants, some (but not all) of which are currently repeated in the individual participant category obligations. It is proposed to reflect all common obligations in 5.2.1 and to call out this clause specifically in the individual category obligations.

**Commented [A15]:** Drafting note - changes proposed to better align with existing individual registered participant obligations to also 'plan and design', as well as recognising that the participants themselves may use authorised representatives to carry out those activities. 'Provision' is a term already used in paragraph (b) and should cover design and procurement of facilities.

- (1) relevant laws;
  - (2) the requirements of the *Rules*;
  - (2A) subject to clause 5.2.2(d), applicable connection agreements; and
  - (3) good electricity industry practice, all relevant Australian Standards and, to the extent specified in the Rules, relevant international instruments, and relevant Australian Standards.
- (b) All *Registered Participants* must ensure that the *connection agreements* to which they are a party require the provision, maintenance and operation and maintenance of all required *facilities* consistent with *good electricity industry practice* and must provide, maintain and operate their plant and equipment in a manner:
- (1) to assist in preventing or controlling instability within the *power system*;
  - (2) to comply with their performance standards and assist in achieving the system standards;
  - (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.

**Commented [A16]:** Drafting note - this replaces obligations currently in clauses 5.2.4, 5.2.5, and 5.2.5A, and is consistent with objectives expressed in 5.1A.2(c) and requirements to be coordinated by the NSP through connection agreements under schedule 5.1

## 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*.

### Note

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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.

**Commented [A17]:** Drafting note - proposed for brevity

- (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**

(1) **if** 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: **and**

(2) **otherwise, the *connection agreement* is to prevail.**

### 5.2.3 Obligations of network service providers

- (a) ~~The obligations in this clause 5.2.3 apply to a *Network Service Provider* in addition to its obligations as a *Registered Participant* under clause 5.2.1. 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) ~~Subject to clause 5.2.2(d), a *Network Service Provider* must comply with the *power system* performance and quality of *supply* standards described in schedule 5.1:-~~

~~(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.~~

#### **Note**

~~This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)~~

- (c) Where the provisions of ~~a 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.

#### **Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (c1) ~~Where a *Network Service Provider's* network comprises or incorporates plant,~~

(1) **for which *access standards* are specified in schedule 5.2 or 5.3a; and**

**Commented [A18]:** Drafting note - Removed as unnecessary and not used for any other category

**Commented [A19]:** Drafting note - Transitional provisions will be required to determine the time within which performance standards for relevant existing NSP plant must be documented after the effective date of the amending rule

(2) that is not subject to the terms of a connection agreement with another person incorporating performance standards for the plant.

the Network Service Provider must determine and document the performance standards applicable to that plant in accordance with the requirements of the relevant schedule, and must promptly advise AEMO of those performance standards, and any changes to them.

(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 rules 5.3 or 5.3A (as is relevant) 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 rules 5.3 or 5.3A (as is relevant);
- (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 5.6 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 Part D of Chapter 5;
- (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*;

**Note**

This subparagraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)



- (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;

**Note**

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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 subparagraph (9) and, to the best of its ability and knowledge, ensure that all data used for the purposes referred to in rules 5.3 or 5.3A (as is relevant) is consistent with data used for such purposes by other *Network Service Providers*;

**Note**

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (11) provide to *AEMO* the information required from relevant Registered Participants and Connection Applicants (including, where relevant, from the Network Service Provider itself) Generators or Integrated Resource Providers under schedules 5.2, 5.3 or 5.3a 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

**Note**

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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.

**Note**

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (e) A *Network Service Provider* must arrange for operation of that part of the interconnected national electricity system over which it has control in accordance with instructions given by *AEMO*.

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(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 breach 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*.

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(f) A *Network Service Provider* must comply with *applicable regulatory instruments*.

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(g) Each *Network Service Provider* must in respect of proposed new or altered *schedule 5.3a plant* (whether or not ~~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 ~~each other a~~ *Network Service Provider to whose network a new schedule 5.3a plant is to be connected*, in accordance with rule 5.3, prior to that equipment being ~~connected~~ 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 5.6 and schedule 5.3a;
- (3) provide forecast information to the relevant *Network Service Provider* in accordance with Part D of Chapter 5;
- (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.

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(g1) ~~**[Deleted]** A *Network Service Provider* must comply with any terms and conditions of a *connection agreement* for its *market network service facilities* that provide for the implementation, operation, maintenance or performance of a *system strength remediation scheme*.~~

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(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*.

(j) If in *AEMO's* reasonable opinion, there is a risk a *Network Service Provider's plant* or equipment will:

(1) adversely affect *network capability, power system security, quality or reliability of supply, inter-regional power transfer capability*;

(2) adversely affect the use of a *network* by a *Network User*; or

(3) have an *adverse system strength impact*,

*AEMO* may request the *Network Service Provider* to provide information of the type described in clause 4.3.4(o), and following such a request, the *Network Service Provider* must provide the information to *AEMO* and any other relevant *Network Service Provider(s)* in accordance with the requirements and circumstances specified in the *Power System Model Guidelines*, the *Power System Design Data Sheet* and the *Power System Setting Data Sheet*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(k) If in *AEMO's* reasonable opinion, information of the type described in clause 4.3.4(o) is required to enable a *Network Service Provider* to conduct the assessment required by clause 5.3.4B, *AEMO* may request any other relevant *Network Service Provider* to provide the information, and following such a

**Commented [A20]:** Drafting note - Deleted because 5.2.1 requires all registered participants to operate their facilities in accordance with connection agreements, which would cover terms relating to system strength remediation schemes. (Note, also duplicates 5.2.3A(d).)

request, that *Network Service Provider* must provide the information to *AEMO* and the other relevant *Network Service Provider*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (l) All information provided to *AEMO* and the relevant *Network Service Provider(s)* under paragraphs (j) and (k) must be treated as *confidential information* by those recipients.

### 5.2.3A Obligations of Market Network Service Providers

(a0) The obligations in this clause 5.2.3A apply to a *Market Network Service Provider* in addition to its obligations as a *Registered Participant* under clause 5.2.1 and as a *Network Service Provider* under clause 5.2.3.

- (a) If in *AEMO's* reasonable opinion, there is a risk a *Market Network Service Provider's* plant or equipment will:
  - (1) adversely affect *network capability, power system security, quality or reliability of supply, inter-regional power transfer capability*;
  - (2) adversely affect the use of a *network* by a *Network User*; or
  - (3) have an *adverse system strength impact*,

*AEMO* may request the *Market Network Service Provider* to provide information of the type described in clause S5.3a.1(a1), and following such a request, the *Market Network Service Provider* must provide the information to *AEMO* and the relevant *Network Service Provider(s)* in accordance with the requirements and circumstances specified in the *Power System Model Guidelines*, the *Power System Design Data Sheet* and the *Power System Setting Data Sheet*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (b) If in *AEMO's* reasonable opinion, information of the type described in clause S5.3a.1(a1) is required to enable a *Network Service Provider* to conduct the assessment required by clause 5.3.4B, *AEMO* may request a *Market Network Service Provider* to provide the information, and following such a request, the *Market Network Service Provider* must provide the information to *AEMO* and the relevant *Network Service Provider*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (c) All information provided to *AEMO* and the relevant *Network Service Provider(s)* under paragraphs (a) and (b) must be treated as *confidential information* by those recipients.

- (d) ~~[Deleted] A Market Network Service Provider must comply with any terms and conditions of a connection agreement for its connected plant that provide for the implementation, operation, maintenance or performance of a system strength remediation scheme.~~

**Commented [A21]:** Drafting note - As above, deleted as 5.2.1 requires all registered participants to comply with their connection agreements

#### 5.2.4 Obligations of customers

- (a) ~~The obligations in this clause 5.2.4 apply to a Customer in addition to its obligations as a Registered Participant under clause 5.2.1. 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.~~

**Commented [A22]:** Drafting note - Paragraph (a) is covered by the obligations on all registered participants

**Note**

~~This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)~~

- (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 ~~or 5.3A~~ 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 5.6 and schedule 5.3;
  - (3) provide *load* forecast information to the relevant *Network Service Provider* in accordance with Part D of Chapter 5;
  - (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.
- (c) If in AEMO's reasonable opinion, there is a risk that a Customer's plant will:
- (1) adversely affect *network capability, power system security, quality or reliability of supply, inter-regional power transfer capability*;
  - (2) adversely affect the use of a *network* by a *Network User*; or
  - (3) have an *adverse system strength impact*,

*AEMO* may request a *Customer* to which Schedule 5.3 applies to provide information of the type described in clause S5.3.1(a1), and following such a request, the *Customer* must provide the information to *AEMO* and the relevant *Network Service Provider(s)* in accordance with the requirements and circumstances specified in the *Power System Model Guidelines*, the *Power System Design Data Sheet* and the *Power System Setting Data Sheet*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (d) If in *AEMO*'s reasonable opinion, information of the type described in clause S5.3.1(a1) is required to enable a *Network Service Provider* to conduct the assessment required by clause 5.3.4B, *AEMO* may request a *Customer* to which Schedule 5.3 applies, to provide the information, and following such a request, the *Customer* must provide the information to *AEMO* and the relevant *Network Service Provider*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (e) All information provided to *AEMO* and the relevant *Network Service Provider(s)* under paragraphs (c) and (d) must be treated as *confidential information* by those recipients.
- (f) ~~[Deleted] A *Customer* must comply with any terms and conditions of a connection agreement for its connected plant that provide for the implementation, operation, maintenance or performance of a system strength remediation scheme.~~

## 5.2.5 Obligations of Generators

- (a) ~~The obligations in this clause 5.2.5 apply to a *Generator* in addition to its obligations as a *Registered Participant* under clause 5.2.1. 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.~~

**Note**

~~This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)~~

- (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 5.6 and schedule 5.2;
  - (3) provide *generation* forecast information to the relevant *Network Service Provider* in accordance with Part D of Chapter 5;
  - (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.
- (c) ~~[Deleted] A Generator must comply with any terms and conditions of a connection agreement for its generating system that provide for the implementation, operation, maintenance or performance of a system strength remediation scheme.~~

**Note**

~~This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)~~

- (d) If in *AEMO's* reasonable opinion, there is a risk that a *Generator's plant* will:
- (1) adversely affect *network capability*, *power system security*, quality or reliability of *supply*, *inter-regional power transfer capability*;
  - (2) adversely affect the use of a *network* by a *Network User*; or
  - (3) have an *adverse system strength impact*,

*AEMO* may request a *Generator* to provide information of the type described in clause S5.2.4, and following such a request, the *Generator* must provide the information to *AEMO* and the relevant *Network Service Provider(s)* in accordance with the requirements and circumstances specified in the *Power System Model Guidelines*, the *Power System Design Data Sheet* and the *Power System Setting Data Sheet*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (e) If in *AEMO's* reasonable opinion, information of the type described in clause S5.2.4 is required to enable a *Network Service Provider* to conduct the assessment required by clause 5.3.4B, *AEMO* may request a *Generator* to provide the information, and following such a request, the *Generator* must provide the information to *AEMO* and the relevant *Network Service Provider*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (f) All information provided to *AEMO* and the relevant *Network Service Provider(s)* under paragraphs (c) and (d) must be treated as *confidential information* by those recipients.

**5.2.5A Obligations of Integrated Resource Providers**

- (a) ~~The obligations in this clause 5.2.5A apply to an *Integrated Resource Provider* in addition to its obligations as a *Registered Participant* under clause 5.2.1. An *Integrated Resource Provider* 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) An *Integrated Resource Provider* must:
- (1) submit an *application to connect* in respect of new *generating plant* (including an *integrated resource system*) owned, operated or controlled by the *Integrated Resource Provider*, or to be owned, operated or controlled by the *Integrated Resource Provider*, 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 5.6 and schedule 5.2;
  - (3) provide *generation forecast information* to the relevant *Network Service Provider* in accordance with Part D of Chapter 5;
  - (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.
- (c) ~~[Deleted] An *Integrated Resource Provider* must comply with any terms and conditions of a connection agreement for its generating system or integrated resource system that provide for the implementation, operation, maintenance or performance of a system strength remediation scheme.~~
- (d) If in *AEMO's* reasonable opinion, there is a risk that an *Integrated Resource Provider's plant* will:



- (1) adversely affect *network capability, power system security, quality or reliability of supply, inter-regional power transfer capability*;
- (2) adversely affect the use of a *network* by a *Network User*; or
- (3) have an *adverse system strength impact*,

*AEMO* may request the *Integrated Resource Provider* to provide information of the type described in clause S5.2.4, and following such a request, the *Integrated Resource Provider* must provide the information to *AEMO* and the relevant *Network Service Provider(s)* in accordance with the requirements and circumstances specified in the *Power System Model Guidelines*, the *Power System Design Data Sheet* and the *Power System Setting Data Sheet*.

- (e) If in *AEMO's* reasonable opinion, information of the type described in clause S5.2.4 is required to enable a *Network Service Provider* to conduct the assessment required by clause 5.3.4B, *AEMO* may request the *Integrated Resource Provider* to provide the information, and following such a request, the *Integrated Resource Provider* must provide the information to *AEMO* and the relevant *Network Service Provider*.
- (f) All information provided to *AEMO* and the relevant *Network Service Provider(s)* under paragraphs (c) and (d) must be treated as *confidential information* by those recipients.

#### **5.2.6 Obligations of AEMO**

*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*.

##### **Note**

This clause is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

#### **5.2.6A AEMO review of technical requirements for connection**

- (a) *AEMO* must conduct a review of some or all of the technical requirements set out in [Schedule schedule 5.2](#), [Schedule schedule 5.3](#) and [Schedule schedule 5.3a](#) at least once in every five year period (and may conduct a review more frequently if *AEMO* considers necessary) to assess whether those requirements should be amended, having regard to:
  - (1) the *national electricity objective*;
  - (2) the need to achieve and maintain *power system security*;
  - (3) changes in *power system* conditions; and
  - (4) changes in technology and capabilities of *facilities* and *plant*.

- (b) When conducting a review under this clause 5.2.6A, *AEMO* must consult with, among other affected parties, the *Reliability Panel*.
- (c) *AEMO* must commence a review under this clause 5.2.6A with the publication of an approach paper on its website, which must:
  - (1) set out the scope of the review, including the nature and extent of the issues to be reviewed;
  - (2) describe the technical requirements to be consulted on; and
  - (3) state the date by which a draft report will be published.
- (d) *AEMO* must publish a draft report on its website that:
  - (1) sets out *AEMO*'s recommendations for any amendments to the technical requirements set out in ~~Schedule schedule~~ 5.2, ~~Schedule schedule~~ 5.3 and ~~Schedule schedule~~ 5.3a and the reasons for those recommendations; and
  - (2) includes an invitation for written submissions to be made to *AEMO* within a period specified in the invitation (which must be at least 30 *business days*) on the technical requirements and recommendations in the draft report and must publish any submissions on its website, subject to obligations in respect of *confidential information*.
- (e) *AEMO* must publish a final report on its website within 12 months of the approach paper's publication under paragraph (c), setting out *AEMO*'s recommendations for any amendments to the technical requirements set out in ~~Schedule schedule~~ 5.2, ~~Schedule schedule~~ 5.3 and ~~Schedule schedule~~ 5.3a, having regard to the matters set out in subparagraphs (a)(1) to (4) and any submissions made in response to its invitation under subparagraph (d)(2).
- (f) As soon as practicable following publication of a *AEMO* may extend the time for publication of its final report by publishing a notice before the expiry of the time limit under paragraph (e), if *AEMO* must provide written notification to the *AEMC* as to whether *AEMO* will be submitting a *Rule change proposal* that results from the review, considers an extension is necessary due to:
  - (1) issues of complexity or difficulty; or
  - (2) a material change in circumstances.
- (g) A notice under paragraph (f) must specify the new date for publication of the final report and the reasons for the extension of time.

**Commented [A23]:** [Mention was removed] [Mention was removed] [Mention was removed] to save a separate rule change just on this could we add to the blue changes that this could be extended by a further six months for matters of significant scale and complexity - to respond to the AERs letter on our non compliance with this NER requirement. We would probably need a paragraph in the standard rule change package to explain it.

**Commented [A24]:** For standard rule change. Drafting note - Given the public nature of *AEMO*'s consultation including *Reliability Panel* involvement, and the usual interaction between market bodies in relation to any rule proposals, this paragraph in its original form is redundant

### 5.2.7 Obligations of designated network asset owners

- (a) **[Deleted]**
- (b) An owner of a *designated network asset* must plan, design and construct its *designated network asset* to comply with:
  - (1) the functional specifications applicable to those *designated network assets* as specified by the *Primary Transmission Network Service Provider*; and
  - (2) its *network operating agreement* applicable to those *designated network assets*.

#### Note

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (c) An owner of a *designated network asset* must prepare, maintain and publish an *access policy* in accordance with clause 5.2A.8.
- (d) An owner of a *designated network asset* must permit and participate in commissioning of *facilities* and equipment that are to be *connected* to a *network* for the first time in accordance with rule 5.8.

## 5.2A Transmission network connection and access

[...]

## 5.3 Establishing or Modifying Connection

### 5.3.1 Process and procedures

- (a) For the purposes of this rule 5.3:
  - (1) **establish a connection** includes:
    - (i) modify an existing *connection* or alter *plant* but does not include alterations to *plant* in the circumstances set out in clause 5.3.9 or clause 5.3.12; or
    - (ii) incorporating a *designated network asset* into a *transmission network*.
  - (2) **connect** includes the incorporation of a *designated network asset* into a *transmission network*.
- (b) ~~Subject to paragraph (b1),~~ **A person who wishes to establish a connection:**
  - (1) to a transmission network, for any plant, must follow the process in this rule 5.3, subject to paragraph (b1);
  - (2) to a distribution network, for a schedule 5.3a plant or another distribution network (including an embedded network), must follow the process in this rule 5.3; or
  - (3) to a distribution network, for any other plant, must follow the applicable process determined in accordance with clause 5.3.1A. a Registered Participant or person intending, or required by the Rules, to become a Registered Participant who wishes to establish a connection to a network must follow the procedures in this rule 5.3.
- (b1) If a ~~person Registered Participant, or person intending to become a Registered Participant,~~ wishes to establish a *connection* to a part of a *network* that is a *designated network asset* either through a *dedicated connection asset* or by way of a new *designated network asset*, then:
  - (1) for *connection*, the process in rule 5.3 applies; and
  - (2) for access to *DNA services* from the existing *designated network asset*, the access is governed by the relevant *access policy* that applies.

**Commented [A25]:** Drafting note - the application rules clearer (in particular references to 'rule 5.3') may be clearer if clauses 5.3.1 and 5.3.1A were placed in a separate rule (e.g. 5.2B), with the remainder of rule 5.3 renamed appropriately (e.g. Establishing or modifying connection - transmission and inter-network connections).

**Commented [A26]:** Drafting note - see note on the table in 5.1.2

- (c) A ~~Generator or Integrated Resource Provider~~ Schedule 5.2 Participant wishing to alter any connected generating system, ~~or integrated resource system~~ or synchronous condenser system must comply with clause 5.3.9 and a ~~Schedule 5.3 Participant or Schedule 5.3a Participant Network User or Market Network Service Provider~~ to whom clause 5.3.12 applies must comply with clause 5.3.12.
- (d) ~~[Deleted] AEMO must comply with clause 5.3.11 in relation to requests to change normal voltage.~~
- (e) For *connection* to a *transmission network*, there may be more than one *Connection Applicant* in relation to a *connection* where there are different persons developing and owning *contestable IUSA components*, *dedicated connection assets*, *designated network assets* and *Transmission Network User facilities* in relation to that *connection*.

**Commented [A27]:** Drafting note - deleted as clause 5.3.11 and the term 'normal voltage' are proposed to be removed

### 5.3.1A Application of rule to connection of distribution connected systems

- (a) ~~[Deleted]~~
- (b) If a *Connection Applicant* wishes to *connect* a *generating system*, ~~or an integrated resource system~~, a synchronous condenser system or a large inverter based load to a *distribution network*, then:
  - (1) unless otherwise provided, rule 5.3A applies to the proposed connection and clauses 5.3.2, 5.3.3, 5.3.4 and 5.3.5 do not apply to the proposed *connection*; and
  - (2) for the avoidance of doubt, the application of the balance of Chapter 5, Part B to the *Connection Applicant* is otherwise unaffected by this clause 5.3.1A.
- (c) A reference to a *Connection Applicant* in paragraph (b) is to a:
  - (1) Registered Participant or person who intends to be a Registered Participant-Distribution-Connected Resource Provider;
  - (2) person who has applied or intends to apply to AEMO for an exemption from the requirement to register as a *Generator* or *Integrated Resource Provider* in respect of a *generating system* or an *integrated resource system* (and is not eligible for an automatic exemption under the *registration information resource and guidelines*);
  - (3) *non-registered DER provider* who has made an election under clause 5A.A.2(c); or
  - (4) a person (including a *non-registered DER provider* or other retail customer) who is seeking *connection* for a *large inverter based resource* or a synchronous condenser system;

~~and who makes a connection enquiry under clause 5.3A.5 or an application to connect under clause 5.3A.9 in relation to any generating systems or integrated resource systems, or any network elements used in the provision of a network service, as the case may be.~~
- (d) The process for establishing a connection to a distribution network by a person other than a Connection Applicant listed in paragraph (c) is specified in Chapter 5A, provided that where the person is:

**Commented [A28]:** Drafting note - Suggested deletion as this cannot be a precondition of being a Connection Applicant under this clause - following the process involved in these steps is one of the obligations of a Connection Applicant.

(1) a Schedule 5.2 Participant under clause S5.2.1, the requirements of schedule 5.2 apply to the extent provided for under clause S5.2.1; or  
(2) a Schedule 5.3 Participant under clause S5.3.1a, the requirements of schedule 5.3 apply to the extent provided for under clause S5.3.1a,  
and for the purposes of determining performance standards under the relevant schedule, the processes in clause 5.3.4A will apply with such modifications as are appropriate to the nature of the connection.

### 5.3.2 Connection enquiry

- (a) A person referred to in clause 5.3.1(b) 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.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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*.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (g) If applicable, a *Primary Network Service Provider* may charge a *Connection Applicant* an enquiry fee, the amount of which must not be more than necessary to cover the reasonable costs of work required to provide the information in clauses 5.3.3(b)(5A) and (7) to (10).

### 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:
    - (i) 40 *business days* after receipt of the *connection* enquiry which relates to a *designated network asset* and all such additional information (if any) advised under clause 5.3.2(b);
    - (ii) 30 *business days* after receipt of any other *connection* enquiry and all such additional information (if any) advised under clause 5.3.2(b); or
  - (2) within 30 *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*; 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) in relation to *Distribution Network Service Providers* and *Network Service Providers* for *declared transmission systems*, whether any service the *Network Service Provider* proposes to provide is *contestable* in the relevant *participating jurisdiction*;
- (5A) whether any service a *Transmission Network Service Provider* proposes to provide in relation to the *connection* enquiry is a *prescribed transmission service*, a *negotiated transmission service* or a *non-regulated transmission service* including, if applicable:
  - (i) whether the capital cost of any *identified user shared asset* is reasonably expected to exceed \$10 million; and
  - (ii) if so, the *contestable IUSA components* and *non-contestable IUSA components*;
- (5B) whether the *connection* enquiry relates to *connection* to a part of a *network* that is a *designated network asset*;
- (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;
- (7) the specification of the interface required to provide the *connection*, including plant and equipment requirements for the *connection* of a *dedicated connection asset* or *designated network asset* (as applicable), to the *transmission network* and of the interface between the *transmission network* and any *contestable IUSA components* or *designated network asset*;
- (8) if applicable, the scope of work for any *non-contestable IUSA components*;
- (9) if the response to the *connection enquiry* specifies the need for an *identified user shared asset* the capital cost of which is reasonably expected to exceed \$10 million or includes a *designated network asset*, a functional specification:
  - (i) setting out the technical parameters for that asset as described in the table in clause 5.2A.4 with sufficient detail to enable the *Connection Applicant* to obtain binding tenders for the provision of detailed design, construction and ownership services for the *contestable IUSA components* or *designated network asset*; and;
  - (ii) at the *Primary Transmission Network Service Provider's* option in respect of an *identified user shared asset*, that is above those minimum requirements in subparagraph (i) subject to the *Primary Transmission Network Service Provider* separately identifying the additional requirements and agreeing to fund the additional works related to those requirements;
- (10) an indicative costing for operation and maintenance services for any *identified user shared asset* or *designated network asset*, based on the functional specification provided pursuant to subparagraph (9); and
- (11) the amount of any enquiry fee under clause 5.3.2(g).

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (b1) The *Network Service Provider* must:
- (1) within 30 *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 30 *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*—the information required under clause 5.3.2(f).~~

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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*.
- (b5) For a *connection point* for a proposed new *connection* in relation to which clause 5.3.4B applies, within the time applicable under paragraph (b1), the *Network Service Provider* must provide the *Connection Applicant* with the following written details:
- (1) the minimum *three phase fault level* at the *connection point*;
  - (2) the results of the *Network Service Provider's* preliminary assessment of the impact of the new *connection* undertaken in accordance with the *system strength impact assessment guidelines* and clause 5.3.4B; and



- (3) except where, under clause 5.3.4B(a3), the *Network Service Provider* is not required to calculate the *system strength locational factor*:
- (i) the indicative *system strength quantity* for the *connection point*;
  - (ii) the *system strength locational factor* for the *connection point*; and
  - (iii) the relevant *system strength node* and the indicative *system strength charge* using the then applicable *system strength unit price*.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (c) Within 30 *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 6.21 and 6A.28;
  - (4A) the *DER generation information* that the *Network Service Provider* requires;
  - (5) the amount of the application fee which is payable on lodgement of an *application to connect*, such amount:
    - (i) not being more than necessary to cover the reasonable costs of all work anticipated to arise from investigating the *application to connect* and preparing the associated offer to *connect* and to 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
- (ii) must not include any amount for, or in anticipation of, the costs of the person using an *Independent Engineer*; and
- (6) any other information relevant to the submission of an *application to connect*.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

### 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, clause 5.3.4A and clause 5.3.4B.
- (b) To be eligible for *connection* the *Connection Applicant* must submit an *application to connect* containing:
  - (1) the information specified in clause 5.3.3(c);
  - (2) the relevant application fee to the relevant *Network Service Provider*;
  - (3) for services related to *contestable IUSA components* that the *Connection Applicant* has not obtained from the *Primary Transmission Network Service Provider* or a *designated network asset* (as applicable):
    - (i) the *Connection Applicant's* process for how the *Primary Transmission Network Service Provider* will undertake a review of the detailed design and inspect the construction of those components or assets and how risks of defects will be addressed;
    - (ii) the detailed design of those components or assets; and
    - (iii) if the *Primary Transmission Network Service Provider* will not own the *contestable IUSA components* or *designated network asset*, the *Connection Applicant's* proposed changes (if any) to the form of *network operating agreement* published pursuant to schedule 5.10; and
  - (4) if the *Connection Applicant* has obtained services related to *contestable IUSA components* or a *designated network asset* other than from the *Primary Transmission Network Service Provider*, all information reasonably required for the *Primary Transmission Network Service Provider* to properly provide operation and maintenance services for the life of those components or assets, including details of the *contestable IUSA components* or *designated network assets'* construction, instructions for operation and maintenance and health safety and asset management manuals; and
  - (5) except where, under clause 5.3.4B(a3), the *Network Service Provider* is not required to calculate the *system strength locational factor*, the *Connection Applicant's* election under clause 5.3.4B(b1).

- (b1) The *Connection Applicant's* detailed design under paragraph (b)(3)(ii):
- (1) must be consistent with the minimum functional specification provided by the *Primary Transmission Network Service Provider* under clause 5.3.3(b)(9)(i);
  - (2) must not unreasonably inhibit the capacity for future expansion of the *identified user shared asset* or preclude the possibility of future *connections* to that asset; and
  - (3) subject to the *Connection Applicant* considering the *Primary Transmission Network Service Provider's* additional requirements under clause 5.3.3(b)(9)(ii) in good faith, may be (but is not required to be) consistent with those additional requirements.
- (c) In relation to *Distribution Network Service Providers* and *Network Service Providers* for *declared transmission systems*, 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;
  - (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*; or
  - (3) lodge a combined *application to connect* with the *Primary Network Service Provider* where the *connection* involves more than one *Connection Applicant* due to different persons developing and owning *contestable IUSA components, dedicated connection assets, designated network assets* and *Transmission Network User facilities* in relation to that *connection*.
- (g) A *Connection Applicant* who proposes a *system strength remediation scheme* under clause 5.3.4B must submit its proposal with the *application to connect*.

### 5.3.4A Negotiated access standards

- (a) AEMO must advise on AEMO advisory matters.
- (b) A negotiated access standard must:
- (1) subject to subparagraph (1A), be no less onerous than the corresponding *minimum access standard* provided by the relevant Network Service Provider under clauses 5.3.3(b1)(4) or S5.4B(b)(2);
  - (1A) with respect to a submission ~~by a Generator or Integrated Resource Provider under clause 5.3.9(b)(3), or a Network User or Market Network Service Provider under clause 5.3.12(b)(3)~~, be no less onerous than the existing performance standard that corresponds to the relevant plant-generating system or integrated resource system or plant (as applicable);
  - (2) be set at a level that will not adversely affect *power system security* or achievement of the system standards;
  - (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 Schedule 5.2~~ meet the requirements of a negotiated access standard for the corresponding technical requirement under schedule 5.2, schedule 5.3 or schedule 5.3a as applicable,  
where the assessment of those matters considers, as relevant and in the range of expected power system operating conditions, the expected performance of the existing power system, considered projects and projects for connection of Network Users that the Network Service Provider reasonably considers will proceed.
- (b1) When submitting a proposal for a *negotiated access standard* under clauses 5.3.4(e), 5.3A.9(f), 5.3.9(b)(3), 5.3.12(b)(3) or subparagraph (h)(3), and where there is a corresponding *automatic access standard* for the relevant technical requirement, a *Connection Applicant* must propose a standard that is as close as practicable to the corresponding *automatic access standard*, having regard to:
- (1) the need to protect the *plant* from damage;
  - (2) *power system* conditions at the location of the proposed *connection*; and
  - (3) the commercial and technical feasibility of complying with the *automatic access standard* with respect to the relevant technical requirement.
- (b2) When proposing a *negotiated access standard* under paragraph (b1), the *Connection Applicant* must provide reasons and evidence to the *Network Service Provider* and AEMO as to why, in the reasonable opinion of the *Connection Applicant*, the proposed *negotiated access standard* is appropriate, including:
- (1) how the *Connection Applicant* has taken into account the matters outlined in subparagraphs (b1)(1) to (3); and

**Commented [A29]:** Drafting note - this is added for clarification of the reference to 'performance standard'. Other issues relating to this requirement and 5.3.9 are being separately considered, including with regard to the meaning of 'no less onerous'

**Commented [A30]:** Drafting note - this reflects the objective in 5.1A.2(c), obligations of all Registered Participants, and is reflected in some technical standards

**Commented [A31]:** Drafting note - this paragraph seeks to capture the slightly different iterations of broadly the same concepts that are currently expressed throughout the technical standards (e.g. S5.2.5.1, S5.2.5.4, S5.2.5.5, S5.2.5.12, S5.2.8), but are likely to be relevant for most.

- (2) how the proposed *negotiated access standard* meets the requirements of paragraph (b).
- (c) Following the receipt of a proposed *negotiated access standard* under clauses 5.3.4(e), 5.3A.9(f), 5.3.9(b)(3), 5.3.12(b)(3) or subparagraph (h)(3), the *Network Service Provider* must consult with *AEMO* as soon as practicable in relation to *AEMO advisory matters* for that proposed standard.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (d) Within 20 *business days* following the later of:
- (1) receipt of a proposed *negotiated access standard* under clauses 5.3.4(e), 5.3A.9(f), 5.3.9(b)(3), 5.3.12(b)(3) or subparagraph (h)(3); and
  - (2) receipt of all information required to be provided by the *Connection Applicant* under clauses S5.2.4, S5.5.6, S5.3.1(a1) or S5.3a.1(a1),
- AEMO* must advise the *Network Service Provider* in writing, in respect of *AEMO advisory matters*, whether the proposed *negotiated access standard* should be accepted or rejected.
- (d1) When advising the *Network Service Provider* under paragraph (d) to reject a proposed *negotiated access standard*, and subject to obligations in respect of *confidential information*, *AEMO* must:
- (1) provide detailed reasons in writing for the rejection to the *Network Service Provider*, including:
    - (i) where the basis of *AEMO*'s advice is lack of evidence from the *Connection Applicant*, details of the additional evidence of the type referred to in paragraph (b2) *AEMO* requires to continue assessing the proposed *negotiated access standard*; and
    - (ii) the extent to which each of the matters identified at subparagraphs (b)(1), (b)(1A), (b)(2) and (b)(4) contributed to *AEMO*'s decision to reject the proposed *negotiated access standard*; and
  - (2) recommend a *negotiated access standard* that *AEMO* considers meets the requirements of subparagraphs (b)(1), (b)(1A), (b)(2) and (b)(4).
- (e) Within 30 *business days* following the later of:
- (1) receipt of a proposed *negotiated access standard* in accordance with clauses 5.3.4(e), 5.3A.9(f), 5.3.9(b)(3), 5.3.12(b)(3) or subparagraph (h)(3); and
  - (2) receipt of all information required to be provided by the *Connection Applicant* under clauses S5.2.4, S5.5.6, S5.3.1(a1) or S5.3a.1(a1),
- the *Network Service Provider* must accept or reject a proposed *negotiated access standard*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (f) The *Network Service Provider* must reject the proposed *negotiated access standard* where:
- (1) in the *Network Service Provider's* reasonable opinion, one or more of the requirements at subparagraphs (b)(1), (b)(1A), (b)(3) and (b)(4) are not met; or
  - (2) *AEMO* has advised the *Network Service Provider* under paragraph (d) to reject the proposed *negotiated access standard*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (g) If a *Network Service Provider* rejects a proposed *negotiated access standard*, the *Network Service Provider* must, at the same time:
- (1) subject to obligations in respect of *confidential information*, provide to the *Connection Applicant*:
    - (i) where the basis for the *Network Service Provider's* rejection is lack of evidence from the *Connection Applicant*, details of the additional evidence of the type referred to in paragraph (b2) the *Network Service Provider* requires to continue assessing the proposed *negotiated access standard*;
    - (ii) detailed reasons in writing for the rejection, including the extent to which each of the matters identified at subparagraphs (b)(1), (b)(1A), (b)(3) and (b)(4) contributed to the *Network Service Provider's* decision to reject the proposed *negotiated access standard*; and
    - (iii) the detailed reasons and recommendation (if any) provided by *AEMO* to the *Network Service Provider* in respect of an *AEMO advisory matter* under subparagraphs (d1)(1) and (2); and
  - (2) advise the *Connection Applicant* of a *negotiated access standard* that the *Network Service Provider* considers meets the requirements of subparagraphs (b)(1), (b)(1A), (b)(3) and (b)(4).

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (h) The *Connection Applicant* may in relation to a proposed *negotiated access standard* advised by a *Network Service Provider* in accordance with subparagraph (g)(2):
- (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.

#### 5.3.4B System strength mitigation requirement

- (a) This clause applies in relation to:
  - (1) a proposed new *connection* of a ~~*schedule 5.2 plant or schedule 5.3 plant that, in either case, includes a large inverter-based resource; generating system, integrated resource system or market network service facility to which rule 5.3 or 5.3A applies;*~~
  - (2) a proposed new *connection* ~~*of a schedule 5.3a plant that is not subject to transmission service regulation under Chapter 6A; for a Network User to whom schedule 5.3 applies where the facility to be connected includes an inverter-based resource;*~~ and  
**Note:**  
The joint planning obligations of the relevant Network Service Providers under Part D of Chapter 5 apply to the connection of a schedule 5.3a plant that will be subject to economic regulation.
  - (3) a proposed alteration to ~~*plant described in subparagraph (1) or (2) a generating system or integrated resource system*~~ where clause 5.3.9 ~~*or applies or to other connected plant where clause 5.3.12 applies.*~~
- (a1) In this clause, a reference to a *Connection Applicant* includes a reference to a ~~*Schedule 5.2 Participant Generator or an Integrated Resource Provider*~~ to whom clause 5.3.9 applies and a ~~*Schedule 5.3 Participant or Schedule 5.3a Participant Network User or Market Network Service Provider*~~ to whom clause 5.3.12 applies.
- (a2) For each proposed new *connection* or proposed alteration to ~~*a generating system, integrated resource system or other connected plant*~~ to which this clause applies, a *Network Service Provider* must:
  - (1) undertake a preliminary *system strength impact assessment* in accordance with the *system strength impact assessment guidelines*;
  - (2) subject to paragraph (a3), calculate the *system strength locational factor* for the new *connection* or proposed alteration in accordance with the *system strength impact assessment guidelines*;
  - (2A) subject to paragraph (a3), calculate, in accordance with the *system strength impact assessment guidelines*, the indicative *system strength quantity*;
  - (3) undertake a full *system strength impact assessment* following the preliminary assessment, unless:
    - (i) the preliminary assessment indicates there will be no *general system strength impact* or the impact is below any threshold specified in the *system strength impact assessment guidelines* for the purposes of paragraph (f)(3); or

- (ii) where applicable, the *Connection Applicant* has elected in accordance with paragraph (b1) to pay the *system strength charge* in relation to the *connection*; and
- (4) where the *Connection Applicant* has elected in accordance with paragraph (b1) to pay the *system strength charge* in relation to the *connection* or proposed alteration, undertake modelling in accordance with the *system strength impact assessment guidelines* to verify the stability of the *plant*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (a3) A *Network Service Provider*:
  - (1) is not required to calculate the *system strength locational factor* where it determines in accordance with the *system strength impact assessment guidelines* that a *system strength locational factor* cannot reasonably be calculated or would be manifestly excessive; and
  - (2) is not required to calculate an indicative *system strength quantity* if, in accordance with subparagraph (1), it is not required to calculate the *system strength locational factor*.
- (a4) A *Connection Applicant* may request the *Network Service Provider* to undertake a further preliminary *system strength impact assessment* in accordance with the *system strength impact assessment guidelines* and provide a revised *system strength locational factor* and a revised indicative *system strength quantity* for a new *connection* or proposed alteration to a *generating system, integrated resource system* or other *connected plant*.
- (a5) A *Network Service Provider* may require payment of a fee to meet the reasonable costs anticipated to be incurred by the *Network Service Provider* in undertaking any further preliminary assessment or providing a revised *system strength locational factor* or a revised indicative *system strength quantity* requested under paragraph (a4).
- (b) The *Network Service Provider* must give the results of the preliminary assessment and where applicable the full assessment to the *Connection Applicant* concerned following consultation with *AEMO*.
- (b1) A *Connection Applicant* must elect in its *application to connect*, its submission under clause 5.3.9(b) or its submission under clause 5.3.12(b) (as applicable) whether the *system strength charge* will be payable in relation to the new *connection* or alteration to the *generating system, integrated resource system* or other *connected plant* (as applicable). The election cannot be revoked.
- (c) A dispute referred to in paragraph (d) between any of:
  - (1) *AEMO*;
  - (2) a *Network Service Provider* required to conduct an assessment under paragraph (a);



- (3) a *Connection Applicant* who has submitted an *application to connect* for which a full assessment is required under paragraph (a2)(3); **and**
- (4) a **Connection Applicant** ~~Generator or Integrated Resource Provider~~ who proposes an alteration ~~to a generating system or integrated resource system~~ to which clause 5.3.9 **or clause 5.3.12** applies and for which a full assessment is required under paragraph (a2)(3) ~~and~~
- (5) **[Deleted]** ~~a Network User or Market Network Service Provider who proposes an alteration to connected plant to which clause 5.3.12 applies and for which a full assessment is required under paragraph (a2)(3).~~

**Commented [A32]:** Drafting note - See paragraph (a1)

may be determined under rule 8.2.

- (d) Paragraph (c) applies to any dispute relating to the assessment of the *general system strength impact* as a result of conducting a *system strength impact assessment* including a dispute in relation to:
  - (1) whether the model specified by *AEMO* for the purposes of clause 4.6.6(b)(2) was reasonably appropriate for conducting the *system strength impact assessment*; and
  - (2) the application of the *system strength impact assessment guidelines* when undertaking a *system strength impact assessment*.
- (e) Subject to paragraph (f), a *Network Service Provider* must undertake *system strength connection works* at the cost of the *Connection Applicant* if the full assessment undertaken in accordance with the *system strength impact assessment guidelines* indicates that the *Connection Applicant's* proposed new *connection* or proposed alteration will have a *general system strength impact*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (f) Paragraph (e) does not require a *Network Service Provider* to undertake, nor permit a *Network Service Provider* to require, *system strength connection works* in the following circumstances:
  - (1) the proposed new *connection* or alteration does not proceed;
  - (2) to the extent that the *general system strength impact* referred to in paragraph (e) is or will be avoided or remedied by a *system strength remediation scheme* agreed or determined under this clause and implemented by the *Connection Applicant* in accordance with its *connection agreement*;
  - (3) to the extent that the impact is below any threshold specified in the *system strength impact assessment guidelines* for this purpose; or
  - (4) the *Connection Applicant* has elected for the *system strength charge* to be payable in relation to the new *connection* or proposed alteration.

- (g) A *Connection Applicant* must include any proposal for a *system strength remediation scheme* in its *application to connect* or its proposal under clause 5.3.9(b)(4) or under clause 5.3.12(b)(4).
- (h) A *Connection Applicant* proposing to install *plant* as part of a *system strength remediation scheme* must include a description of the *plant* and other information (including models) reasonably required by the *Network Service Provider* and *AEMO* to assess the *system strength remediation scheme*.
- (i) A *Network Service Provider* must, following the receipt of a proposal for a *system strength remediation scheme*, consult with *AEMO* as soon as practical in relation to the proposal.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (j) Following the submission of a proposal for a *system strength remediation scheme*, *AEMO* must use reasonable endeavours to respond to the *Network Service Provider* in writing in respect of the proposal within 20 *business days*.
- (k) A *Network Service Provider* must within 10 *business days* following the receipt of a response from *AEMO* under paragraph (h) to a proposal for a *system strength remediation scheme*, accept or reject the proposal.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (l) The *Network Service Provider* must reject a proposal for a *system strength remediation scheme* if the scheme is not reasonably likely to achieve its required outcome or would:
  - (1) in the reasonable opinion of the *Network Service Provider* adversely affect quality of *supply* for other *Network Users*; or
  - (2) on *AEMO*'s reasonable advice, adversely affect *power system security*.
- (m) If a *Network Service Provider* rejects a proposal for a *system strength remediation scheme*, the *Network Service Provider* must give its reasons but has no obligation to propose a *system strength remediation scheme* that it will accept.
- (n) The *Connection Applicant* submitting a proposal for a *system strength remediation scheme* rejected by a *Network Service Provider* may:
  - (1) propose an alternative *system strength remediation scheme* to be further evaluated following the process initiated under paragraph (i); or
  - (2) request negotiations under paragraph (o).
- (o) If a *Connection Applicant* requests negotiations under this paragraph, the *Connection Applicant*, the *Network Service Provider* and *AEMO* must negotiate in good faith to reach agreement in respect of the proposal for a *system strength remediation scheme*.
- (p) If the matter is not resolved by negotiation under paragraph (o):

- (1) in the case of a *connection* to a *transmission system* other than the *declared transmission system* of an *adoptive jurisdiction*, the matter may be dealt with as a dispute under rule 5.5 (but not rule 8.2); or
  - (2) otherwise, may be dealt with under rule 8.2 or as a *distribution service access dispute* as applicable.
- (q) The parties to a *connection agreement* containing a *system strength remediation scheme* must not modify the scheme unless the modified scheme has been agreed or determined under this clause. A ~~party~~ *Registered Participant* proposing to modify a *system strength remediation scheme* must submit its proposal for modification to the *Network Service Provider* for evaluation by the *Network Service Provider* and *AEMO* under this clause. Once agreed or determined, the modified scheme must be incorporated as an amendment to the *connection agreement* and notified to *AEMO* under clause 5.3.7(g).

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

#### 5.3.4C Information about system strength connection points

- (a) A *Network Service Provider* for a *system strength connection point* who is not also the *System Strength Service Provider* for the *system strength connection point* must notify the information in paragraph (b) to the relevant *System Strength Service Provider* within 10 *business days* of either of the following occurring:
- (1) an election being made under clause 5.3.4B(b1) for the *system strength charge* to be payable in relation to a new *connection* or proposed alteration; or
  - (2) agreement being reached under clause 5.3.9 or clause 5.3.12 to vary the performance of *plant* at a *system strength connection point*, relative to the technical requirements in clause S5.2.5.15, clause S5.3.11 or clause S5.3a.7 (as applicable).
- (b) The *Network Service Provider* must notify:
- (1) the *system strength locational factor*;
  - (2) its calculation of the indicative *system strength quantity*;
  - (3) the expected date from which the *system strength charge* for the *connection* will commence or the amendment take effect; and
  - (4) information reasonably required by the *System Strength Service Provider* to identify the relevant *connection*.
- (b1) A *Network Service Provider* for a *system strength connection point* who is not also the *System Strength Service Provider* for the *system strength connection point* must notify to the relevant *System Strength Service Provider*, within 20 *business days* of execution of the *connection agreement* for the *connection point*, the *short circuit ratio* and ~~rated active power, rated active power capability,~~ *power transfer capability* or *maximum demand* for

the *system strength connection point* agreed in accordance with clause S5.2.5.15, clause S5.3.11 or clause 5.3a.7 (as applicable).

- (c) A *Network Service Provider* for a *system strength connection point* must, within 20 *business days* of a request of the relevant *System Strength Service Provider*:
  - (1) calculate in accordance with the *system strength impact assessment guidelines* and notify to the *System Strength Service Provider*, the *system strength locational factor* applicable to the *system strength connection point* for each year of the *system strength charging period* specified by the *System Strength Service Provider*; and
  - (2) provide any other information reasonably required by the *System Strength Service Provider* for the purposes of calculating and billing *system strength charges* for the *system strength connection point*.
- (d) A *System Strength Service Provider* must establish and maintain arrangements to enable other *Network Service Providers* to provide information to the *System Strength Service Provider* in accordance with this clause 5.3.4C.
- (e) A *System Strength Service Provider* must establish and maintain a record of all *connections* subject to the *system strength charge* and for which it is the *System Strength Service Provider* and must include in the record all information reasonably required by the *System Strength Service Provider* to identify the relevant *connection* for the purposes of calculating and billing *system strength charges*.

### 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* (including the details of any person undertaking the construction, detailed design and/or ownership of *contestable IUSA components*) or *designated network asset* 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) The *Network Service Provider* preparing the offer to *connect* must specify in reasonable detail any *system strength connection works* to be undertaken by the *Network Service Provider*.
- (f) **[Deleted]**
- (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.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

### 5.3.6 Offer to connect

- (a) Subject to paragraph (a3), a *Network Service Provider* processing an *application to connect* must make an offer to *connect* the *Connection Applicant's facilities* to the *network* within the following timeframes:
- (1) where the *application to connect* was made under clause 5.3.4(a), the timeframe specified in the *preliminary program*, subject to clause 5.3.3(b)(6); and
  - (2) where the *application to connect* was made under clause 5.3A.9(b), a period of time no longer than 4 months from the date of receipt of the *application to connect* and any additional information requested under clause 5.3A.9(d), unless agreed otherwise.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (a1) The *Network Service Provider* may amend the time period referred to in paragraph (a)(1) 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 or a *system strength remediation scheme* in accordance with clause 5.3.4B or any time taken by *AEMO* to respond under clause 5.3.4B(j) in excess of 20 *business days*.

- (a2) In relation to the timeframes fixed in paragraph (a)(2), for the purposes of calculating elapsed time, the following periods shall be disregarded:
- (1) the period that commences on the day when a dispute is initiated under clause 8.2.4(a) and ends of the day on which the dispute is withdrawn or is resolved in accordance with clauses 8.2.6D or 8.2.9(a);
  - (2) any time taken to resolve a *distribution services access dispute*; and
  - (3) any time taken by AEMO to respond under clause 5.3.4B(j) in excess of 20 *business days*.
- (a3) In relation to a *Connection Applicant's application to connect* made under clause 5.3.4(a) for *connection* to a part of a *network* that is a *designated network asset*, the *Network Service Provider* must not make an offer to *connect* under paragraph (a), unless the owner of the *designated network asset* has given notice to the *Network Service Provider*:
- (1) confirming access to *DNA services* in respect of that the *designated network asset* has been agreed with the *Connection Applicant* in accordance with the relevant *access policy*; and
  - (2) providing any details on technical requirements or limitations agreed as part of the *DNA services* that are relevant to the offer to *connect*.
- (b) In relation to an *application to connect* made under clause 5.3.4(a), 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 Part A and (where applicable) Part B of schedule 5.6,
- and must be capable of acceptance by the *Connection Applicant* so as to constitute a *connection agreement* and (where applicable) a *network operating agreement*.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (b1) The proposed terms and conditions detailed in the offer to *connect* must be no lower than the applicable *minimum access standards*.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (b2) An offer to *connect* made under paragraph (a)(2), must be accompanied by:
- (1) so far as is relevant, and in relation to services the *Distribution Network Service Provider* intends to provide, an itemised statement of *connection costs* including:

- (i) *connection service* charges;
  - (ii) costs associated with metering requirements contained in the offer to *connect*;
  - (iii) costs of *network extension*;
  - (iv) details of *augmentation* required to provide the *connection* and associated costs;
  - (v) details of the interface equipment required to provide the *connection* and associated costs;
  - (vi) details of any ongoing operation and maintenance costs and charges by the *Distribution Network Service Provider*; and
  - (vii) other incidental costs and their basis of calculation;
- (2) if any item in the statement of costs in subparagraph (1) differs substantially from the estimate provided under clause S5.4B(h), an explanation of the differences;
- (3) a *connection agreement* capable of execution by the *Connection Applicant*, which must contain the proposed terms and conditions for *connection* to the *distribution network* (of the kind set out in Part A of schedule 5.6) including, for each technical requirement identified by the *Distribution Network Service Provider* in the *detailed response* provided under clause 5.3A.8(c), the *automatic access standard* or the negotiated access standard as determined in accordance with clause 5.3.4A; and
- (4) an explanation:
- (i) of how the offer to *connect* can be accepted; and
  - (ii) that the offer to *connect* remains open for 20 *business days*, unless otherwise agreed.
- (b3) An offer to *connect* made under paragraph (a)(2) must remain open for acceptance for 20 *business days* from the date it is made and, if not accepted within that period, lapses unless the *Connection Applicant* has sought an extension of the period of time from the *Distribution Network Service Provider*. The *Distribution Network Service Provider* may not unreasonably withhold consent to the extension.
- (b4) An offer to *connect* by a *Primary Transmission Network Service Provider* made under paragraph (a)(1) must include:
- (1) the *Primary Transmission Network Service Provider's* requirements in relation to the matters proposed in clause 5.3.4(b)(3) and (b)(4); and
  - (2) the costs of the services proposed to be provided by the *Primary Transmission Network Service Provider* separated between *negotiated transmission services* and *non-regulated transmission services* (if applicable).
- (b5) A *Connection Applicant* may seek amendments to the offer to *connect* provided that the *Connection Applicant* agrees to changes to the *preliminary program* to reflect the additional time required to agree the amendments.

- (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.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (c1) **[Deleted]**

- (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.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (i) **[Deleted]**

- (j) An offer to *connect* in respect of a *distribution network* made to a *Connection Applicant* specified in rule 5.3AA(a)(2) ~~*Distribution-Connected Resource Provider* or a *Market Network Service Provider*~~, must conform with the relevant access arrangements set out in rule 5.3AA.



**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (k) **[Deleted]**

**5.3.7 Finalisation of connection agreements and network operating agreements**

- (a) If a *Connection Applicant* wishes to accept an offer to *connect*, the *Connection Applicant* must negotiate and enter into:
- (1) a *connection agreement* with each relevant *Network Service Provider* identified in accordance with clauses 5.3.3(b)(3) and (4) or clauses S5.4A(d) and (e); and
  - (2) if applicable, a *network operating agreement* with the *Primary Transmission Network Service Provider*,
- 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* and (if applicable) *network operating 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* or any *system strength connection works*.
- (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.
- (f1) The parties may agree to have one *connection agreement* between a *Primary Transmission Network Service Provider*, owner of a *dedicated connection asset* or *designated network asset* and a *Transmission Network User* for a *connection*.
- (f2) A *network operating agreement* must be based on the offer to *connect* as varied by agreement between the parties.
- (f3) Paragraph (g) applies in respect of a *connection agreement* if:

(1) the relevant *Connection Applicant* is, or will be, a *Registered Participant* for the plant to be connected; or

(2) the connection agreement includes an AEMO advisory matter.

(g) Within 20 *business days* of execution of ~~a the connection agreement~~ in respect of which this paragraph (g) applies, the *Network Service Provider* responsible for the *connection point* and the ~~*Registered Participant Connection Applicant*~~ *Registered Participant Connection Applicant* 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 the *Connection Applicant is a Schedule 5.2 Participant, Registered Participant is a Generator or Integrated Resource Provider*, the arrangements for:
  - (i) updating the *releasable user guide* and other information required under clause S5.2.4(b); and
  - (ii) informing AEMO when the *connection agreement* expires or is terminated;
- (3) the proposed *metering installation*;
- (4) arrangements to obtain physical access to the *metering installation* for the *Metering Provider* and the *Metering Data Provider* for *metering installations* type 4A, 5 and 6;
- (5) the terms upon which a *Registered Participant* is to supply any *ancillary services* under the *connection agreement*; and
- (6) the details of any *system strength remediation scheme* agreed, determined or modified under clause 5.3.4B.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(h) AEMO must, within 20 *business days* of receipt of ~~a the~~ notice under paragraph (g), advise the relevant *Network Service Provider* and the ~~*Connection Applicant 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 7.4.

**5.3.8 Provision and use of information**

- (a) The data and information provided under rules 5.2A, 5.3 and 5.3A 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 rule 3.7F, clause 3.13.3, this clause 5.3.8 or in accordance with rule 8.6.

- (a1) The data and information provided to a *Primary Transmission Network Service Provider* in relation to its provision of non-contestable services as specified under clause 5.2A.4(a) must not be used by the *Primary Transmission Network Service Provider* for the purpose of tendering for, or negotiating, *contestable* services specified under clause 5.2A.4(a) in the *connection* process in which the data or information was given, or in future *connection* processes, without the consent of the *Connection Applicant*.
- (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-~~ 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*;
    - (iii) determine the extent of any required *augmentation* or *extension* or *system strength connection works*; or
    - (iv) assess *system strength remediation scheme* proposals.
- (c) A *Network Service Provider* may disclose the data and information to be provided under rules 5.2A, 5.3 and 5.3A 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, unless the information may be disclosed in accordance with rule 8.6.
- (d1) If a *Connection Applicant* becomes aware of any material change to information contained in or relevant to a *connection* enquiry under rule 5.3 following receipt of the response from the *Network Service Provider* under clause 5.3.3, that *Connection Applicant* must promptly notify the *Network Service Provider* of that change.
- (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.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (f) A ~~Registered Participant~~ *Network Service Provider or a Schedule 5 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

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~~incomplete, inaccurate or out of date, incorrect, advise provide AEMO with of the correct updated~~ information.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

**5.3.9 Alteration of ~~a generating system or integrated resource system~~ schedule 5.2 plant**

- (a) Subject to paragraph (a1), this clause 5.3.9 applies where a Schedule 5.2 Participant ~~:~~
- ~~(1) a Generator or Integrated Resource Provider~~ proposes to alter a connected schedule 5.2 plant generating system or a generating system for which performance standards have been previously accepted by the *Network Service Provider* and AEMO (in relation to AEMO advisory matters, to the extent applicable to the schedule 5.2 plant under clause S5.2.1) and that alteration:
    - ~~(1)(i)~~ will affect the performance of the generating system schedule 5.2 plant relative to any of the technical requirements set out in clauses S5.2.5, S5.2.6, S5.2.7 and S5.2.8; or
    - ~~(2)(ii)~~ will, in AEMO's reasonable opinion, have a *general system strength impact*; or
    - ~~(3)(iii)~~ will, in AEMO's reasonable opinion, adversely affect *network capability, power system security, quality or reliability of supply, inter-regional power transfer capability* or the use of a *network* by another *Network User*.
  - ~~(2) an Integrated Resource Provider~~ proposes to alter a connected integrated resource system or an integrated resource system for which performance standards have been previously accepted by the *Network Service Provider* and AEMO (in relation to AEMO advisory matters) and that alteration:
    - ~~(i)~~ will affect the performance of the integrated resource 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; or
    - ~~(ii)~~ will, in AEMO's reasonable opinion, have a *general system strength impact*; or
    - ~~(iii)~~ will, in AEMO's reasonable opinion, adversely affect *network capability, power system security, quality or reliability of supply, inter-regional power transfer capability* or the use of a *network* by another *Network User*.
- (a1) This clause 5.3.9 does not apply in relation to any modifications made ~~to a scheduled generating unit, semi-scheduled generating unit or scheduled bidirectional unit~~ by a *Scheduled Generator, Semi-Scheduled Generator or Scheduled Integrated Resource Provider* in order to comply with the *Primary Frequency Response Requirements* as applicable to a schedule 5.2 plant. ~~that unit.~~

- (b) A ~~Generator or Integrated Resource Provider~~ Schedule 5.2 Participant 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 proposed 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 for production units or synchronous condensers in accordance with the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*;

**Note**

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (2A) ~~[Deleted] in respect of the proposed alteration to the integrated resource system, details of the bidirectional unit and where applicable generating unit design data and setting data in accordance with the Power System Model Guidelines, Power System Design Data Sheet and Power System Setting Data Sheet;~~
  - (3) in relation to each relevant technical requirement for which the proposed alteration to the equipment will affect the performance of the ~~schedule 5.2 plant generating system or integrated resource system~~, the proposed amendments to the *plant's* existing corresponding *performance standard* for that technical requirement; and
  - (4) where relevant, the ~~Generator's or Integrated Resource Provider's Schedule 5.2 Participant's~~ proposed *system strength remediation scheme* or its election for the *system strength charge* to be payable in relation to the alteration.
- (c) Clause 5.3.4A applies to a submission ~~by a Generator or Integrated Resource Provider~~ under subparagraph (b)(3).
- (c1) Clause 5.3.4B applies to a submission ~~by a Generator or Integrated Resource Provider~~ under subparagraph (b)(4). A ~~Generator or Integrated Resource Provider~~ Schedule 5.2 Participant may request the *Network Service Provider* to undertake a preliminary assessment and (subject to clause 5.3.4B(a3)) calculate the *system strength locational factor* and indicative *system strength quantity* in accordance with clause 5.3.4B(a2) before making a submission under paragraph (b).
- (d) Without limiting paragraph (a), a proposed alteration to the equipment specified in column 1 of the table set out below is deemed to affect the performance of the ~~generating system or integrated resource system~~ schedule 5.2 plant relative to technical requirements specified in column 2, thereby necessitating a submission under subparagraph (b)(3), unless *AEMO* and the *Network Service Provider* otherwise agree.

| 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, 5.2.5.15            |
| 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  |
| <del>voltage-voltage</del> control system | S5.2.5.5, S5.2.5.7, 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, S5.2.5.10, 5.2.5.16 |
| auxiliary supplies                        | S5.2.5.1, S5.2.5.2, S5.2.7  |
| 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 *Network Service 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 any information of a kind required to be provided to AEMO under clause 5.3.7, an existing connection agreement the *Network Service Provider* and the ~~Generator or Integrated Resource Provider~~ Schedule 5.2 Participant must immediately jointly advise *AEMO*, including the details of any *performance standards* amended pursuant to this clause 5.3.9.

#### Note

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

### 5.3.10 Acceptance of performance standards for plant that is altered

- (a) A ~~Generator~~ Schedule 5.2 Participant must not commission altered ~~generating-schedule 5.2~~ plant until the *Network Service Provider* has advised the ~~Generator~~ Schedule 5.2 Participant that the Network Service Provider ~~provider~~ and *AEMO* are satisfied in accordance with paragraph (b).

#### Note

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (a1) ~~[Deleted] An Integrated Resource Provider must not commission altered plant comprised in an integrated resource system (including generating plant) until the Network Service Provider has advised the Integrated Resource Provider that the provider and AEMO are satisfied in accordance with paragraph (b).~~
- (b) In relation to altered plant, the *Network Service Provider* and *AEMO*, ~~to the extent of AEMO's advisory role under clause 5.3.4A and clause 5.3.4B, (in relation to AEMO advisory matters, to the extent applicable to the schedule 5.2 plant under clause S5.2.1)~~ must be satisfied that:
- (1) the ~~Generator or Integrated Resource Provider~~ Schedule 5.2 Participant has complied with clause 5.3.9; and
  - (2) each amended performance standard submitted by the ~~Generator or Integrated Resource Provider~~ Schedule 5.2 Participant 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); and
  - (3) any *system strength remediation scheme* satisfies clause 5.3.4B.
- (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), if applicable.

### 5.3.11 ~~[Deleted] Notification of request to change normal voltage~~

- ~~(a) On receipt of a request from a Network Service Provider to change normal voltage, AEMO must publish a notice to Registered Participants advising:~~
- ~~(1) the change in normal voltage requested; and~~
  - ~~(2) the connection point to which the request relates.~~
- ~~(b) Within a reasonable period after publication of the notice in paragraph (a), AEMO must publish a further notice to Registered Participants advising:~~

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~~(1) whether the normal voltage at the relevant connection point will change; and~~

~~(2) the nature of, and reasons for, any such change.~~

### 5.3.12 Procedure to be followed for alterations to other connected plant

- (a) This clause 5.3.12 applies where a Schedule 5.3 Participant Network User specified in clause S5.3.11(a) or a Schedule 5.3a Participant Market Network Service Provider specified in clause S5.3a.1a proposes to alter *connected plant* and that alteration will affect the performance of the *plant* relative to a technical requirement in schedule 5.3 or schedule 5.3a ~~the technical requirements in clause S5.3.11 or clause S5.3a.7~~ (as applicable) that is an AEMO advisory matter.
- (b) A Schedule 5.3 Participant or Schedule 5.3a Participant Network User or Market Network Service Provider to whom 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 *plant*, details of the design setting data in accordance with the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*;
  - (3) in relation to the technical requirements in clause S5.3.11 or clause S5.3a.7 (as applicable), the proposed amendments to the *plant's* existing corresponding *performance standard* for that technical requirement; and
  - (4) except where the alteration relates to schedule 5.3a plant that is not subject to transmission service regulation under Chapter 6A, the ~~*Network User's or Market Network Service Provider's*~~ proposed *system strength remediation scheme* or ~~its~~an election for the *system strength charge* to be payable in relation to the alteration.
- (c) Clause 5.3.4A applies to a submission under subparagraph (b)(3).
- (d) Clause 5.3.4B applies to a submission under subparagraph (b)(4). A Schedule 5.3 Participant or Schedule 5.3a Participant Network User or Market Network Service Provider (as applicable) may request the *Network Service Provider* to undertake a preliminary assessment and (subject to clause 5.3.4B(a3)) calculate the *system strength locational factor* and indicative *system strength quantity* in accordance with clause 5.3.4B(a2) before making a submission under paragraph (b).
- (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 *Network Service 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*.

**Commented [A35]:** Drafting note - Changes made in 5.3.12 and 5.3.13 to capture changes that affect AEMO advisory matters for both load and HVDC outside clauses S5.3.11 and S5.3a.7



- (g) On payment of the required fee referred to in paragraph (d), 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 5.3.12 leads to a variation to any information of a kind required to be provided to AEMO under clause 5.3.7, the agreed technical requirements in clause S5.3.11 or clause S5.3a.7 (as applicable) in an existing connection agreement, the *Network Service Provider* and the *Schedule 5.3 Participant* or *Schedule 5.3a Participant Network User* or *Market Network Service Provider* (as applicable) must immediately jointly advise *AEMO*, including the details of any *performance standards* amended pursuant to this clause 5.3.12.

### 5.3.13 Acceptance of performance standards for other plant that is altered

- (a) A *Schedule 5.3 Participant* or *Schedule 5.3a Participant Network User* or *Market Network Service Provider* to whom clause 5.3.12 applies must not commission altered *plant* until the *Network Service Provider* has advised the *Schedule 5.3 Participant* or *Schedule 5.3a Participant Network User* or *Market Network Service Provider* (as applicable) that the provider and *AEMO* are satisfied in accordance with paragraph (b).
- (b) In relation to altered *plant*, the *Network Service Provider* and *AEMO*, to the extent of *AEMO's* advisory role under clause 5.3.4A and clause 5.3.4B, must be satisfied that:
  - (1) the *Schedule 5.3 Participant* or *Schedule 5.3a Participant Network User* or *Market Network Service Provider* (as applicable) has complied with clause 5.3.12; and
  - (2) each amended *performance standard* submitted by the *Schedule 5.3 Participant* or *Schedule 5.3a Participant Network User* or *Market Network Service Provider* (as applicable) meets the relevant technical requirements of *schedule 5.3* or *schedule 5.3a* ~~clause S5.3.11 or clause S5.3a.7~~ (as applicable); and
  - (3) any *system strength remediation scheme* satisfies clause 5.3.4B.
- (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).

## 5.3A Establishing or modifying connection – distribution connected systems

### 5.3A.A1 Definitions

[Deleted]

- (b) For the purposes of this rule 5.3A and Schedules 5.4A and 5.4B:
  - detailed response** means the response to a *connection* enquiry prepared under clause 5.3A.8.
  - establish a connection** has the same meaning as in clause 5.3.1.

**information pack** means information relevant to the making of an *application to connect* specified in clause 5.3A.3(b).

**preliminary response** means the response to a *connection* enquiry prepared under clause 5.3A.7.

**sub-transmission line** has the same meaning as in clause 5.10.2.

**zone substation** has the same meaning as in clause 5.10.2.

### 5.3A.1 Application of rule 5.3A

[Deleted]

- (b) Where a *Connection Applicant* wishes to connect a ~~*schedule 5.2 plant, a schedule 5.3a plant or a large inverter-based resource generating system or an integrated resource system*~~ to a *distribution network*, this rule 5.3A applies.
- (c) For the purposes of this rule 5.3A and Schedules 5.4A and 5.4B, ~~*a Connection Applicant*~~ refers to a person specified in clause 5.3.1A(c):
- (1) ~~a reference to a *Connection Applicant* is to a:~~
- ~~(i) person who intends to be a *Distribution Connected Resource Provider*;~~
  - ~~(ii) person who has applied or intends to apply to AEMO for an exemption from the requirement to register as a *Generator or Integrated Resource Provider* in respect of a *generating system or integrated resource system* (and is not eligible for an automatic exemption under the *registration information resource and guidelines*);~~
  - ~~(iii) non-registered *DER provider* who has made an election under clause 5A.A.2(e); or~~
  - ~~(iv) a person (including a non-registered *DER provider*) who is seeking connection for a *large inverter based resource* and who makes a *connection enquiry* under clause 5.3A.5 or an *application to connect* under clause 5.3A.9 in relation to any *generating systems or integrated resource systems*, or any *network elements* used in the provision of a *network service*, as the case may be.~~
- (2) the *Distribution Network Service Provider* is the *Distribution Network Service Provider* required under clause 5.3A.5 to process and respond to a *connection* enquiry or required under clause 5.3A.10 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 a *network service*.

### 5.3A.2 Miscellaneous

[Deleted]

- (b) To the extent a *Distribution Network Service Provider* has provided information required to be provided under this clause 5.3A by the inclusion of that information in:

- (1) its *industry engagement document* under clause 5.13.1(g); or
- (2) a *Distribution Annual Planning Report*,

it will comply with the relevant information provision requirements of rule 5.3A by including hyperlinks to the relevant information in information provided to a *Connection Applicant*.

- (c) Where this rule 5.3A fixes a time limit for the provision of information or a response then, for the purposes of calculating elapsed time, the period that:
  - (1) commences on the day when a dispute is initiated under clause 8.2.4(a); and
  - (2) ends on the day on which the dispute is withdrawn or is resolved in accordance with clauses 8.2.6D or 8.2.9(a),is to be disregarded.

### 5.3A.3 Publication of Information

- (a) A *Distribution Network Service Provider* must *publish* the following in the same location on its website:
  - (1) an enquiry form for *connection* of a *generating system* or an *integrated resource system* to a *distribution network*;
  - (2) a register of completed distribution connected resource projects under rule 5.18B; and
  - (3) an *information pack*.
- (b) An *information pack* must include:
  - (1) a description of the process for lodging an *application to connect* under this rule, including:
    - (i) the purpose of each stage of the *connection* enquiry and application processes;
    - (ii) the steps a *Connection Applicant* will need to follow at each stage of the *connection* enquiry and application processes;
    - (iii) the information that is to be included by the *Connection Applicant* with a *connection* enquiry and the information that will be made available to the *Connection Applicant* by the *Distribution Network Service Provider* at each stage of the *connection* enquiry;
    - (iv) the information that is to be included with an *application to connect* and the type of information that will be made available to the *Connection Applicant* by the *Distribution Network Service Provider* after lodgement of the application;
    - (v) the factors taken into account by the *Distribution Network Service Provider*, at each stage of the *connection* enquiry and application, when assessing an *application to connect* under this rule;
    - (vi) the process for negotiating *negotiated access standards* under clause 5.3.4A and any *system strength remediation scheme* under clause 5.3.4B and a summary of the factors the *Distribution Network Service Provider* takes into account when considering

proposed *negotiated access standards* and *system strength remediation schemes* and where applicable, in determining the *system strength locational factor* and the indicative *system strength quantity*; and

- (vii) a list of services, if any, relevant to the *connection* that are *contestable* in the relevant *participating jurisdiction*;
- (2) single line diagrams of the *Distribution Network Service Provider's* preferred *connection* arrangements, and a range of other possible *connection* arrangements for integration of a *generating system* or an *integrated resource system*, showing the *connection point*, the point of common coupling, the *distribution connected unit(s)*, other sources of load, *meter(s)*, circuit breaker(s) and isolator(s);
- (3) a sample schematic diagram of the *protection system* and *control system* relevant to the *connection* to the *distribution network*, showing the *protection system* and *control system*, including all relevant current circuits, relay potential circuits, alarm and monitoring circuits, back-up systems and parameters of protection and *control system* elements;
- (4) worked examples of *connection service* charges, enquiry and application fees for the *connection* of a *generating system* or an *integrated resource system*, based on the preferred and possible *connection* arrangements set out in paragraph (b)(2);
- (5) details of any *minimum access standards* or *plant standards* the *Distribution Network Service Provider* considers are applicable;
- (6) technical requirements relevant to the processing of a *connection* enquiry or an *application to connect*, including information of the type, but not limited to:
  - (i) *protection systems* and protection schemes;
  - (ii) fault level management principles;
  - (iii) *reactive power capability* and *power factor* correction;
  - (iv) power quality and how limits are allocated;
  - (v) responses to *frequency* and ~~voltage~~-voltage disturbances;
  - (vi) ~~voltage~~-voltage control and regulation;
  - (vii) *remote monitoring equipment*, control and communication requirements;
  - (viii) earthing requirements and other relevant safety requirements;
  - (ix) circumstances in which *augmentation* may be required to facilitate integration of a *generating system* or an *integrated resource system* into the *network*;
  - (x) commissioning and testing requirements; and
  - (xi) circumstances in which a *system strength remediation scheme* or *system strength connection works* will be required as a condition of *connection*; and

- (7) model *connection agreements* used by that *Distribution Network Service Provider*.

#### 5.3A.4 Fees

- (a) A *Distribution Network Service Provider* may charge a *Connection Applicant* an enquiry fee, the amount of which must not be more than necessary to cover the reasonable costs of work required to prepare a *detailed response* to the enquiry.
- (b) The *Distribution Network Service Provider* may specify that an enquiry fee is payable in components.
- (c) The enquiry fee, or such component of it identified by the *Distribution Network Service Provider*, is payable either:
  - (1) on lodgement of the further information identified in S5.4A(o); or
  - (2) on receipt of advice from the *Distribution Network Service Provider* provided pursuant to clause 5.3A.7(b).
- (d) A *Distribution Network Service Provider* must not charge a fee for the provision of a preliminary response.
- (e) A *Distribution Network Service Provider* may charge an application fee, payable on lodgement of an *application to connect*, provided that the fee must not:
  - (1) include an amount for work that was completed in preparing the *detailed response* to the enquiry; and
  - (2) be more than necessary to:
    - (i) cover the costs of work and expenses reasonably incurred by the *Distribution Network Service Provider* in assessing the *application to connect* and making an 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.

#### 5.3A.5 Enquiry

- (a) A *Connection Applicant* who wishes to make an *application to connect* must first make a *connection enquiry* with the *Local Network Service Provider*.
- (b) Subject to paragraph (c), an enquiry must be in the form determined by the *Local Network Service Provider*.
- (c) An enquiry form under paragraph (b) must require the *Connection Applicant* to provide:
  - (1) a qualitative description of the objectives of the project proposal the subject of the *application to connect*;
  - (1A) the *DER generation information* that the *Distribution Network Service Provider* requires;
  - (2) the information specified in Schedule 5.4; and

- (3) a list of the information required from the *Local Network Service Provider* in relation to its *application to connect* and supporting reasons for its requests.
- (d) A *Local Network Service Provider* must, within 5 *business days* after receiving an enquiry, provide written acknowledgment of receipt of the *connection enquiry*.
- (e) If the *Local Network Service Provider* considers that the *connection enquiry* should be jointly examined by more than one *Distribution Network Service Provider*, then, with the agreement of the *Connection Applicant*, one of those *Distribution Network Service Providers* may be allocated the task of liaising with the *Connection Applicant* and the other *Distribution Network Service Providers* to process and respond to the enquiry.
- (f) If the enquiry is incomplete in a material respect, or the *Connection Applicant* has lodged an enquiry other than in accordance with the form determined by a *Local Network Service Provider*, that *Local Network Service Provider* must, within 5 *business days* after receipt of the enquiry, advise the *Connection Applicant* of the deficiency, and may require the *Connection Applicant* to provide the necessary information.
- (g) A *Connection Applicant* may request in a *connection enquiry* made under paragraph (a), that the *Local Network Service Provider* provide only a detailed response under clause 5.3A.8(c) to its enquiry. The *Local Network Service Provider* must, within 5 *business days* after receipt of the enquiry and all such additional information (if any) requested under paragraph (f), advise the *Connection Applicant* if it agrees to the request.

#### **5.3A.6 Response to Enquiry**

- (a) In response to a *connection enquiry*, the *Distribution Network Service Provider* must provide:
  - (1) subject to clause 5.3A.5(g) or receiving any further information requested under clause 5.3A.5(f), a preliminary response; and
  - (2) subject to receiving the enquiry fee and the further information requested under clause 5.3A.8(b), if relevant, a *detailed response*.
- (b) In preparing either the *detailed response* or preliminary response, the *Distribution Network Service Provider* must liaise with other *Network Service Providers* with whom it has *connection agreements*, if the *Distribution Network Service Provider* believes, in its reasonable opinion, that compliance with the terms and conditions of those *connection agreements* will be affected. The *Distribution Network Service Provider* responding to the *connection enquiry* may include in its preliminary response or *detailed response*, the reasonable requirements of any such other *Network Service Providers* for information to be provided by the *Connection Applicant*.

#### **5.3A.7 Preliminary Response to Enquiry**

- (a) Unless agreed otherwise, a preliminary response must:

- (1) be provided within 15 *business days* of receipt of a *connection* enquiry and all such additional information (if any) requested under clause 5.3A.5(f); and
  - (2) include the information specified in Schedule 5.4A.
- (b) If the *Distribution Network Service Provider* has agreed under clause 5.3A.5(g) to not provide a preliminary response, it must advise the *Connection Applicant* of the:
- (1) estimate of the enquiry fee payable by the *Connection Applicant* for the *detailed response*, including details of how components of the fee were calculated; and
  - (2) the component of the estimate of the enquiry fee payable by the *Connection Applicant* to request the *detailed response*,
- within 15 *business days* of receipt of a *connection* enquiry and all such additional information (if any) requested under clause 5.3A.5(f), unless agreed otherwise.
- (c) A *Distribution Network Service Provider* may seek an extension of a time period specified in paragraphs (a) or (b) by giving notice, in writing to the *Connection Applicant*, specifying the reasons required for the extension. The *Connection Applicant* may not unreasonably withhold consent to that extension.
- (d) Nothing in paragraph (a) or Schedule 5.4A is to be read or construed as requiring the *Distribution Network Service Provider* to undertake detailed design or to perform detailed technical studies or analysis to prepare a preliminary response.

#### **5.3A.8 Detailed Response to Enquiry**

- (a) Subject to clause 5.3A.5(g), a *Distribution Network Service Provider* must within 5 *business days* after receiving the further information identified in clause S5.4A(o) provide written acknowledgment of receipt of it.
- (b) If the further information provided under paragraph (a) is incomplete in a material respect the *Distribution Network Service Provider* must within 10 *business days* after receipt of it, advise the *Connection Applicant* of the deficiency and what is required to address it.
- (c) Unless:
  - (1) agreed otherwise; or
  - (2) the proposed *connection* requires the application of the *regulatory investment test for distribution*,the *Distribution Network Service Provider* must provide a *detailed response* within 30 *business days* of the date specified under paragraph (d).
- (d) For the purposes of paragraph (c), the relevant date is the date on which the *Distribution Network Service Provider* has received all of the following:
  - (1) the enquiry fee, or any component of the enquiry fee requested by the *Distribution Network Service Provider*;

- (2) if the *Connection Applicant* was required to remedy a deficiency in further information provided under paragraph (b), that further information; and
  - (3) if the *Connection Applicant* was required under clause S5.4A(o) to provide further information, that information.
- (e) A *Distribution Network Service Provider* may seek an extension of the time period specified in paragraph (c) by giving notice, in writing to the *Connection Applicant*, specifying the reasons required for the extension. The *Connection Applicant* may not unreasonably withhold consent to that extension.
- (f) Where the proposed *connection* requires the application of the *regulatory investment test for distribution*, the *Distribution Network Service Provider* and the *Connection Applicant* are to agree a timeframe for the provision of a *detailed response*, taking into account the status of the relevant *RIT-D project*.
- (g) A detailed response must include the information specified in:
- (1) paragraphs (f), (g) and (m) of Schedule 5.4B;
 

**Note**

This subparagraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)
  - (2) paragraphs (a) - (e1), (h) - (l) and (n)-(o) of Schedule 5.4B.
 

**Note**

Clause 5.3A.8(g) requires that a *detailed response* include all information specified in Schedule 5.4B. The above division may be of relevance for enforcement purposes only.
- (h) A *Connection Applicant* that is a *Registered Participant*, *AEMO* or an *interested party* may make a request in relation to technical requirements for access to the *Reliability Panel* in accordance with clause 5.3.3(b2)-(b4).

### 5.3A.9 Application for connection

- (a) Following receipt of a *detailed response* under clause 5.3A.8, a *Connection Applicant* may make an *application to connect* in accordance with this clause 5.3A.9, clause 5.3.4A and clause 5.3.4B.
- (b) To be eligible for *connection*, the *Connection Applicant* must submit an *application to connect* containing the information specified in the *detailed response* provided under clause 5.3A.8(c) and the application fee specified under clause S5.4B(m) to the *Distribution Network Service Provider* and (except where, under clause 5.3.4B(a3), the *Network Service Provider* is not required to calculate the *system strength locational factor*) the *Connection Applicant's* election under clause 5.3.4B(b1) .
- (c) The *Connection Applicant* may submit an *application to connect* to more than one *Distribution Network Service Provider* in order to receive additional offers to *connect* in respect of *facilities* to be provided that are *contestable*.
- (d) If the *application to connect* is incomplete in a material respect the *Distribution Network Service Provider* must, within 10 *business days* after



receipt of it, advise the *Connection Applicant* of the deficiency, and the steps required to address it.

- (e) 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 *Distribution 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.
- (f) For each technical requirement where the proposed arrangement will not meet the *automatic access standards* nominated by the *Distribution Network Service Provider* pursuant to clause S5.4B(b), 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.
- (g) The *Connection Applicant* may:
  - (1) lodge separate *applications to connect* and separately liaise with the other *Network Service Providers* identified in clause 5.3A.5(e) who may require a form of agreement; or
  - (2) lodge one *application to connect* with the *Distribution 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*.
- (h) A *Connection Applicant* who proposes a *system strength remediation scheme* under clause 5.3.4B must submit its proposal with the *application to connect*.

#### **5.3A.10 Preparation of offer to connect**

- (a) The *Distribution Network Service Provider* to whom the *application to connect* is submitted under clause 5.3A.9(a):
  - (1) at the *automatic access standard*; 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) So as to maintain levels of service and quality of *supply* to existing *Registered Participants* in accordance with the *Rules*, the *Distribution 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 *Distribution 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*.
- (c) If the *application to connect* involves the *connection* of *distribution connected units* having a *nameplate rating* of 10 MW or greater, 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.
- (d) The *Transmission Network Service Provider* consulted under paragraph (c) 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.
- (e) The *Distribution 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 these costs.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (f) The *Distribution Network Service Provider* preparing the offer to *connect* must specify in reasonable detail any *system strength connection works* to be undertaken by the *Distribution Network Service Provider*.

#### **5.3A.11 Technical Dispute**

- (a) Rule 8.2 applies to any dispute between a *Distribution Network Service Provider* and a *Connection Applicant* as to the technical requirements to establish or modify a *connection* sought by a *Connection Applicant* in a *connection* enquiry made under clause 5.3A.5 or an *application to connect* under clause 5.3A.9.

#### **5.3A.12 Network support payments and functions**

- (a) When negotiating the amount of a *network support payment* with a *Distribution Connected Resource Provider*, the *Transmission Network Service Provider* must take into account the:
  - (1) nature of the *network support services* being provided by the *Distribution Connected Resource Provider*; and
  - (2) extent to which the *Distribution Connected Resource Provider* is being, or will be, compensated for providing those *network support services* by receiving *avoided Customer TUOS charges*.
- (b) 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* or *bidirectional unit* with AEMO and specify that the *generating unit* or *bidirectional 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.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

### 5.3AA Access arrangements relating to Distribution Networks

- (a) In ~~this rule 5.3AA~~:
  - (1) the *Distribution Network Service Provider* is the *Distribution Network Service Provider* required under clauses 5.3.3 or 5.3A.5 to process and respond to a *connection enquiry* or required under clauses 5.3.5 or 5.3A.10 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*;
  - (2) the references to a *Connection Applicant* are to:
    - (i) a *Distribution Connected Resource Provider*;
    - (ii) a ~~*Schedule 5.3a Participant Market Network Service Provider*~~; or
    - (iii) a *non-registered DER provider* who makes an election for rule 5.3A to apply instead of Chapter 5A,

~~who~~ makes a *connection enquiry* under clauses 5.3.2 or 5.3A.5 or an application to *connect* under clauses 5.3.4 or 5.3A.10 in relation to any *generating system* or *integrated resource system*, or any *network elements* used in the provision of a *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 ~~its *connected plant*; and~~
    - ~~(i) its *distribution connected units* (in case of a *Distribution Connected Resource Provider*); or~~

**Commented [A36]:** Drafting note - consequential changes may be needed to align the process for seeking a level of access to a distribution network with rules 5.3 and 5.3A. We assume this should also cover, in addition to the categories here – other distribution/embedded networks, inverter-based load, and generation/integrated resources where a registration exemption is applied for.

**Commented [A37]:** Drafting note: this paragraph is appropriate in this context

- ~~(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 ~~the *active power capability, maximum demand or power transfer capability, as applicable.*~~ :
- ~~(1) in the case of a *Distribution Connected Resource Provider*, the greater of the maximum output or maximum demand of the relevant *distribution connected units* or group of *distribution connected 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 *distribution 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 *distribution network user access* arrangements in respect of all affected *distribution networks*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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 *distribution connection assets* to be provided by the *Distribution Network Service Provider*;
  - (2) in the case of a Schedule 5.3a Participant, ~~*Market Network Service Provider*~~, the service level standards to which the Schedule 5.3a Participant ~~*Market Network Service Provider*~~ requires the *Distribution Network Service Provider* to adhere in providing its services;
  - (3) the charge to be paid:

**Commented [A38]:** Drafting note - consider application of these provisions to connection of other networks (other distribution/embedded networks)

- (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 *Schedule 5.3a Participant*, ~~*Market Network Service Provider*~~, to the *Schedule 5.3a Participant* ~~*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 augmentation and extension 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 a *Distribution Connected Resource Provider*:
    - (A) the compensation to be provided by the *Distribution Network Service Provider* to the *Distribution Connected Resource Provider* in the event that the *distribution connected units* or group of *distribution connected units* of the *Distribution Connected Resource Provider* are *constrained off* or *constrained on* during a *trading interval*; and
    - (B) the compensation to be provided by the *Distribution Connected Resource Provider* to the *Distribution Network Service Provider* in the event that dispatch of the *Distribution Connected Resource Provider's distribution connected units* or group of *distribution connected units* causes another *Generator's* or *Integrated Resource Provider's production units* or group of *production 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* or *Integrated Resource Provider's production units* or group of *production units* to be *constrained off* or *constrained on*

**Commented [A39]:** Drafting note - the amounts in paragraph (4) are linked to market dispatch, so it appears appropriate for them to remain limited to Market Participants

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

- (g) The maximum *negotiated augmentation and extension 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*.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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 a *Distribution Connected Resource Provider*, if that *Distribution Connected Resource Provider* 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 *TUOS 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).

[...]

## 5.7 Inspection and Testing

[...]

### 5.7.2 Right of testing

- (a) A *Registered Participant* or *Schedule 5 Participant*, who has reasonable grounds to believe that equipment owned or operated by a *Registered Participant* or *Schedule 5 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 or assessment of the relevant equipment by giving notice in writing to the other *Registered Participant* or *Schedule 5 Participant*.
- (b) If a notice is given under clause 5.7.2(a) any test that requires, or may cause, an outage or change to normal operation of any power system equipment the relevant test is to be conducted at a time agreed by AEMO.
- (c) The *Registered Participant* or *Schedule 5 Participant* who receives a notice under clause 5.7.2(a) must co-operate in relation to conducting tests or assessments requested under clause 5.7.2(a).
- (d) The cost of tests or assessments requested under clause 5.7.2(a) must be borne by the *Registered Participant* or *Schedule 5 Participant* requesting the ~~m~~-test, unless the equipment is determined by the tests not to comply with the *Rules* relevant *connection agreement* and the *Rules*, in which case all reasonable costs of such tests or assessments must be borne by the owner of that equipment.
- (e) Tests or assessments conducted in respect of a *connection point* under clause 5.7.2 must be conducted using ~~test~~-procedures agreed between the relevant ~~participants-Registered Participants~~, which agreement is not to be unreasonably withheld or delayed.
- (f) Tests or assessments 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* or *Schedule 5 Participant* who requests a test under this clause 5.7.2 may appoint a *representative* to witness a test and the ~~other relevant-Registered Participant~~ or *Schedule 5 Participant* must permit ~~that appointed a~~ representative appointed under this clause 5.7.2(h) to be present while the test is being conducted.

#### Note

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (i) A *Registered Participant* or *Schedule 5 Participant* who conducts a test or assessment under this clause 5.7.2 must submit a report to the *Registered Participant* or *Schedule 5 Participant* who requested the relevant test, AEMO

**Commented [A40]:** Drafting note - addition of Schedule 5 Participants who are not registered participants proposed for standard consultation. This will ensure corresponding rights and obligations for those connections with regard to testing interoperability with the network

**Commented [A41]:** Drafting note - this clause currently only contemplates testing of equipment, with the context suggesting physical tests. Addition of assessment is to make clear that simulation studies can be requested in appropriate cases, e.g. to determine the causes of switching surges

**Commented [A42]:** Drafting note - This change is made to improve efficiency to ensure that AEMO involvement is not required for testing or assessments that can be carried out without power system impacts.

**Commented [A43]:** Drafting note - unnecessary words

(where paragraph (b) applied) 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.

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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 and Integrated Resource Providers~~

- (a) ~~Each Registered Participant~~ ~~Each Generator~~ must, in accordance with ~~the any applicable~~ time frames specified in rule 4.15, provide evidence to any relevant *Network Service Provider* with which that ~~Generator-Registered Participant~~ has a *connection agreement*, and to AEMO, that its *plant* complies with:

- ~~(1) the applicable technical requirements of clause S5.2.5; and~~
- ~~(2) the relevant connection agreement including the performance standards.~~

**Note**

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (a1) ~~[Deleted] Each Integrated Resource Provider must, in accordance with the time frames specified in rule 4.15, provide evidence to any relevant Network Service Provider with which that Integrated Resource Provider has a connection agreement and to AEMO, that its generating system or integrated resource system (as applicable) 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 paragraph (a) ~~or (a1)~~ demonstrates that a *relevant plant generating system or integrated resource system* is not complying with one or more technical requirements of clause S5.2.5 or does not comply with the relevant *connection agreement* or one or more of the *performance standards* then the ~~Registered Participant Generator or Integrated Resource Provider~~ must:

**Commented [A44]:** Drafting note - amended because 4.15 only applies to performance standards. This clause extends to other requirements of the connection agreement



- (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).

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (d) If *AEMO* reasonably believes that a *schedule 5.2 plant, schedule 5.3 plant or schedule 5.3a plant* does not meet the requirements of one or more *performance standards* in respect of an *AEMO advisory matter*, ~~generating system or integrated resource 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 request the relevant *Schedule 5 Participant* instruct the *Generator or Integrated Resource Provider* to conduct tests within 25 business days to demonstrate compliance of that the relevant *plant, and the Schedule 5 Participant* must comply with that request within 25 business days. ~~generating system or integrated resource system complies with those performance standards or technical requirements.~~

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (e) If the tests undertaken in accordance with paragraph (d) provide evidence that the *plant generating system or integrated resource system* continues to meet the relevant requirements, ~~comply with those requirements~~ *AEMO* must reimburse the *Schedule 5 Participant Generator or Integrated Resource Provider* for the reasonable expenses incurred as a direct result of conducting the tests.
- (f) If *AEMO*:
  - (1) is satisfied that:
    - (i) a *Schedule 5 Participant's plant* does not meet the requirements of one or more generating system or integrated resource system is not complying with the relevant performance standards for that system in respect of an *AEMO advisory matter* 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

**Commented [A45]:** Drafting note - restructured to identify the obligation, and move away from 'instruction' terminology more associated with dispatch or 4.8.9

- (ii) ~~the performance of a Schedule 5 Participant's plant a generating system's or integrated resource 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 plant ~~generating system or integrated resource system~~, or inadequacy of the applicable analytical model ~~of the generating system or integrated resource system~~ is or will impede AEMO's ability to carry out its role in relation to power system security,

~~AEMO may require the Schedule 5 Participant to, and the Schedule 5 Participant must, operate the plant at a particular level, pattern or profile of active power or in a particular mode, until the Schedule 5 Participant submits evidence reasonably satisfactory to AEMO that the plant is complying with the relevant performance standard or performing substantially in accordance with the applicable analytical model.~~

‡

~~(3) (in the case of a generating system) direct the relevant Generator to operate the generating system at a particular generated output or in a particular mode; or~~

~~(4) (in the case of an integrated resource system) direct the relevant Integrated Resource Provider to operate the integrated resource system at a particular level of active power, or a particular pattern or profile of active power, or in a particular mode;~~

~~until the relevant Generator or Integrated Resource Provider submits evidence reasonably satisfactory to AEMO that the generating system or integrated resource system is complying with the relevant performance standard and performing substantially in accordance with the applicable analytical model.~~

- (g) ~~A Registered Participant Each Generator and Integrated Resource Provider~~ must maintain records for 7 years for each of its ~~generating systems, integrated resource systems and power stations~~ setting out details of the results of all technical performance and monitoring conducted on its plant under this clause 5.7.3 and make these records available to AEMO on request.

[...]

## 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.

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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.

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

### 5.8.1A Application of rule 5.8

References in clauses 5.8.2, 5.8.4 and 5.8.5 to a *Registered Participant*, in respect of its new or replacement equipment, are taken to include a *Schedule 5 Participant* (not being a *Registered Participant*):

- (a) if the relevant *schedule 5.2 plant*, *schedule 5.3 plant* or *schedule 5.3 plant* has a maximum capacity equal to or more than 30 MW or 30 MVA;
- (b) unless *AEMO*, having regard to the expected effect of the *plant* on *power system security* and after consulting with the *Network Service Provider*, agrees that those clauses should not apply.

**Commented [A46]:** Drafting note - proposed for standard consultation to provide AEMO with a reasonable opportunity to confirm the intended operation of future very large plant, including IBL and synchronous condensers, that may not be operated by registered participants. It is noted commissioning requirements not covered by these clauses can be included in connection agreements.

### 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*.

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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.

**Note**

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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*.

#### Note

This paragraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (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).

[...]

## Part D Network Planning and Expansion

[...]

### 5.20 System security reports

#### 5.20.1 Definitions

In this rule 5.20:

**NSCAS description** means a detailed description of each type of *network support and control ancillary service*.

**NSCAS quantity procedure** means a procedure that determines the location and quantity of each type of *network support and control ancillary service* required.

**NSCAS trigger date** means for any *NSCAS gap* identified in clause 5.20.3(b), the date that the *NSCAS gap* first arises.

**NSCAS tender date** means for any *NSCAS gap* identified in clause 5.20.3(c), the date or indicative date that *AEMO* would need to act so as to call for offers to acquire *NSCAS* to meet that *NSCAS gap* by the relevant *NSCAS* trigger date in accordance with clause 3.11.3(c)(4).

#### **5.20.2 Publication of NSCAS methodology**

- (a) *AEMO* must develop and publish the *NSCAS* description and *NSCAS* quantity procedure in accordance with the *Rules consultation procedures*.
- (b) *AEMO* may amend the *NSCAS* description and the *NSCAS* quantity procedure.
- (c) *AEMO* must comply with the *Rules consultation procedures* when making or amending the *NSCAS* description or the *NSCAS* quantity procedure.
- (d) *AEMO* may make minor and administrative amendments to the *NSCAS* description or the *NSCAS* quantity procedure without complying with the *Rules consultation procedures*.

#### **5.20.3 Publication of NSCAS Report**

*AEMO* must publish annually the *NSCAS Report* on its website for the following year which must include:

- (a) an assessment that identifies any *NSCAS gap*;
- (b) for any *NSCAS gap* identified in subparagraph (a) required to maintain *power system security* and reliability of *supply* of the *transmission network* in accordance with the *power system security standards* and the *reliability standard*, the relevant *NSCAS* trigger date;
- (c) for any *NSCAS gap* identified in subparagraph (a) required to maintain *power system security* and reliability of *supply* of the *transmission network* in accordance with the *power system security standards* and the *reliability standard*, the relevant *NSCAS* tender date;
- (d) a report on *NSCAS* acquired by *AEMO* under *ancillary services agreements* in the previous calendar year; and
- (e) information on any other matter that *AEMO* considers relevant.

#### **5.20.4 Inertia requirements methodology**

- (a) *AEMO* must develop and publish the *inertia requirements methodology* in accordance with the *Rules consultation procedures*.
- (b) *AEMO* may amend the *inertia requirements methodology*.
- (c) *AEMO* must comply with the *Rules consultation procedures* when making or amending the *inertia requirements methodology*.

- (d) *AEMO* may make minor and administrative amendments to the *inertia requirements methodology* without complying with the *Rules consultation procedures*.
- (e) The *inertia requirements methodology* determined by *AEMO* must provide for *AEMO* to take the following matters into account in determining the *secure operating level of inertia*:
- (1) the capabilities and expected response times provided by ~~generating units providing market ancillary services~~ *ancillary service units* (other than the *regulating raise service* or *regulating lower service*) in the *inertia sub-network*;
  - (2) the maximum *load shedding* or *generation shedding* expected to occur on the occurrence of any *credible contingency event* affecting the *inertia sub-network* when the *inertia sub-network* is *islanded*;
  - (3) additional *inertia* needed to account for the possibility of a reduction in *inertia* if the *contingency event* that occurs is the loss or unavailability of a ~~synchronous production generating unit~~, *synchronous condenser* or any other *facility* or *service* that is material in determining *inertia requirements*;
  - (4) any *constraints* that could reasonably be applied to the *inertia sub-network* when *islanded* to achieve a *secure operating state* and any *unserved energy* that might result from the *constraints*; and
  - (5) any other matters as *AEMO* considers appropriate.

**Commented [A47]:** Drafting note - to correct an omission from IESS rule

**Commented [A48]:** Drafting note - Deletion proposed to prevent artificial restrictions on the type of units that may contribute to inertia in future, including GFM technology.

#### 5.20.5 Publication of Inertia Report

- (a) *AEMO* must publish annually the *Inertia Report* on its website for the following year which must include:
- (1) the boundaries of the *inertia sub-networks* and related *inertia requirements* determined by *AEMO* under rule 5.20B since the last *Inertia Report* and details of *AEMO's* assessment of any *inertia shortfall* and *AEMO's* forecast of any *inertia shortfall* arising at any time within a planning horizon of at least 5 years;
  - (2) a report on the *inertia requirements* determined for each *inertia sub-network* together with the results of *AEMO's* assessment under clause 5.20B.3; and
  - (3) information on any other matter that *AEMO* considers relevant.

#### 5.20.6 Publication of system strength requirements methodologies

- (a) *AEMO* must develop and publish the *system strength requirements methodology* in accordance with the *Rules consultation procedures*.
- (b) *AEMO* may amend the *system strength requirements methodology*.
- (c) *AEMO* must comply with the *Rules consultation procedures* when making or amending the *system strength requirements methodology*.

- (d) AEMO may make minor and administrative amendments to the *system strength requirements methodology* without complying with the *Rules consultation procedures*.
- (e) The *system strength requirements methodology* determined by AEMO must provide for AEMO to take the following matters into account in determining the *system strength requirements*:
- (1) the combination of *three phase fault levels* at each *system strength node* in the *region* that could reasonably be considered to be sufficient for the *power system* to be in a *secure operating state*;
  - (2) the maximum *load shedding* or *generation shedding* expected to occur on the occurrence of any *credible contingency event* or *protected event* affecting the *region*;
  - (3) the stability of the *region* following any *credible contingency event* or *protected event*;
  - (4) the risk of *cascading outages* as a result of any *load shedding* or *generating system*, *integrated resource system* *schedule 5.2 plant* or *schedule 5.3a plant market network service facility* tripping as a result of a *credible contingency event* or *protected event* in the *region*;
  - (5) additional contribution to the *three phase fault level* needed to account for the possibility of a reduction in the *three phase fault level* at a *system strength node* if the *contingency event* that occurs is the loss or unavailability of a *synchronous production unit* or any other *facility* or service that is material in determining the *three phase fault level* at the *system strength node*;
  - (6) the stability of any equipment that is materially contributing to the *three phase fault level* or *inertia* within the *region*; and
  - (7) any other matters AEMO considers appropriate.
- (f) The *system strength requirements methodology* determined by AEMO must:
- (1) provide an overview of *system strength nodes* and the process to declare them;
  - (2) describe:
    - (i) how AEMO forecasts new *connections* and the information it takes into account;
    - (ii) how AEMO will determine the assumptions it will use about the size, type and operational profile of *facilities* or classes of *facilities* to be *connected* and their contribution to the matters taken into account in determining the *system strength requirements*; and
    - (iii) the modelling and analysis methodologies AEMO will use to determine *system strength nodes* and minimum *three phase fault levels* at the *system strength nodes* and the matters it will take into account;
  - (3) provide for AEMO to take the following matters into account in determining the *system strength requirements*:



- (i) the *Integrated System Plan* and the *Electricity Statement of Opportunities*;
  - (ii) the matters in paragraphs (e)(1) to (7) for each year of the forecast period; and
  - (iii) any other matters *AEMO* considers appropriate; and
- (4) provide a description of what is meant by stable ~~voltage~~-voltage waveforms for the purposes of clause S5.1.14(b)(2) (in addition to that provided in clause S5.1.14(c)) including the matters that may be taken into account by *System Strength Service Providers* to assess, for the level and type of *inverter based resources* projected by *AEMO* at *system strength nodes*, what may be required to achieve stable operation.

#### **5.20.7 Publication of System Strength Report**

*AEMO* must publish annually by 1 December the *System Strength Report* on its website for the following year which must include:

- (a) a description of the *system strength requirements* determined by *AEMO* under rule 5.20C since the last *System Strength Report*;
- (b) the *system strength requirements* determined for each *system strength node*;
- (c) the system strength standard specification (as defined in clause S5.1.14(a)) applicable at each *system strength node* during the 12 months following publication of the *System Strength Report*;
- (d) the assumptions used by *AEMO* to determine the *system strength requirements* including assumptions about the size, type and operational profile of *facilities* or classes of *facilities* to be *connected* and their contribution to the matters taken into account in determining the *system strength requirements*;
- (e) information about new *system strength nodes* declared since the last *System Strength Report* and an indication of possible future *system strength nodes* and when *AEMO* considers the nodes may be declared; and
- (f) information on any other matter that *AEMO* considers relevant.

[...]

#### **5.20B Inertia sub-networks and requirements**

[...]

##### **5.20B.6 Inertia network services information and approvals**

- (a) An *Inertia Service Provider* required to make *inertia network services* available under clause 5.20B.4(b) must prepare and give to *AEMO* and keep up to date, a schedule setting out:
  - (1) the *inertia network services* made available by the *Inertia Service Provider* for the *inertia sub-network*; and
  - (2) the *Inertia Service Provider's* proposed order of priority for the *inertia network services* to be *enabled*.

- (b) Where the *Inertia Service Provider* procures *inertia network services* from a *Generator* or *Integrated Resource Provider* provided by means of a ~~synchronous~~ *production generating unit* under an *inertia services agreement*, the *Inertia Service Provider* must register the *production generating unit* with *AEMO* as an *inertia unit* and specify that the *production generating unit* may be periodically used to provide *inertia network services* and will not be eligible to set *spot prices* when *constrained on* to provide *inertia* in accordance with clause 3.9.7(c).

Commented [A49]: Drafting note - this change enables (b1) to be deleted

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (b1) ~~[Deleted] Where the *Inertia Service Provider* procures *inertia network services* from an *Integrated Resource Provider* provided by means of a *bidirectional unit* under an *inertia services agreement*, the *Inertia Service Provider* must register the *bidirectional unit* with *AEMO* as an *inertia unit* and specify that the *bidirectional unit* may be periodically used to provide *inertia network services* and will not be eligible to set *spot prices* when *constrained on* to provide *inertia* in accordance with clause 3.9.7(c).~~
- (c) An *Inertia Service Provider* required to make *inertia network services* available under clause 5.20B.4(b) must give to *AEMO* and keep up to date the following details for each *inertia network service*:
- (1) a description of the *inertia network service*, including:
    - (i) the nature of the *inertia network service*;
    - (ii) the *inertia unit* or other *facilities* used to provide the *inertia network service*;
    - (iii) the purpose for which the *inertia network service* is being provided;
    - (iv) the location in the *transmission network* or *distribution network* of the *facilities* used to provide the *inertia network service*;
    - (v) the quantity of *inertia* to be provided when the *inertia network service* is enabled and;
    - (vi) any other information requested by *AEMO* in connection with the *inertia network service*;
  - (2) information about the availability of the *inertia network service*, including:
    - (i) the times when, and the period over which, the *inertia network service* will be available to provide *inertia*; and
    - (ii) any possible restrictions on the availability of the *inertia network service*
- (d) An *Inertia Service Provider* required to make *inertia network services* available under clause 5.20B.4(b) must prepare and submit to *AEMO* for approval under paragraph (e) the following details for each *inertia network service*:

- (1) the technical specification and performance standards for the *inertia network service*; and
- (2) the arrangements necessary for *AEMO* to give instructions to *enable* or cease the provision of the *inertia network service* including:
  - (i) the period of any notice that has to be given to the provider of the *inertia network service* for it to be *enabled*;
  - (ii) the response time to any instruction for the *inertia network service* to be *enabled* or to cease being provided; and
  - (iii) communication protocols between it, *AEMO* and the *Registered Participants* that provide *inertia network services*.
- (e) The technical specification, performance standards and arrangements necessary for *AEMO* to give the instructions referred to in paragraph (d) and any change to them must be consistent with the *Rules* and approved by *AEMO*.
- (f) An *Inertia Service Provider* must ensure that *AEMO's* approval is obtained under paragraph (e) before the *inertia network service* is first made available and in the case of a change, before the change comes into effect.

**Note**

This clause is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (g) *AEMO* must use reasonable endeavours to respond to the *Inertia Service Provider* within 20 *business days* following the receipt of a request for approval under paragraph (e) stating whether it gives its approval.
- (h) If *AEMO* does not approve the matters in a request for approval under paragraph (e):
  - (1) *AEMO* must tell the *Inertia Service Provider* its reasons for withholding approval and may advise the *Inertia Service Provider* of the changes *AEMO* requires to be made; and
  - (2) the *Inertia Service Provider* must amend its request to address the matters identified by *AEMO* and submit to *AEMO* a new request for approval.

## **5.20C System strength requirements**

### **5.20C.1 Declaring system strength requirements**

- (a) *AEMO* may from time to time declare *system strength nodes*, being locations on the *transmission network* of a *System Strength System Provider* at which:
  - (1) in relation to *AEMO*, clauses 4.2.6(g), 4.4.5(a) and 4.6.1(b) apply; and
  - (2) in relation to a *System Strength Service Provider* for a *system strength node*, clause S5.1.14 applies.
- (b) *AEMO* must, by 1 December each year, determine the *system strength requirements* for each *system strength node*. In determining *system strength*

requirements, AEMO must apply the system strength requirements methodology.

- (c) The system strength requirements to be determined for a system strength node are:
  - (1) the minimum three phase fault level for the system strength node applicable for the purposes of clauses 4.2.6(g), 4.4.5(a) and 4.6.1(b) for the following year (commencing 2 December); and
  - (2) AEMO's forecast of the following matters for each of the following ten years (commencing 2 December):
    - (i) the minimum three phase fault level applicable at the system strength node for the purposes of clause S5.1.14(b)(1); and
    - (ii) the level and type of inverter based resources and *schedule 5.3a plant market network service facilities* projected by AEMO for the system strength node for the purposes of clause S5.1.14(b)(2).
- (d) AEMO must publish its declaration of system strength nodes under paragraph (a) and the system strength requirements determined for each system strength node in the System Strength Report.
- (e) If AEMO becomes aware of a material change to the power system likely to affect the system strength requirements for a system strength node, where the timing, occurrence or impact of the change was unforeseen, AEMO must as soon as reasonably practicable, revise and publish its determination of the minimum three phase fault level under paragraph (c)(1) and the forecast under paragraph (c)(2) for the system strength node.

[...]

#### 5.20C.4 System strength services information and approvals

- (a) A System Strength Service Provider who makes system strength services available for the purposes of clause S5.1.14 must prepare and give to AEMO and keep up to date, a schedule setting out:
  - (1) the system strength services available to contribute to the three phase fault level at each system strength node; and
  - (2) the System Strength Service Provider's proposed order of priority for the system strength services to be enabled.
- (b) Where the System Strength Service Provider procures system strength services from a Generator or Integrated Resource Provider provided by means of a ~~production generating~~ unit under a system strength services agreement, the System Strength Service Provider must register the ~~production generating~~ unit with AEMO as a system strength production unit and specify that the generating unit may be periodically used to provide system strength services and will not be eligible to set spot prices when constrained on to provide system strength services in accordance with clause 3.9.7(c).

##### Note

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

Commented [A50]: Drafting note - this change enables (b1) to be deleted

- (b1) ~~Where the System Strength Service Provider procures system strength services from an Integrated Resource Provider provided by means of a bidirectional unit under a system strength services agreement, the System Strength Service Provider must register the bidirectional unit with AEMO as a system strength production unit and specify that the generating unit may be periodically used to provide system strength services and will not be eligible to set spot prices when constrained on to provide system strength services in accordance with clause 3.9.7(c).~~
- (c) A System Strength Service Provider must give to AEMO and keep up to date the following details for each system strength service it makes available to AEMO under the Rules:
- (1) a description of the system strength service, including:
    - (i) the nature of the system strength service;
    - (ii) the system strength production unit or other facilities used to provide the system strength service;
    - (iii) the purpose for which the system strength service is being provided;
    - (iv) the location in the transmission network or distribution network of the facilities used to provide the system strength service;
    - (v) the contribution to the three phase fault level at each relevant system strength node and the facility's connection point when the system strength service is enabled; and
    - (vi) any other information (including models) requested by AEMO to assess the contribution of the system strength service referred to in subparagraph (v).
  - (2) information about the availability of the system strength service, including:
    - (i) the times when, and the period over which, the system strength service will be available to contribute to the three phase fault level at each relevant system strength node; and
    - (ii) any possible restrictions on the availability of the system strength service.
- (d) A System Strength Service Provider must prepare and submit to AEMO the following details for each system strength service it makes available to AEMO under the Rules:
- (1) the technical specification and performance standards for the system strength service; and
  - (2) the arrangements necessary for AEMO to give instructions to enable or cease the provision of the system strength service including:
    - (i) the period of any notice that has to be given to the provider of the system strength service for it to be enabled;
    - (ii) the response time to any instruction for the system strength service to be enabled or to cease being provided; and

- (iii) communication protocols between it, *AEMO* and the *Registered Participants* or other persons that provide *system strength services*.
- (e) The arrangements necessary for *AEMO* to give the instructions referred to in paragraph (d) and any change to them must be consistent with the *Rules* and approved by *AEMO*.
- (f) A *System Strength Service Provider* must ensure that *AEMO*'s approval is obtained under paragraph (e) before the *system strength service* is first made available and in the case of a change, before the change comes into effect.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (g) *AEMO* must use reasonable endeavours to respond to the *System Strength Service Provider* within 20 *business days* following the receipt of a request for approval under paragraph (e) stating whether it gives its approval.
- (h) If *AEMO* does not approve the matters in a request for approval under paragraph (e):
  - (1) *AEMO* must tell the *System Strength Service Provider* its reasons for withholding approval and may advise the *System Strength Service Provider* of the changes *AEMO* requires to be made; and
  - (2) the *System Strength Service Provider* must amend its request to address the matters identified by *AEMO* and submit to *AEMO* a new request for approval.

[...]

## 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.

This schedule does not apply to a *Distribution Network Service Provider* in relation to a *regulated SAPS*. The performance and quality of *supply* standards for a *regulated SAPS* are defined by the *Distribution Network Service Provider* in accordance with clause 5.13B.1 and schedule 5.13.

#### **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* or *protected 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-voltage~~ control must be maintained following the most severe *credible contingency event* or any *protected 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.

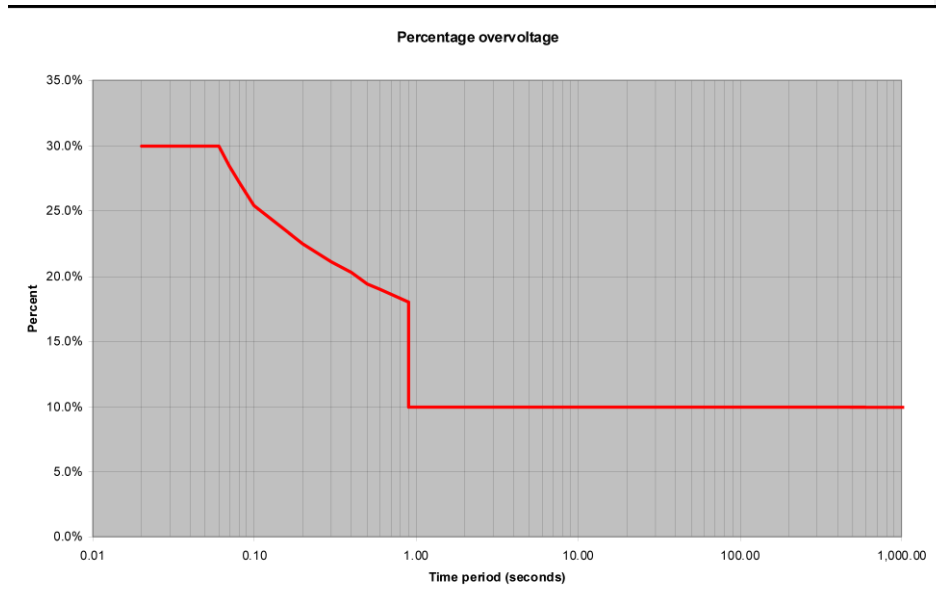
#### **S5.1a.4 Power frequency voltage**

Except as a consequence of a *contingency event*, the ~~voltage-voltage~~ of *supply* at a *connection point* should not vary by more than 10 percent above or below its ~~normal~~ *nominal* 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-voltage~~ of *supply* at a *connection point* should not rise above its ~~normal-nominal~~ voltage by more than a given percentage of ~~normal-nominal~~ 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-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-voltage~~ fluctuation level of *supply* should be less than the "compatibility levels" set out in ~~Table 1 of the International Electrotechnical Commission publication IEC/TR 61000.3.7 Australian Standard AS/NZS 61000.3.7:2004~~. To facilitate the application of this standard *Network Service Providers* must establish "planning levels" for their *networks* as provided for in ~~IEC/TR 61000.3.7 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-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-voltage~~ fluctuations.

#### S5.1a.6 Voltage waveform distortion

Harmonic ~~voltage-voltage~~ distortion level of *supply* should be less than the "compatibility levels" defined in ~~Table 1 of the International Electrotechnical Commission publication IEC/TR 61000.3.6 Australian Standard AS/NZS 61000.3.7:2004~~. To facilitate the application of this standard *Network Service Providers* must establish "planning levels" for their *networks* as provided for in ~~the Australian Standard IEC/TR 61000.3.6~~.



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-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-voltage~~ distortion.

**S5.1a.7 Voltage unbalance**

Except as a consequence of a *contingency event*, the average ~~voltage-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* or *protected event*, the average ~~voltage-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-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-voltage~~, when determined over a 10 minute averaging period.

The average ~~voltage-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-nominal supply~~-voltage, when determined over a 1 minute averaging period.

For the purpose of this clause, ~~voltage-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 or protected 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               | 2.0              |

| Nominal supply voltage (kV)        | Maximum negative sequence voltage (% of nominal voltage) |                      |   |                   |                  |
|------------------------------------|--|----------------------|---|-------------------|------------------|
|                                    | Column 1   | Column 2             | Column 3                                      | Column 4          | Column 5         |
|                                    |  | no contingency event | credible contingency event or protected event | general           | once per hour    |
|                                    |  | 30 minute average    | 30 minute average                             | 10 minute average | 1 minute average |
| 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 S5.1a.8(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*.

**S5.1a.9 Minimum three phase fault levels and stability for system strength nodes**

- (a) The *power system* should have minimum *three phase fault levels* sufficient to enable:
  - (1) the *protection systems* of *transmission networks*, *distribution networks*, *Transmission Network Users* and *Distribution Network Users* to operate correctly;
  - (2) ~~voltage-voltage~~ *control systems* (such as reactive bank switching and dynamic ~~voltage-voltage~~ control) to be stable; and
  - (3) the *power system* to remain stable following any *credible contingency event* or *protected event*.
- (b) There should be stable ~~voltage-voltage~~ waveforms at *connection points* in the *power system* such that:
  - (1) in steady state conditions, *plant* does not create, amplify or reflect instabilities; and
  - (2) avoiding ~~voltage-voltage~~ waveform instability following any *credible contingency event* or *protected event* is not dependent on *plant* disconnecting from the *power system* or varying *active power* or *reactive power* transfer at *connection points* except in accordance with applicable *performance standards*.

**Table S5.1a.2**

| Nominal voltage at fault location(kV) | Time(millisecond)   |          |          |          |
|---------------------------------------|---|----------|----------|----------|
|                                       | Column 1  | 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 |          |          |          |

## Schedule 5.1 Network Performance Requirements to be Provided or Co-ordinated by Network Service Providers

### S5.1.1 Introduction

- (a) 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.
- (b) Together, these are the *power system* performance and quality of *supply* standards that *Network Service Providers* must comply with in accordance with clause 5.2.3(b).
- (c) The criteria and the obligations of *Registered Participants* to implement them, fall into two categories, namely:
- (a) ~~(1)~~ 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) ~~(2)~~ those required to achieve a specific level of *network service* at an individual *connection point*.
- (d) 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 system* 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.
- (e) 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.
- (f) ~~In negotiating a connection agreement with a *Registered Participant*, a *Network Service Provider* must describe the *network service* in terms which are fair and reasonable. This schedule includes provisions for *Network Service Providers* and a *Connection Applicant* to which any of schedules 5.2, 5.3 or 5.3a apply. *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*~~

**Commented [A51]:** Drafting note - amendments to this paragraph proposed to remove duplication of provisions already covered in 5.3.4A

~~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:~~

- ~~(1) set relevant access standards for the purposes of clause S5.1.9; and~~
- ~~(2) first be satisfied that the application of any the negotiated access standards will be consistent with the requirements of this schedule 5.1, in addition to the requirements of clause 5.3.4A(b). will not adversely affect other Registered Participants.~~

~~(g) This schedule does not apply to a Distribution Network Service Provider in relation to a regulated SAPS. The performance and quality of supply standards for a regulated SAPS are defined by the Distribution Network Service Provider in accordance with clause 5.13B.1 and schedule 5.13.~~

~~(h) A power system performance or quality of supply standard in this schedule 5.1 does not apply to a Network Service Provider in respect of a network element for which performance standards have been recorded in accordance with schedule 5.2 or schedule 5.3a.~~

## 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 production units to ~~loads 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 *production 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-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~~-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~~-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~~-*Network Users* by *Network Service Providers* within a *region*. The amount of *network* redundancy provided must be determined by the process set out in rules 5.12 and 5.13 of the *Rules* and is expected to reflect the grouping of *production units*, their expected capacity factors and availability and the size and importance of ~~load~~ *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 Part B of Chapter 5.

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* ~~described 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 manual *load shedding* in accordance with clause S5.1.10, or is required by *AEMO* to be switched for operational purposes or is required to be switched or *disconnected* for operation of an *emergency frequency control scheme*.

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-voltage~~ such that the minimum steady

state ~~voltage-voltage~~ magnitude, the maximum steady state ~~voltage-voltage~~ magnitude and variations in ~~voltage-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-voltage~~ of *supply* at the *connection point* such that the ~~voltage-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-voltage~~ of *supply* at the *connection point* such that the ~~voltage-voltage~~ may vary:

- (1) as a consequence of a *credible contingency event* or *protected event* in accordance with clause S5.1a.4; and
- (2) otherwise, ~~within a range of 5% of nominal voltage above and below between 95 percent and 105 percent of the target voltage-voltage.~~

- (c) For the purposes of clause S5.1.4(b) the target ~~voltage-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-voltage~~ in consultation with *AEMO* taking into account the capability of existing *facilities* that are subject to that *supply voltage-voltage*; and
- (2) otherwise, *Network Users* that share the same *supply voltage-voltage* must jointly determine the target ~~voltage-voltage~~ which may be specified to vary with aggregate *loading level*;

provided that at all times the *supply voltage-voltage* remains between 90 percent and 110 percent of the ~~normal-nominal~~ *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-voltage~~ of *supply* is measured as the ~~average of the root mean square of the voltages between each pair of phases, RMS phase voltage.~~

Where the independent control of ~~voltage-voltage~~ at the *connection point* is possible without adverse impact on ~~voltage-voltage~~ control at another *connection point*, the *Network Service Provider* must make reasonable endeavours to meet the request. The target ~~voltage-voltage~~ and any agreement to a target range of ~~voltage-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* or *protected event* (and how these target ranges may be required to vary with *loading level*).

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-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-voltages~~ which may arise dependent on the nature and location of the fault.

**Commented [A52]:** Drafting note - Proposed to improve accuracy of drafting

**Commented [A53]:** Drafting note - Proposed to delete the defined term 'RMS phase voltage' as it is used only once in the NER, and set out the full meaning here.



#### **S5.1.4A Slow front over-voltages**

A Network Service Provider must design its network and undertake insulation coordination so that switching of network elements does not cause connected plant to experience recurring slow front over-voltages (switching surges) of the type contemplated in the International Electrotechnical Commission standard IEC 60071-1, for voltages above those described in clause S5.1a.4 of the system standards.

**Commented [A54]:** Drafting note - new requirement to complement new participant obligation in S5.2.3(b)

#### **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-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 the International Electrotechnical Commission publication IEC/TR 61000.3.7-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-voltage~~ fluctuation levels for all supply points to customers supplied from their network below the "Compatibility Levels" defined in Table 1 of IEC/TR 61000.3.7-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 IEC/TR 61000.3.7-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 IEC/TR 61000.3.7-AS/NZS 61000.3.7:2001.
- (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-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-voltage~~ fluctuations above the levels defined above is limited to ~~voltage-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-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 [the International Electrotechnical Commission publication IEC/TR 61000.3.6-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-voltage~~ distortion for all supply points to customers supplied from their *network* below the "Compatibility Levels" defined in Table 1 of [IEC/TR 61000.3.6-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 [IEC/TR 61000.3.6-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 [IEC/TR 61000.3.6-AS/NZS 61000.3.6:2001](#).
- (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-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-voltage~~ distortion outside the range defined above is limited to harmonic ~~voltage-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-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 S5.3.1a(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-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-voltage~~ unbalance outside the ranges defined above is limited to ~~voltage-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* and *Integrated Resource Provider* will balance:
  - (1) the ~~voltage-voltage~~ generated in each phase of its *generating system* or *integrated resource system*; and
  - (2) when not generating, the current drawn in each phase,in order to achieve average levels of negative sequence ~~voltage-voltage~~ at each of the *generating system* or *integrated resource 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-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* ~~or any protected event~~ described in clause S5.1.2.1 or any protected event:

- (a) the *power system* will remain in synchronism;
- (b) damping of *power system* oscillations will be adequate; and
- (c) ~~voltage-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* or any *protected 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-voltage~~ control criterion is that stable ~~voltage-voltage~~ control must be maintained following the most severe *credible contingency event* or any *protected event*. This requires that an adequate *reactive power* margin must be maintained at every *connection point* in a *network* with respect to the ~~voltage-voltage~~ stability limit as determined from the ~~voltage-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 in consultation with AEMO, install, maintain and upgrade emergency controls within the *Network Service Provider's* or *Registered Participant's* system or in both, as necessary, to minimise disruption to any

*transmission network* 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 clauses S5.1.9(a)(2) or 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 clauses S5.1.9(a)(2)(i) or 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) [Deleted]

#### 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, investments 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, generation 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 under-frequency relays or other *facilities* where required to minimise or reduce the risk that in the event of the sudden, unplanned simultaneous occurrence of multiple *contingency events*, the *power system frequency* moves outside the *extreme frequency excursion tolerance limits*;
- (b) where determined to be necessary, sufficient *load* is under the control of under-voltage 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 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 including abnormal operating conditions in which *emergency frequency control schemes* are intended to operate.

*Transmission Network Service Providers* and *connected Distribution Network Service Providers* must cooperate to agree arrangements to implement *load shedding*. The arrangements may include the opening of circuits in either a *transmission network* 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* including *emergency frequency control schemes*.

#### S5.1.10.1a Emergency frequency control schemes

- (a) A *Network Service Provider* must:
  - (1) **[Deleted]**
  - (2) provide to *AEMO* all information and assistance reasonably requested by *AEMO* for the development and review of *EFCS settings schedules*.
- (b) Where a *protected event EFCS standard* has been determined for an *emergency frequency control scheme* applicable in respect of a *Network Service Provider's transmission system* or *distribution system*, the *Network Service Provider* must:
  - (1) design, procure, commission, maintain, monitor, test, modify and report to *AEMO* in respect of, the *emergency frequency control scheme*;
  - (2) perform its obligations under subparagraph (1) so as to achieve the availability and operation of the scheme in accordance with the *protected event EFCS standard*; and
  - (3) coordinate with *AEMO* in relation to the monitoring and testing of the scheme once it is in operation.



- (c) A *Network Service Provider* must use reasonable endeavours to achieve commissioning of a new or upgraded *emergency frequency control scheme* within the time contemplated by the relevant *general power system risk review* or, where applicable, *AEMO's* request to the *Reliability Panel* for declaration of a *non-credible contingency event* as a *protected event* and the decision of the *Reliability Panel* with respect to that request.
- (d) For an *over-frequency scheme*:
  - (1) A *Network Service Provider* must identify which elements of the scheme (if any) can be implemented by *facilities* provided by a *Generator* or *Integrated Resource Provider* for the person's *production units* or by modification to the *facilities* of the *Generator* or *Integrated Resource Provider* or by changes to the settings of *protection systems* or *control systems* for the person's *production units*.
  - (2) Where those opportunities are identified, the *Network Service Provider* must notify the *Generator* or *Integrated Resource Provider* concerned of the opportunity and must request the *Generator* or *Integrated Resource Provider* to negotiate with the *Network Service Provider* to reach agreement on the modifications to be made and the other arrangements required by the *Network Service Provider* to comply with its obligations with respect to the scheme (including commissioning, testing, monitoring and future modification).
  - (3) If the *Generator* or *Integrated Resource Provider* declines the request, or if the *Generator* or *Integrated Resource Provider* agrees to the request but good faith negotiations do not result in agreement being reached in a reasonable time (having regard to the implementation timetable for the scheme), the *Network Service Provider* may make other arrangements to implement the relevant elements of the scheme.
  - (4) If the *Generator* or *Integrated Resource Provider* accepts the request, the *Generator* or *Integrated Resource Provider* and the *Network Service Provider* must each negotiate in good faith with respect to the matters referred to above.
- (e) Nothing in paragraph (d) is intended to prevent the exercise of rights under a *connection agreement*.
- (f) Nothing in paragraph (d) is intended to constitute or require an *application to connect* for the purposes of rule 5.3 or rule 5.3A. If clause 5.3.9 applies in respect of alterations for an *over-frequency scheme* the subject of negotiations under paragraph (d), the *Network Service Provider* cannot charge a fee under clause 5.3.9(e) for assessment of a submission in respect of those alterations.

#### **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*, cooperate with the *Transmission Network Service Providers* in conducting

- periodic functional testing of the *facilities* and *emergency frequency control schemes*, which must not require *load* to be *disconnected*;
- (c) apply *frequency* settings to relays or other *facilities* as determined by *AEMO* in consultation with the *Network Service Provider*; and
  - (d) apply under-voltage 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 *emergency frequency control schemes*; and
- (b) notify *Distribution Network Service Providers* regarding the settings of under-voltage *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** ~~[Deleted] 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.~~

Commented [A55]: Drafting note - This clause effectively duplicates 5.3.2(f)

**S5.1.14** **Minimum three phase fault levels and stability for system strength nodes**

- (a) In this clause:

**relevant year** means each period of 12 months commencing 2 December.

**system strength standard specification** means, for a *system strength node* at any time in a relevant year, the forecast system strength requirements for the *system strength node* determined for the relevant year three years prior (that is, in the *system strength requirements* due to be determined by 1 December falling three years before the relevant year commenced and disregarding any revision under clause 5.20C.1(e)).

**Examples**

If the relevant year is 2 December 2026 to 1 December 2027, the system strength standard specification on each day during that year will be the forecast made in the determination of the *system strength requirements* due to be made by 1 December 2023.

If a new *system strength node* is declared on 1 December 2028, there will be no system strength standard specification for that *system strength node* for the relevant years commencing 2 December 2028, 2 December 2029 and 2 December 2030. During those relevant years the *Transmission Network Service Provider* will nonetheless have obligations under paragraph (b) to plan, design etc its *network* to meet the standard for the relevant year commencing 2 December 2031.

**forecast system strength requirements** means, for a *system strength node* for a relevant year, *AEMO's* forecast under clause 5.20C.1(c) of:

- (i) the minimum *three phase fault level* applicable at the *system strength node*; and
- (ii) the level and type of *inverter based resources* and ~~*schedule 5.3a plant market network service facilities*~~ projected by *AEMO* for the *system strength node*.

- (b) A *Transmission Network Service Provider* who is a *System Strength Service Provider* must use reasonable endeavours to plan, design, maintain and operate its *transmission network*, or make *system strength services* available to AEMO, to meet the following requirements at *system strength nodes* on its *transmission network* in each relevant year:
- (1) maintain the minimum *three phase fault level* specified by AEMO for the *system strength node* in the system strength standard specification for the relevant year; and
  - (2) achieve stable ~~voltage-voltage~~ waveforms for the level and type of *inverter based resources* and ~~schedule 5.3a plant market network service facilities~~ projected by AEMO in the system strength standard specifications for the *system strength node* for the relevant year:
    - (i) in steady state conditions; and
    - (ii) following any *credible contingency event* described in clause S5.1.2.1 or any *protected event*.
- (c) For paragraph (b)(2), ~~voltage-voltage~~ waveforms must be sufficiently stable such that:
- (1) in steady state conditions, *inverter based resources* and ~~schedule 5.3a plant market network service facilities~~ do not create, amplify or reflect instabilities;
  - (2) avoiding ~~voltage-voltage~~ waveform instability following any *credible contingency event* described in clause S5.1.2.1 or any *protected event* is not dependent on any of the *inverter based resources* or ~~schedule 5.3a plant market network service facilities~~ disconnecting from the power system or significantly varying the *active power* or *reactive power* transfer at the *connection point* except in accordance with applicable *performance standards*; and
  - (3) the description of what is meant by stable ~~voltage-voltage~~ waveforms in the *system strength requirements methodology* is satisfied.

**Schedule 5.2**      **Conditions for Connection of Generator5.s and Integrated Resource Providers Technical connection requirements for generating systems, integrated resource systems and synchronous condensers**

**S5.2.1**      **Application of the schedule Outline of requirements**

- (a) This schedule sets out details of additional requirements and conditions that ~~a person to whom this schedule applies (described in paragraph (b)) must satisfy as a condition of connection to the power system of a production system or synchronous condenser system ("schedule 5.2 plant").~~ *Generators and Integrated Resource Providers* must satisfy as a condition of *connection to the power system of a generating system or integrated resource system to the power system*.

**Note**

For *integrated resource systems*, the definition of *production system* includes only its *production units* and *synchronous condensers*, and relevant auxiliary or *reactive plant*. Any other source of load that is part of an *integrated resource system* may be a *schedule 5.3 plant*, depending on its characteristics.

(b) ~~This schedule does not apply to a person, in respect of a *generating system* or *integrated resource system* that is or will be owned, operated or controlled by that person, if:~~

- ~~(1) that person has received an exemption from the requirement to register as a *Generator* or *Integrated Resource Provider* under clause 2.1A.2, or is eligible for an automatic exemption under the *registration information resource and guidelines*, subject to any terms and conditions imposed by AEMO as part of that exemption; and~~
- ~~(2) that *generating system* or *integrated resource system* is *connected*, or the person intends to *connect* it; and~~
- ~~(3) that *generating system* or *integrated resource system* is 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*.~~

This schedule applies to a person (“*Schedule 5.2 Participant*”) in respect of *schedule 5.2 plant* if that person is one of the following:

- (1) the *Connection Applicant* in respect of a *schedule 5.2 plant*, who:
  - (i) is or intends to be the *Registered Participant* for that *plant*; or
  - (ii) has appointed or intends to appoint an *intermediary* for that *plant*;
- (2) the *Connection Applicant* in respect of a *production system*, who:
  - (i) has received, or intends to apply for, an exemption from a requirement to register as a *Generator* or *Integrated Resource Provider* under clause 2.1A.2; or
  - (ii) is entitled to an automatic exemption under the *registration information resource and guidelines*,

but, in either case, only to the extent of the requirements in this Schedule 5.2 that the *Network Service Provider* considers necessary to minimise any adverse effect of the *connection* or operation of the *production system* on the quality or security of *network service* to other *Network Users*;

- (3) the *Connection Applicant* (other than a person referred to in paragraph (1)) in respect of a *synchronous condenser system* that is neither part of a *production system* nor part of the *network* to which it is or will be connected:
  - (i) if the combined *nameplate rating* of the *synchronous condensers* is 5 MVA or more; or
  - (ii) otherwise only to the extent of the requirements in this Schedule 5.2 that the *Network Service Provider* considers necessary to minimise any adverse effect of the *connection* or operation of the *synchronous condenser system* on the quality or security of *network service* to other *Network Users*;

**Commented [A56]:** Drafting note - expressing the application of the schedule rather than the non-application

**Commented [A57]:** Drafting note - this recognises that the rules allow for registration of persons with different interests in a production system, including solely commercial/market interests, on an intermediary basis for the others. The person who is party to the connection agreement with the NSP should be the party with an ongoing interest in the plant or the site.

**Commented [A58]:** Drafting note - to align with 5.2.3(b)(3)

- (4) subject to paragraph (b1), the Network Service Provider whose network incorporates the schedule 5.2 plant, where that plant:
- (i) is a production system having production units with a combined nameplate rating of 5 MW or more or a synchronous condenser system having synchronous condensers with a combined nameplate rating of 5 MVA or more; and
  - (ii) is not (or will not be when operational) subject to the terms of a connection agreement with a third party responsible for the operation of that plant.
- (b1) This schedule applies to a Schedule 5.2 Participant described in paragraph (b)(4) with the following modifications:
- (1) where this schedule contemplates that a matter is to be agreed with or approved by the Network Service Provider, the Schedule 5.2 Participant must determine that matter in a manner consistent with achieving all relevant system standards and performance requirements under schedule 5.1 and subject to any requirement for AEMO's agreement or approval;
  - (2) the Schedule 5.2 Participant must consult with AEMO and follow AEMO's advice in determining a matter that is an AEMO advisory matter;
  - (3) requirements to co-operate with, or provide information to, the Network Service Provider do not apply; and
  - (4) references to the connection point of the schedule 5.2 plant are taken to refer to the interface between the schedule 5.2 plant and the rest of the network, as designated by the Schedule 5.2 Participant and recorded in the performance standards.
- (b2) The application of some requirements in clauses S5.2.5 and 5.2.6 to synchronous condensers has been excluded or modified. Where exclusions or modifications, apply, they are noted in the first paragraph of the relevant sub-clauses.
- (c) This schedule also sets out the requirements and conditions which, subject to clause 5.2.5 or clause 5.2.5A of the Rules (as applicable), are obligations on Schedule 5.2 Participants-Generators and Integrated Resource Providers:
- (1) to co-operate with the relevant Network Service Provider on technical matters relating to schedule 5.2 plant when making a new connection; and
  - (2) to provide information to the Network Service Provider or AEMO.
- (d) The equipment associated with each schedule 5.2 plant generating system or integrated resource system must be designed to withstand without damage the range of operating conditions which may arise consistent with the system standards.
- (e) Schedule 5.2 Participants-Generators and Integrated Resource Providers 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 or Integrated Resource 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 services to facilitate management of the market.~~
- (g) ~~The Network Service Provider must record all access standards determined for a schedule 5.2 plant under this schedule as the plant's performance standards in (as applicable). This schedule provides for automatic access standards and the determination of negotiated access standards which once determined, must be recorded together with the automatic access standards in~~
- ~~(1) a connection agreement for the relevant schedule 5.2 plant; or~~
  - ~~(2) where the Schedule 5.2 Participant is also the Network Service Provider, a standalone document that it must provide to AEMO and keep up to date,~~
- ~~and registered with AEMO as performance standards.~~

**Commented [A59]:** Drafting note - Proposed deletion as there is no apparent need for the clause. There are separate provisions dealing with such arrangements, which are broader than those described here as they include contracts with NSPs, and could of course include additional or varied performance requirements which would be notified to AEMO as part of the contracting process anyway.

## S5.2.2 Application of Settings

A ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ must only apply settings to a *control system* or a *protection system* that are necessary to comply with performance requirements of this schedule 5.2 if the settings have been approved in writing by the relevant *Network Service Provider* and, if the requirement is ~~an AEMO advisory matter, one that would involve AEMO under clause 5.3.4A(e) of the Rules,~~ also by AEMO. A ~~Schedule 5.2 Participant Generator or Integrated Resource Provider~~ must not allow its *schedule 5.2 plant production unit* to supply electricity to, or take electricity from, the *power system* without such prior approval.

If a ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ seeks approval from the *Network Service Provider* to apply or change a setting, then (except in the case of settings to be applied or changed by the ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ in connection with an *emergency frequency control scheme*) approval must not be withheld unless the *Network Service Provider* or, if the requirement is ~~an AEMO advisory matter, one that would involve AEMO under clause 5.3.4A(e) of the Rules,~~ AEMO, reasonably determines that the changed setting would cause the ~~schedule 5.2 plant production 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 ~~an AEMO advisory matter, one that would involve AEMO under clause 5.3.4A(e) of the Rules,~~ AEMO, reasonably determines that a setting of a ~~schedule 5.2 plant's production 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 ~~Schedule 5.2 Participant-Generator or Integrated~~

**Commented [A60]:** Drafting note - the requirement to submit performance standards to AEMO for registered participants and others electing to follow the 5.3/5.3A connection process is set out in clauses 5.3.7, 5.3.9 and 5.3.12. The register of performance standards for 4.14 purposes is limited to registered participants

~~Resource Provider~~, 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 ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ to apply a setting or to conduct a test, if it relates to an *AEMO* advisory matter.

A ~~Schedule 5.2 Participant-Generator or Integrated Resource 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 ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ must, on request, provide ~~both *AEMO* and~~ the *Network Service Provider* and, if applicable, *AEMO*, with a report of a requested test, including evidence of its success or failure. Such a report of a test is *confidential information*.

A ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ must not change a setting requested by the *Network Service Provider* without its prior written agreement. If the *Network Service Provider* requires a ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ to change a setting within 18 months of a previous request, the *Network Service Provider* must pay the ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ its reasonable costs of changing the setting and conducting the tests as requested.

### S5.2.3 Technical matters to be coordinated

- (a) A ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ 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 ~~schedule 5.2 plant generating system or integrated resource 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 ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ must ensure that in designing the ~~schedule 5.2 a generating system's or integrated resource system's electrical plant~~, including any *substation* for ~~its the connection of the generating system or integrated resource 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 the *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~~ 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 ~~plant generating system or integrated resource system~~ plant generating system or integrated resource system is connected as specified in the *connection agreement*;
  - (4A) operation of the plant does not cause network equipment or other Network Users' facilities to experience recurring slow front over-voltages (switching surges) of the type contemplated in the International Electrotechnical Commission standard IEC 60071-1, for voltages above those described in clause S5.1a.4 of the system standards; and
  - (5) safety provisions in respect of the *plant* comply with requirements applicable to the *participating jurisdiction* in which the ~~plant generating system or integrated resource system~~ plant generating system or integrated resource 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 ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ must agree with the *Network Service Provider* for the ~~schedule 5.2 plant Generator or Integrated Resource Provider~~ to comply with another relevant standard.

#### S5.2.4 Provision of information

- (a) A ~~Schedule 5.2 Participant-Generator, Integrated Resource Provider 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 its schedule 5.2 plant that generating system or integrated resource system specified in schedule 5.5.

##### Note

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (b) A ~~Schedule 5.2 Participant Generator, Integrated Resource Provider or person required under the Rules to register as the Generator or Integrated Resource Provider~~ in respect of a ~~generating system comprised of generating units with a combined nameplate rating of 30 MW or more, or an integrated resource system that (to the extent it comprises bidirectional units) is comprised of bidirectional units with a combined nameplate rating of 5 MW or more or (to the extent it comprises generating units) is comprised of generating units with a combined nameplate rating of 30 MW or more,~~
- (1A) production system having production units with a combined nameplate rating of 30 MW or more; or

(1B) synchronous condenser system having synchronous condensers with a combined nameplate rating of 30 MVA 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 the schedule 5.2 plant generating system or integrated resource system~~ or planned alteration to a ~~schedule 5.2 plant generating system or integrated resource system~~; or
- (4) 5 business days before commissioning of ~~an alteration to the schedule 5.2 plant generating system or integrated resource 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 Provider*(s) (including the relevant *Transmission Network Service Provider* in respect of a *distribution connected unit*):
  - (i) information about the ~~protection protections~~ systems of the ~~schedule 5.2 plant generating system or integrated resource system~~;
  - (ii) information about the *control systems* of the ~~schedule 5.2 plant generating system or integrated resource system~~ including:
    - (A) a set of functional block diagrams, including all functions between feedback signals and *generating system* output or *integrated resource system* output or consumption;
    - (B) the parameters of each functional block, including all settings, gains, time constants, delays, deadbands and limits;
    - (C) the characteristics of non-linear elements;
    - (D) encrypted models in a form suitable for the software simulation products nominated by AEMO in the *Power System Model Guidelines*;
- (6) to AEMO, the model source code (in the circumstances required by the *Power System Model Guidelines*) associated with the *power system* simulation model in subparagraph (ii)(D) in an unencrypted form suitable for at least one of the software simulation products nominated by AEMO in the *Power System Model Guidelines*, and in a form that would allow conversion for use with other software products nominated by AEMO in the *Power System Model Guidelines*;
- (7) **[Deleted]**

- (7A) to AEMO and the relevant *Network Service Provider(s)*, any other information specified in the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*; and
- (8) to AEMO and the relevant *Network Service Providers* (including the relevant *Transmission Network Service Provider* in respect of a *distribution connected unit*) a *releasable user guide*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (b1) The information provided under paragraph (b) must contain sufficient detail for AEMO and the relevant *Network Service Provider(s)* to perform *power system* simulation studies in accordance with the requirements and circumstances specified in the *Power System Model Guidelines*.
- (c) The information provided under paragraph (b) must:
- (1) encompass all *control systems* that respond to ~~voltage-voltage~~ or *frequency* disturbances on the *power system*, and which are either integral to the *production units* or otherwise part of the ~~schedule 5.2 plant-generating-system or integrated-resource-system~~, including those applying to *reactive power* equipment that forms part of the ~~schedule 5.2 plant-generating-system or integrated-resource-system~~; and
  - (2) conform with the applicable models developed in accordance with the *Power System Model Guidelines*, or an alternative model agreed with AEMO to be necessary to adequately represent the relevant *plant* to carry out load flow and dynamic simulations and (where applicable) specialised *power system* studies; and
  - (3) reflect the *control system* tuning consistent with the range of:
    - (i) three phase fault levels; and
    - (ii) system impedance values,specified by the *Network Service Provider* for the *connection point* consistent with clauses S5.2.5.5 and S5.2.5.13 respectively, and the *releasable user guide* must record the relevant levels used for tuning, including the *X/R* ratio of the *power system* observed from the *connection point*.
- (d) The ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ must provide to AEMO information that updates the information provided under paragraph (b) and must provide to the relevant *Network Service Providers* information that updates the information provided under subparagraph (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 ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ 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 in~~ incomplete, inaccurate or out of date.
- (d1) A ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ 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 either:
- (1) be registered as an *Intending Participant* in accordance with rule 2.7;  
~~or-~~
- (2) if neither required nor intending to register in respect of the relevant *schedule 5.2 plant*, comply with rule 8.6 as if the *Connection Applicant* were a *Registered Participant* and, if required by the *Network Service Provider*, give an undertaking to that effect in a form satisfactory to the *Network Service Provider* as a condition of providing the technical information.
- (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 ~~*schedule 5.2 plant generating system* or *integrated resource system*~~ includes:
- (1) the highest and lowest expected single phase fault level and ~~three phase fault levels~~ three phase fault level at the *connection point* and the X/R ratio, with the ~~*schedule 5.2 plant generating system* or *integrated resource system*~~ not electrically connected;
- (1A) the mid-point voltage for the purposes of clause S5.2.5.1;
- (1B) the highest and typical expected system impedance levels at the *connection point* with the *schedule 5.2 plant* not electrically connected, as required for the purposes of clause S5.2.5.13;
- (1C) any other matters that AEMO or the *Network Service Provider* may specify, nominate or require for the purposes of any *access standard* in this schedule 5.2;
- (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-voltage~~ fluctuation, harmonic ~~voltage~~ voltage distortion and ~~voltage-voltage~~ unbalance at the *connection point* with the ~~*schedule 5.2 plant generating system* or *integrated resource system*~~ not electrically connected;
- (4) technical information relevant to the *connection point* with the ~~*schedule 5.2 plant generating system* or *integrated resource system*~~ not electrically connected ~~synchronised~~ including equivalent source impedance information, sufficient to estimate fault levels, ~~voltage~~ voltage fluctuations, harmonic ~~voltage-voltage~~ distortion (for harmonics relevant to the *generating system*) and ~~voltage-voltage~~ unbalance;

**Commented [A61]:** Drafting note - to the extent the Connection Applicant reasonably requires access to information from AEMO under clause 3.13.3(k) and cannot be registered, the NER will need to address the confidentiality requirements, in a similar way (similar to clause 4.6.6(f)). An alternative is to consider deeming provisions as for project developers. Draft amendments to address these issues may be better located within rule 5.3, applicable to relevant schedule 5.2 and 5.3 participants

**Commented [A62]:** Drafting note - As 'synchronised' is associated with synchronous plant, replaced with 'electrically connected' - consistent with the definition of synchronised but with broader application. For consistency, the same terminology is proposed wherever a comparison is made between power system properties with the plant connected vs disconnected

- (5) other 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*; and
- (6) the *Network Service Provider's* expected *three phase fault level* at the *connection point* for the ~~*schedule 5.2 plant generating system or integrated resource system*~~ following the *connection* of the ~~*schedule 5.2 plant generating system or integrated resource system*~~.
- (f) All information provided under this clause S5.2.4 must be treated as *confidential information*. A *Schedule 5.2 Participant* who receives information under this clause and is not a *Registered Participant* must comply with rule 8.6 as if it were a *Registered Participant*.

## S5.2.5 Technical requirements

### S5.2.5.1 Reactive power capability

(a0) Only clause S5.2.5.1(f) applies to *synchronous condensers*.

(a00) In this clause S5.2.5.1:

- (1) the **maximum active power or Pmax** of a *schedule 5.2 plant* refers to:
  - (i) for a *generating system*, the *active power capability* with all its *production units in service*; and
  - (ii) for an *integrated resource system*, both the *active power capability* and the *maximum demand* with all its *production units in service*;

in each case, less any applicable *temperature derating*;
- (2) **mid-point voltage** is a voltage specified by the *Network Service Provider* for a *schedule 5.2 plant's connection point*, within the range of 95% to 105% of *nominal voltage* at the *connection point*, that accounts for typical operating conditions at the *connection point* and in the nearby *network*; and
- (3) **temperature derating** is an amount (which may be calculated by reference to one or more inputs or measurements) by which:
  - (i) *active power capability* may be reduced if the relevant *plant's production or consumption capacity* is materially affected by *ambient temperatures*, and separate amounts may apply to *active power capability* and *maximum demand*; or
  - (ii) for a *synchronous condenser*, *reactive power capability* may be reduced if that *capability* is materially affected by *ambient temperatures*.

**Commented [A63]:** Drafting note - Pmax has been defined as the maximum capacity with all units in service to reduce complexity, as the maximum active power of individual units at the connection point is not necessarily linear/will vary between units depending on the associated equipment, filters etc. Paragraph (e1) describes the basis on which the reactive power capability will reduce with fewer than all units in service.

### Automatic access standard

~~(a) The automatic access standard is a generating system or integrated resource 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 or integrated resource system and 0.395.~~

~~(a) The automatic access standard is the requirements of paragraphs (a1) to (a3).~~

~~(a1) A schedule 5.2 plant, operating with all its production units in service at any level of active power and while meeting its other performance standards applicable to the voltage ranges specified below, must be capable of supplying or absorbing reactive power continuously at its connection point of the following amounts, with no temperature derating at ambient temperatures below 50°C:~~

~~(1) for a voltage range that is five percent of nominal voltage above and below the mid-point voltage, both supplying and absorbing an amount at least equal to the product of the maximum active power of the schedule 5.2 plant and 0.395; and~~

~~(2) for a voltage range from the upper limit of the range described in paragraph (1) to the upper limit established under clause S5.1a.4 without a contingency event:~~

~~(i) absorbing an amount at least equal to the product of the maximum active power of the schedule 5.2 plant and 0.395; and~~

~~(ii) supplying an amount at least equal to the amount specified under sub-paragraph (i) at the upper limit of the voltage range in paragraph (1), decreasing linearly to zero at the upper limit established under clause S5.1a.4 without a contingency event; and~~

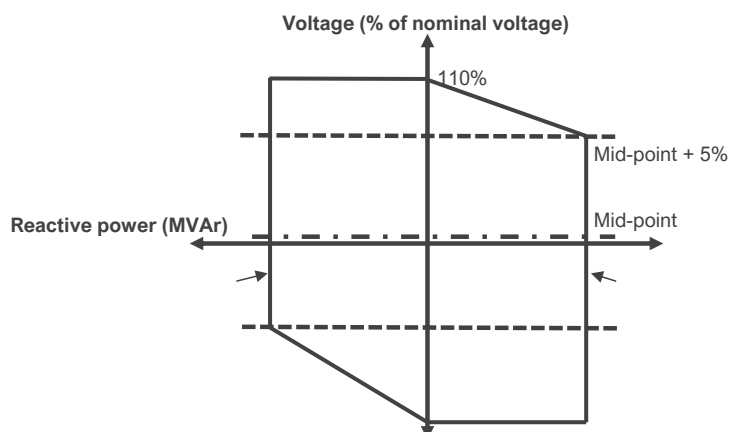
~~(3) for a voltage range from the lower limit of the voltage range in paragraph (1) to the lower limit established under clause S5.1a.4 without a contingency event:~~

~~(i) supplying an amount at least equal to the product of the maximum active power of the schedule 5.2 plant and 0.395; and~~

~~(ii) absorbing an amount at least equal to the amount specified under sub-paragraph (i) at the lower limit of the voltage range in paragraph (1), decreasing linearly to zero at the lower limit established under clause S5.1a.4 without a contingency event,~~

~~as illustrated in Figure S5.2.1.~~

**Figure S5.2.1**



(a2) A schedule 5.2 plant that is electrically connected to the power system but not otherwise in service except for any reactive power compensation under paragraph (h), must not change the voltage at the connection point from the voltage with the schedule 5.2 plant not electrically connected, in steady state conditions and for the highest system impedance nominated under clause S5.2.5.13(m).

#### **Minimum access standard**

(b) The *minimum access standard* is the requirements of paragraphs (b1) and (b2).

(b1) No ~~no~~ capability is required to supply or absorb reactive power at the connection point.

(b2) A schedule 5.2 plant that is electrically connected to the power system but not otherwise in service except for any reactive power compensation under paragraph (h), must not change the voltage at the connection point by more than 1% from the voltage with the schedule 5.2 plant not electrically connected, or a higher percentage agreed with the Network Service Provider, in steady state conditions and for the highest system impedance nominated under clause S5.2.5.13(m).

#### **Negotiated access standard**

(c) A negotiated access standard for reactive power capability under this clause S5.2.5.1: ~~When negotiating a negotiated access standard, the Generator or Integrated Resource Provider, the Network Service Provider and AEMO:~~

(1) ~~must, subject to paragraph (d), must be established at or above a level that is consistent with achieving all relevant system standards any agreement under subparagraph (d)(4), ensure that the reactive power capability of the generating system or integrated resource system is consistent with maintaining power system security and 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 existing power system conditions, considered projects and any other project for the connection of a Network User for which;~~

**Commented [A64]:** Drafting note - remainder of paragraph deleted as covered by proposed addition to 5.3.4A(b)

- (i) ~~there is an existing connection agreement; or~~
- (ii) ~~the Network Service Provider and AEMO reasonably consider the Network User will connect to the power system;~~
- (2) may ~~include 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 ~~include negotiate~~ a limit that describes how the reactive power capability varies as a function of active power level due to a design characteristic of the plant.
- (d) If the ~~schedule 5.2 plant generating system or integrated resource system~~ is not capable of the level of performance ~~specified in established under~~ paragraph (c)(1), the ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~, depending on what is reasonable in the circumstances, must do one or more of the following:
  - (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 ~~schedule 5.2 plant's generating system's or integrated resource 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 ~~schedule 5.2 plant generating system or integrated resource 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 performance standards~~, operational arrangements by which the plant can achieve an agreed level of performance for those operating conditions.
- (d1) Unless otherwise agreed with the Network Service Provider and AEMO, any temperature derating must represent a proportional derating of active power and reactive power at equipment level, projected to the connection point.
- (e) ~~[Deleted] The Generator or Integrated Resource Provider may select one or more options referred to in paragraph (d).~~

Commented [A65]: Drafting note: covered by drafting addition in the lead paragraph of (d)

#### General requirements

- (e1) With fewer than all production units in service, the maximum active power and reactive power capability of a production system may be reduced in a manner consistent with the topology of the plant and of the operating production units, provided the reactive power performance of any individual production unit is not lower than its performance when all production units are in service.
- (f) ~~A performance standard~~ The performance standards must record the agreed values, ~~for rated active power and (for an integrated resource system) rated~~



~~maximum demand~~ and where relevant the method of determining the value of:-

- ~~(1) for a production system, the active power capability and, if applicable, the maximum temperature for operation;~~
- ~~(2) for a synchronous condenser system or a synchronous condenser within a production system, if applicable, the maximum temperature for operation;~~
- ~~(3) if applicable, the temperature derating for ambient temperatures below 50°C; and~~
- ~~(4) the reactive power supply and absorption capabilities of the schedule 5.2 plant while meeting its other performance standards; and~~
- ~~(5) any additional reactive power supply and absorption capabilities of the schedule 5.2 plant, including where these may result in active power reductions.~~

**Note**

Information on the full range of reactive power capability is used to confirm the agreed capability for the performance standard, and may be used by AEMO and the Network Service Provider for network support or emergency purposes.

- ~~(e) A performance standard for consumption of energy by a generating system or integrated resource system in respect of auxiliary load 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 or Integrated Resource Provider were a Market Customer.~~
- (g) For the purposes of the requirement referred to in paragraph (a2) or (b2), the performance standards must record:
- (1) the required level or range of reactive power to meet the compensation requirement (in MVAr); and
  - (2) any operational arrangements necessary to meet the requirement.
- (h) Where the requirement referred to in paragraph (a2) or (b2) is to be met by reactive power compensation from one or more production units that are not otherwise in service:
- (1) a performance standard must be established for stability of the control system for settling time for a voltage step established under clause S5.2.5.13 for the relevant control mode (as if it were a secondary control mode); and
  - (2) the performance standards established under the following clauses will apply for operation in this mode:
    - (i) S5.2.5.2, S5.2.5.9, S5.2.5.10, S5.2.5.15, S5.2.6.1 and S5.2.6.2; and
    - (ii) S5.2.5.8 in respect of protection requirements.

**Commented [A66]:** Drafting note - this responds to concerns that reactive power capability should not be artificially reduced where it may have greater importance for the power system than maintaining active power or full compliance with other performance standards, facilitating potential network support arrangements.

### S5.2.5.2 Quality of electricity generated

- (a) For the purpose of this clause S5.2.5.2 in respect of a synchronous production unit, ~~AS 1359.101~~ and International Electrotechnical Commission standard

IEC 60034-1 ~~is a plant standard~~ ~~are plant standards~~ for harmonic ~~voltage~~ ~~voltage~~ distortion.

#### Automatic access standard

- (b) The *automatic access standard* is a ~~schedule 5.2 plant generating system or integrated resource system~~ at all times when *connected* must not produce at ~~any of its connection points~~ *its connection point*:
- (1) ~~voltage-voltage~~ fluctuation greater than the limits allocated by the *Network Service Provider* under clause S5.1.5(a);
  - (2) harmonic ~~voltage-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-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 ~~schedule 5.2 plant generating system or integrated resource system~~ at all times when *connected* must not produce at ~~any of its connection points~~ *its connection point*:
- (1) ~~voltage-voltage~~ fluctuations greater than limits determined under clause S5.1.5(b);
  - (2) harmonic ~~voltage-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-voltage~~ unbalance more than limits determined under clause S5.1.7(c).

#### Negotiated access standard

- (d) ~~[Deleted] 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.~~

Commented [A67]: Drafting note - suggested deletion as these are general principles for all access standards.

#### S5.2.5.3 Response to frequency disturbances

- (a) ~~In~~ ~~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 ~~schedule 5.2 plant production unit~~ is located.
- stabilisation time** and **recovery time** mean the longest times allowable for the *frequency* of the *power system* 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 ~~schedule 5.2 plant production 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*.

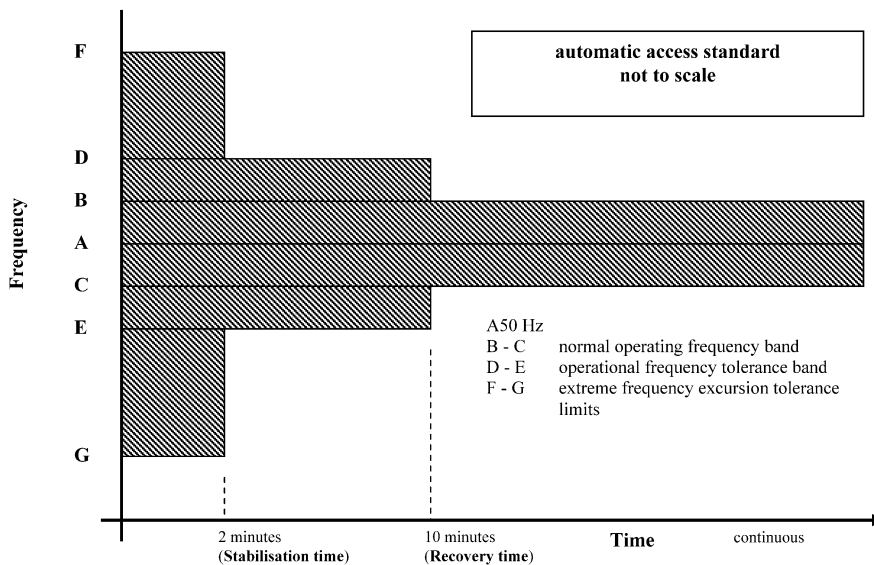
**Automatic access standard**

- (b) The *automatic access standard* is a ~~schedule 5.2 plant generating system or integrated resource system~~ and where applicable each of its *production units* and *synchronous condensers* 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, -3 Hz to 3 Hz per second for more than one second, 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 ~~schedule 5.2 plant generating system or integrated resource system~~ and where applicable each of its *production units and synchronous condensers* 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) unless (for an *integrated resource system*) it has a *protection system* to trip consumption by a *bidirectional unit* if the *frequency* falls below a level agreed with AEMO;
  - (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 (for a *production system*) the ~~plant generating system~~ has a *protection system* to trip ~~generation from a production generating unit~~ if the *frequency* exceeds a level agreed with AEMO ~~or (for an integrated resource system) it has a protection system to trip generation from a bidirectional unit if the frequency exceeds a level agreed with AEMO~~; and

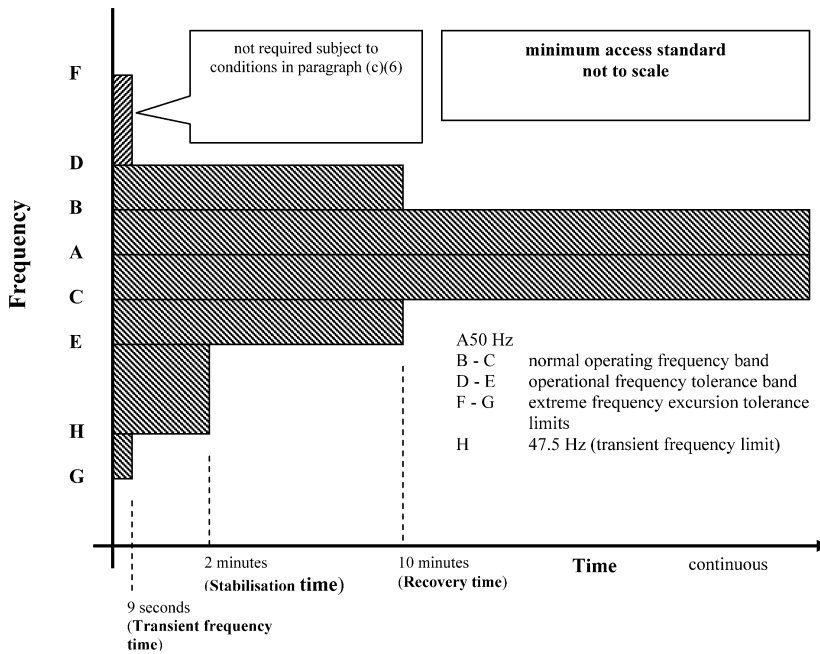
- (6) in respect of a ~~production generating system or integrated resource system~~:
- (i) ~~(in each case)~~ having ~~production generating units~~ with a combined nameplate rating equal to or more than the lower of: of 30 MW or more; and
    - (A) 30 MW or 30 MVA (as applicable); or
    - (B) the amount (in MW or MVA as applicable) that is 5% of any maximum credible contingency event size specified in the frequency operating standard for the relevant region; and
  - (ia) ~~[Deleted](in the case of an integrated resource system) not satisfying subparagraph (6)(i), but having bidirectional units with a combined nameplate rating of 5 MW or more; and~~
  - (ii) ~~(in each case)~~ that does not have a protection system to trip ~~the production units~~ if the frequency exceeds a level agreed with AEMO under subparagraph (5),

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 -2 Hz to 2 Hz per second for more than 0.25 seconds, -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 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 production units or rise above the upper bound of the operational frequency tolerance band as a result of under-frequency tripping of bidirectional units. A proposed negotiated access standard may be accepted if AEMO and the Network Service Provider consider the response of the schedule 5.2 plant is unlikely to cause tripping of production units to an extent that may result in a power system frequency outside the limits of the operational frequency tolerance band.~~

**Note**

This assessment may consider the effects of tripping of the schedule 5.2 plant itself and consequential tripping of other equipment due to under-frequency, over-frequency, rate of change of frequency, three phase fault levels or other resulting power system conditions.

**Commented [A68]:** Drafting note - Paragraph redrafted to accommodate a wider range of schedule 5.2 plant and potential impacts, some of which may only emerge in future. A current example of the need for broader drafting is that disconnection of a large syncon may lead to tripping of other units based on rate of change of frequency or insufficient fault level, rather than specifically over- or under-frequency tripping. To assist understanding of the purpose, this is illustrated via the proposed note.

#### S5.2.5.4 Response to voltage disturbances

(a0) In this clause S5.2.5.4:

- (1) T(ov) means a point in time when the voltage first varied above 110% of nominal voltage before returning to between 90% and 110% of nominal voltage;
- (2) T(uv) means a point in time when the voltage first varied below 90% of nominal voltage before returning to between 90% and 110% of nominal voltage;
- (3) references to nominal voltages are power system frequency voltages at the connection point, measured as the average of the root mean square of the voltages between each pair of phases; and
- (4) references to continuous uninterrupted operation apply subject to paragraph (e1).

#### Automatic access standard

- (a) The *automatic access standard* is a ~~schedule 5.2 plant generating system or integrated resource system~~ and each of its ~~operating production units and synchronous condensers~~ must ~~remain in be capable of continuous uninterrupted operation~~ where a power system disturbance causes the ~~voltage~~ voltage at the connection point to vary within the following ranges:
- (1) ~~over at least~~ 130% of ~~normal voltage-nominal voltage~~ for a period of at least 0.02 seconds after T(ov);
  - (2) 125% to 130% of ~~normal voltage-nominal voltage~~ for a period of at least 0.2 seconds after T(ov);
  - (3) 120% to 125% of ~~normal voltage-nominal voltage~~ for a period of at least 2.0 seconds after T(ov);
  - (4) 115% to 120% of ~~normal voltage-nominal voltage~~ for a period of at least 20.0 seconds after T(ov);
  - (5) 110% to 115% of ~~normal voltage-nominal voltage~~ for a period of at least 20 minutes after T(ov);
  - (6) ~~subject to paragraphs (e1) and (e3)~~, 90% to 110% of ~~normal voltage-nominal voltage~~ continuously;
  - (7) 80% to 90% of ~~normal voltage-nominal voltage~~ for a period of at least 10 seconds after T(uv); and
  - (8) 70% to 80% of ~~normal voltage-nominal voltage~~ for a period of at least 2 seconds after T(uv);-

~~where T(ov) means a point in time when the voltage at the connection point first varied above 110% of normal voltage before returning to between 90% and 110% of normal voltage, and T(uv) means a point in time when the voltage at the connection point first varied below 90% of normal voltage before returning to between 90% and 110% of normal voltage.~~

### Minimum access standard

- (b) The *minimum access standard* is a ~~schedule 5.2 plant generating system or integrated resource system including all and each of its~~ operating production units ~~and synchronous condensers~~ must ~~remain in be capable of~~ continuous uninterrupted operation where a power system disturbance causes the ~~voltage~~ voltage at the ~~connection point~~ to vary within the following ranges:
- (1) 115% to 120% of ~~normal voltage-nominal voltage~~ for a period of at least 0.1 seconds after T(ov);
  - (2) 110% to 115% of ~~normal voltage-nominal voltage~~ for a period of at least 0.9 seconds after T(ov);
  - (3) ~~subject to paragraphs (e1) and (e3)~~, 90% to 110% of ~~normal voltage nominal voltage~~ continuously, provided that the ratio of ~~voltage to frequency~~ (as measured at the ~~connection point~~ and expressed as a percentage of ~~normal voltage-nominal voltage~~ and a percentage of 50 Hz) does not exceed:
    - (i) a value of 1.15 for more than 2 minutes; or
    - (ii) a value of 1.10 for more than 10 minutes;
  - (4) 80% to 90% of ~~normal voltage-nominal voltage~~ for a period of at least 5 seconds after T(uv); and
  - (5) 70% to 80% of ~~normal voltage-nominal voltage~~ for a period of at least 2 seconds after T(uv);

~~where T(ov) means a point in time when the voltage at the connection point first varied above 110% of normal voltage before returning to between 90% and 110% of normal voltage, and T(uv) means a point in time when the voltage at the connection point first varied below 90% of normal voltage before returning to between 90% and 110% of normal voltage.~~

### Negotiated access standard

- (c) ~~[Deleted] In negotiating a negotiated access standard, a generating system or integrated resource system and each of its operating production 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 the total change in the level of active power in the power system as a result of any voltage excursion within levels specified by the automatic access standard would not exceed 100 MW, or a greater limit based on what AEMO and the Network Service Provider both consider to be reasonable in the circumstances.~~
- (c1) ~~If the nominal voltage at the connection point is less than 66 kV with no automatic tap-changing transformer between the schedule 5.2 plant's production units or synchronous condensers and the connection point, the Network Service Provider and AEMO may agree to measure voltage variations under this clause S5.2.5.4 at a specified point other than the connection point, being the electrically closest location with a nominal voltage of 66 kV or above.~~



(d) ~~[Deleted] 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, in addition to the requirements of clauses 5.3.4A(d1) and 5.3.4A(g) respectively, take into account:~~

~~(1) the expected performance of existing networks and considered projects; and~~

~~(2) the expected performance of existing generating plant and other relevant projects.~~

(e) ~~[Deleted]~~

#### **General requirements**

~~(e1) Subject to paragraph (e2) and for the purposes of subparagraphs S5.2.5.4(a)(6) and S5.2.5.4(b)(3), for a variation of up to 10% of connection point voltage, within the range of 90% to 110% of nominal voltage:~~

~~(1) active power output at the connection point must not reduce; and~~

~~(2) reactive power capability must be maintained in accordance with the performance standard established under clause S5.2.5.1.~~

~~(e2) For the purpose of paragraph (e1):~~

~~(1) reliance on onload tap-changing transformers, plant switching and overload capability is permitted;~~

~~(2) a transient response to any voltage disturbance or any consequential tap change or plant switching is to be disregarded;~~

~~(3) expected plant responses (consistent with good electricity industry practice) to conditions that may accompany a voltage disturbance, such as a frequency deviation or phase angle change, are to be disregarded; and~~

~~(4) reductions in active power or reactive power capability (as applicable) are permitted to the extent reasonably attributed to energy source availability, losses and any other factors agreed with the Network Service Provider and AEMO.~~

~~(e3) For connection point voltage variations greater than 10%, within the range of 90% to 110% of nominal voltage, reasonable temporary reductions in active power output and reactive power capability, corrected by tap-changing transformer action, are permitted.~~

~~(f) The access-performance standards must record include any operational arrangements necessary to ensure the schedule 5.2 plant generating system or integrated resource system and each of its production units will meet its agreed performance levels under abnormal network or plant-generating system or integrated resource system conditions.~~

#### **S5.2.5.5 Disturbance ride-through capability Response to disturbances following contingency events**

**Commented [A69]:** Drafting note - Included in clause 5.3.4A(b)

**Commented [A70]:** Drafting note - the reactive current and active power recovery requirements have been separated out into proposed new clause S5.2.5.5A

- (a) In this clause S5.2.5.5, ~~a disturbance is taken to end when the voltage at the connection point recovers to within 90% to 110 % of nominal voltage and remains within that range for at least 20 milliseconds.~~ ~~a fault includes a fault of the relevant type having a metallic conducting path.~~

#### Automatic access standard

- (b) The *automatic access standard* is: ~~the requirements of paragraphs (c) and (d).~~  
~~(1) for a generating system and or integrated resource system and each of its production units, the requirements of paragraphs (c) and (d);~~

Commented [A71]: See proposed new S5.2.5.5A(c) for mark-up of remaining sub-paragraphs

#### All generating systems and integrated resource systems

- (c) A ~~schedule 5.2 plant generating system or integrated resource system~~ and each of its ~~operating production units and synchronous condensers~~ must remain in *continuous uninterrupted operation* for any disturbance caused by:
- (1) a *credible contingency event*, ~~subject to paragraph (1)~~;
  - (2) a three phase fault in a *transmission system* cleared by all relevant primary *protection systems*;
  - (3) a two phase to ground, phase to phase or phase to ground fault in a *transmission system* cleared in:
    - (i) the longest time expected to be taken for a relevant *breaker fail protection system* to clear the fault; or
    - (ii) if a *protection system* referred to in subparagraph (i) 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; or
  - (4) a three phase, two phase to ground, phase to phase or phase to ground fault in a *distribution network* cleared in:
    - (i) the longest time expected to be taken for the *breaker fail protection system* to clear the fault; or
    - (ii) if a *protection system* referred to in subparagraph (i) 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,

Commented [A72]: For standard rule proposal

provided that the event is not one that would *disconnect the plant production unit* from the *power system* by removing *network elements* from service.

- (d) A ~~schedule 5.2 plant generating system or integrated resource system~~ and each of its ~~operating production units and synchronous condensers~~ must remain in *continuous uninterrupted operation* for a series of up to 15 disturbances within any five minute period caused by any combination of the events described in paragraph (c) where:
- (1) up to six of the disturbances cause the ~~voltage~~ ~~voltage~~ at the *connection point* to drop below 50% of ~~normal voltage~~ ~~nominal voltage~~;

- (2) in parts of the *network* where three-phase automatic reclosure is permitted, up to two of the disturbances are three phase faults, and otherwise, up to one three phase fault where ~~voltage-voltage~~ at the *connection point* drops below 50% of ~~normal-voltage-nominal voltage~~;
- (3) up to one disturbance is cleared by a *breaker fail protection system* or similar back-up *protection system*;
- (4) up to one disturbance causes the ~~voltage-voltage~~ at the *connection point* to vary within the ranges under clause S5.2.5.4(a)(7) and (a)(8);
- (5) the ~~minimum-clearance-from time between~~ the end of one disturbance and commencement of the next disturbance may be zero milliseconds; and
- (6) all remaining disturbances are caused by faults other than three phase faults,

provided that none of the events would result in:

- (7) the islanding of the ~~plant generating system or integrated resource system~~ or cause a material reduction in *power transfer capability* by removing *network elements* from service;
- (8) the cumulative time that ~~voltage-voltage~~ at the *connection point* is lower than 90% of ~~normal-voltage-nominal voltage~~ exceeding 1,800 milliseconds within any five minute period; ~~or~~
- (9) the time integral, within any five minute period, of the difference between 90% of ~~normal-voltage-nominal voltage~~ and the ~~voltage-voltage~~ at the *connection point* when the ~~voltage-voltage~~ at the *connection point* is lower than 90% of ~~normal-voltage-nominal voltage~~ exceeding 1 pu second-; or

(10) the three phase fault level at the connection point being lower than the minimum level for which the plant must be tuned, as specified by the Network Service Provider and determined as the higher of:

- (i) the three phase fault level derived from the agreed short circuit ratio value recorded in the performance standard for clause S5.2.5.15; and
- (ii) the minimum three phase fault level at the electrically closest system strength node, in combination with the single network element outage that would cause the greatest reduction in the three phase fault level at the connection point.

- (e) **Deleted**
- (f) **Deleted**
- (g) **Deleted**
- (h) **Deleted**
- (i) **Deleted**

**Minimum access standard**

- (j) The *minimum access standard* is the requirements of paragraphs (k) and (l).÷

**Commented [A73]:** See proposed new S5.2.5.5A for mark-up

**Commented [A74]:** See proposed new S5.2.5.5A for mark-up

**Commented [A75]:** See proposed new S5.2.5.5A for mark-up

**Commented [A76]:** See proposed new S5.2.5.5A for mark-up

**Commented [A77]:** See proposed new S5.2.5.5A for mark-up

~~(1) for a generating system or integrated resource system and each of its production units, the requirements of paragraphs (k) and (l);~~

**Commented [A78]:** See proposed new S5.2.5.5A(j) for mark-up of remaining sub-paragraphs

#### **All-generating systems and integrated resource systems**

(k) A ~~schedule 5.2 plant generating system or integrated resource system~~ and each of its ~~operating production units and synchronous condensers~~ must remain in *continuous uninterrupted operation* for any disturbance caused by:

- (1) a *credible contingency event*, ~~subject to paragraph (1)~~; or
- (2) a single phase to ground, phase to phase or two phase to ground fault in a *transmission system* or *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 the total impact on the *power system* due to that fault would not exceed 100 MW, or a greater limit based on what *AEMO* and the *Network Service Provider* both consider to be reasonable in the circumstances,

provided that the event is not one that would *disconnect the plant production unit* from the *power system* by removing *network elements* from service.

(l) A ~~schedule 5.2 plant generating system or integrated resource system~~ and each of its ~~operating production units and synchronous condensers~~ must remain in *continuous uninterrupted operation* for a series of up to six disturbances within any five minute period caused by any combination of the events described in paragraph (k) where:

- (1) up to three of the disturbances cause the ~~voltage-voltage~~ at the *connection point* to drop below 50% of ~~normal voltage-nominal voltage~~;
- (2) up to one disturbance causes the ~~voltage-voltage~~ at the *connection point* to vary within the ranges agreed by *AEMO* and the *Network Service Provider* under clause S5.2.5.4(a)(7), (a)(8), (b)(4) or (b)(5) (as appropriate);
- (3) the time difference between the ~~clearance-end~~ of one disturbance and commencement of the next disturbance exceeds 200 milliseconds;
- (4) no more than three of the disturbances occur within 30 seconds; and
- (5) all disturbances are caused by faults other than three phase faults,

provided that none of the events would result in:

- (6) the islanding of the ~~plant generating system or integrated resource system~~ or cause a material reduction in *power transfer capability* by removing *network elements* from service;
- (7) the cumulative time that ~~voltage-voltage~~ at the *connection point* is lower than 90% of ~~normal voltage-nominal voltage~~ exceeding 1,000 milliseconds within any five minute period; ~~or~~
- (8) the time integral, within any five minute period, of the difference between 90% of ~~normal voltage-nominal voltage~~ and the ~~voltage-voltage~~ at the *connection point* when the ~~voltage-voltage~~ at the

connection point is lower than 90% of ~~normal voltage-nominal voltage~~ exceeding 0.5 pu second;

(9) ~~the three phase fault level at the connection point being lower than the minimum level for which the plant must be tuned, as specified by the Network Service Provider and determined as the higher of:~~

~~(i) the three phase fault level derived from the agreed short circuit ratio value recorded in the performance standard for clause S5.2.5.15; and~~

~~(ii) the minimum three phase fault level at the electrically closest system strength node, in combination with the single network element outage that would cause the greatest reduction in the three phase fault level at the connection point; or~~

(10) ~~a condition specified in the performance standards in accordance with paragraph (r2),~~

and there is a minimum of 30 minutes where no disturbances occur following a five minute period of multiple disturbances.

(m) ~~Deleted~~

(n) ~~Deleted~~

(o) ~~Deleted~~

(o1) ~~Deleted~~

(p) ~~Deleted~~

(p1) ~~Deleted~~

(p2) ~~Deleted~~

(p3) ~~Deleted~~

#### Negotiated access standard

(q) ~~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.~~

(r) A proposed negotiated access standard may be accepted if the connection of the plant at the proposed access level would not cause other plant to trip as a result of an event, when they would otherwise not have tripped for the same event.

(r1) ~~In carrying out assessments of assessing proposed negotiated access standards under this clause S5.2.5.5 where the Schedule 5.2 Participant~~

Commented [A79]: See proposed new S5.2.5.5A for mark-up

Commented [A80]: See proposed new S5.2.5.5A for mark-up

Commented [A81]: See proposed new S5.2.5.5A for mark-up

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Commented [A85]: See proposed new S5.2.5.5A for mark-up

Commented [A86]: See proposed new S5.2.5.5A for mark-up

Commented [A87]: Drafting note - included in 5.3.4A(b)

~~Connection Applicant~~ has elected in accordance with clause 5.3.4B(b1) to pay the *system strength charge* in relation to the *connection*, the *Network Service Provider* and *AEMO* must take into account the performance required to be provided by the *System Strength Service Provider* at the relevant *system strength node* in accordance with clause S5.1.14.

(r2) A negotiated access standard may include:

- (1) a specified *plant* limitation in respect of which the *Network Service Provider* and *AEMO* agree that the *schedule 5.2 plant* is not required to remain in *continuous uninterrupted operation* for a specified combination of *power system* disturbances or associated conditions; and
- (2) the required response of the *schedule 5.2 plant* for each combination of *power system* disturbances or conditions specified under sub-paragraph (1), which should be as close to *continuous uninterrupted operation* as is reasonably practicable,

provided that any agreed *plant* limitations must not reduce the overall number of disturbances in a given period for which the *schedule 5.2 plant* is required to remain in *continuous uninterrupted operation* below the level specified in paragraph (1).

#### **General requirements**

- (s) The *performance standard* must include any operational arrangements to ensure the ~~*schedule 5.2 plant generating system or integrated resource system including all operating production units*~~ will meet its agreed performance levels under abnormal ~~*network or plant network, generating system or integrated resource system*~~ conditions.
- (t) When assessing multiple disturbances, a fault that is re-established following operation of *automatic reclose equipment* shall be counted as a separate disturbance.

(t1) For the purpose of paragraphs (c) and (k), a *credible contingency event* includes:

- (1) all *credible contingency events* used by the *Network Service Provider* for the purposes of clause S5.1.2.1; and
- (2) *non-credible contingency events* specified by *AEMO* that are routinely expected to be reclassified as *credible contingency events* under clause 4.2.3A in reasonably anticipated *abnormal conditions*, and are likely to cause a significant disturbance at the *schedule 5.2 plant's connection point*.

(u) **Deleted**

(v) **Deleted**

(w) **Deleted**

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Commented [A89]: See proposed new S5.2.5.5A for mark-up

Commented [A90]: See proposed new S5.2.5.5A for mark-up

#### **S5.2.5.5A Responses to disturbances following contingency events**

- (a) This clause applies to *synchronous condensers* with the following modifications:

- (1) paragraphs (d)(3) and (k)(2) do not apply, and there is no *access standard* requirement for the recovery of *active power* levels after a disturbance; and
- (2) paragraph (k)(1) applies as if the words “*deliver active power to the network, and*” were deleted.

(b) In this clause S5.2.5.5A:

- (1) **adequately controlled** means that the response of the *schedule 5.2 plant* to transient over-voltage or transient under-voltage achieves the *agreed level of reactive current injection or absorption within the duration of the relevant disturbance, considering:*
  - (i) *expected positive and negative sequence reactive current response;*
  - (ii) *expected active current response; and*
  - (iii) *stable control when operating at and transitioning into and out of limits,*  
and does not cause or exacerbate:
    - (iv) *voltages beyond the levels or durations specified in the *system standards* or (if more restrictive) agreed under clause S5.2.5.4; or*
    - (v) *voltage oscillations that could adversely affect the ability of other *schedule 5.2 plant* to remain in operation during the disturbance;*
- (2) **control objective** means, for balanced and unbalanced faults and transient over-voltages, to minimise the deviation of voltage on each phase from pre-disturbance values, while maintaining stable control; and
- (3) a disturbance (other than a *frequency* disturbance) is taken to **end** when the voltage at the *connection point* recovers to within 90% to 110 % of *nominal voltage* and remains within that range for at least 20 *milliseconds*;

#### **Automatic access standard**

(dc) The *automatic access standard* is:

- (21) for a *schedule 5.2 plant* to the extent it comprises ~~*generating system or (to the extent it comprises production units) integrated resource system comprised solely of synchronous production units and synchronous condensers,*~~ the requirements of paragraphs ~~(ed)~~ and (e); and
- (32) for a *production system* to the extent it comprises ~~*generating system or (to the extent it comprises production units) integrated resource system comprised solely of asynchronous production units,*~~ the requirements of paragraphs (f) to (i); and
- (4) for a ~~*generating system or (to the extent it comprises production units) integrated resource system comprised of synchronous production units and asynchronous production units;*~~

**Commented [A91]:** Drafting note - As this paragraph sets out which of the requirements apply to synchronous and asynchronous respectively, there is no need to repeat this in subsequent paragraphs.

**Commented [A92]:** Drafting note: This content should be covered by the amendments to (1) and (2) above

- (i) ~~for that part of the generating system or integrated resource system comprised of synchronous production units, the requirements of paragraph (e); and~~
- (ii) ~~for that part of the generating system or integrated resource system comprised of asynchronous production units, the requirements of paragraphs (f) to (i).~~

**Synchronous ~~plant only~~ generating systems and synchronous integrated resource systems**

~~(ed) Subject to paragraph (e), any changed power system conditions or energy source availability beyond the Generator's or Integrated Resource Provider's reasonable control, a schedule 5.2 plant, generating system or (to the extent comprised of production units) integrated resource system that in either case is comprised of synchronous production units, in respect of for disturbances caused by a type the types of fault described in subparagraphs clause S5.2.5.5(c)(2) to (4), must supply to or absorb from the network:~~

- (1) ~~to assist the maintenance of power system voltages during the disturbance fault, supply or absorb capacitive reactive current at the connection point, in addition to of at least the greater of its pre-disturbance reactive current, of and 4% of the maximum continuous current of the generating system or integrated resource system including all operating synchronous production units and synchronous condensers (in the absence of a disturbance) for each 1% reduction (from the level existing just prior to the disturbance fault) of connection point voltage-voltage during the disturbance fault;~~
- (2) ~~after clearance of the fault, supply or absorb reactive power at the connection point, sufficient to ensure that the connection point voltage voltage is within the range for continuous uninterrupted operation under clause S5.2.5.4; and~~
- (3) ~~from within 100 milliseconds after clearance of the fault, active power of at least 95% of the level existing just prior to the fault. the end of the disturbance, reach at least 95% of:~~
  - (i) ~~the pre-disturbance active power level; or~~
  - (ii) ~~during a frequency disturbance, a level of active power consistent with the performance standard established under clause S5.2.5.11 and the operation of the plant in accordance with clause 4.4.2(c1).~~

~~(e) A schedule 5.2 plant is not required to provide a response under paragraph (d) to the extent it is prevented from doing so by changed power system conditions or energy source availability beyond the Schedule 5.2 Participant's reasonable control.~~

**Asynchronous ~~plant only~~ generating systems and synchronous integrated resource systems**

~~(f) Subject to any changed power system conditions or energy source availability beyond the Generator's or Integrated Resource Provider's reasonable control, a Subject to paragraph (h), a schedule 5.2 plant, generating system or~~

**Commented [A93]:** Drafting note - These limited exceptions have been moved to paragraph (1) in part for readability of the main requirement - and the drafting expanded to clarify the necessity of a link between the limiting conditions and the ability to deliver the capability. This is consistent with changes made for asynchronous units, which have additional specific limiting conditions.

**Commented [A94]:** Drafting note - paragraph (b) already specifies which paragraphs apply to synchronous and asynchronous elements

**Commented [A95]:** Drafting note - Aligns with disturbance rather than fault, consistent with the response requirements

**Commented [A96]:** Drafting note - the layout/format of this clause has been revised to align with MAS

**Commented [A97]:** Drafting note - With the addition of 'at the connection point', it isn't necessary to specify to or from the network. This also clarifies that the capability requirement is to be achieved at the connection point (although it may be measured elsewhere and projected to the connection point as confirmed in the general requirements for this clause

**Commented [A98]:** Drafting note - The deleted text is moved to paragraph (h), alongside additional limitations on the response capability



~~(to the extent comprised of production units) integrated resource system that in either case is comprised of asynchronous production units, in respect of for disturbances caused by a type the types of fault described in subparagraphs clause S5.2.5.5(c)(2) to (4), must; have facilities capable of supplying to or absorbing from the network;~~

- (1) to assist the maintenance of ~~power system voltages-voltages~~ during the ~~fault disturbance, have facilities capable of supplying or absorbing at the connection point:~~
  - (i) capacitive reactive current in addition to its pre-disturbance level of at least 4% of the *maximum continuous current* of all operating asynchronous production units ~~of the generating system or integrated resource system~~ (in the absence of a disturbance) for each 1% reduction of ~~voltage positive sequence voltage~~ at the connection point below the ~~relevant voltage at which the range in which a reactive current response commences; must commence, as identified in subparagraph (g)(1), with the performance standards to record the required response agreed with AEMO and the Network Service Provider; and~~
  - (ii) inductive reactive current in addition to its pre-disturbance level of at least 6% of the *maximum continuous current* of all operating asynchronous production units ~~of the generating system or integrated resource system~~ (in the absence of a disturbance) for each 1% increase of ~~voltage positive sequence voltage~~ at the connection point above the relevant percentage of nominal voltage at which the range in which a reactive current response commences; and must commence, as identified in subparagraph (g)(1), with the performance standards to record the required response agreed with AEMO and the Network Service Provider;
  - (iii) negative sequence current or equivalent contributions to oppose unbalanced voltages during a disturbance.

**Note**

Active current is considered in addition to reactive current, as active current affects voltage for low X/R ratios.

with the required responses (within the range of capabilities expressed in this paragraph (f)(1)) to be agreed with the Network Service Provider and AEMO at levels consistent with achieving the control objective;

- (2) substantially maintain a response required under sub-paragraph (1) during the disturbance and maintained until the end of the disturbance, connection point voltage recovers to between 90% and 110% of normal voltage, or until another point such other range agreed with the Network Service Provider and AEMO, except for voltages below the relevant threshold identified in paragraph (h); and
- (23) within from 100 milliseconds after clearance of the fault, active power of at least 95% of the level existing just prior to the fault. the end of the disturbance, reach at least 95% of:
  - (i) the pre-disturbance active power level; or

- (ii) during a frequency disturbance, a level of active power consistent with the performance standard established under clause S5.2.5.11 and the Primary Frequency Response Requirements according to clause 4.4.2(c1).
- (g) For the purpose of paragraph (f):
- (1) ~~the schedule 5.2 plant generating system or integrated resource system must commence the required a response when or before the voltage voltage reaches: is in an under voltage range of 85% to 90% or an over-voltage range of 110% to 115% of normal voltage. These ranges may be varied with the agreement of the Network Service Provider and AEMO (provided the magnitude of the range between the upper and lower bounds remains at ±5%); and~~
- (i) for an under-voltage disturbance, 85% of nominal voltage; or
- (ii) for an over-voltage disturbance, 115% of nominal voltage,  
with the specific response initiating conditions being agreed with the Network Service Provider and AEMO, consistent with achieving the control objective; and
- (2) the reactive current response opposing the voltage change must commence within 10 milliseconds of the response initiating conditions being met, be adequately controlled and, for a step-like voltage profile at the connection point, have a rise time of no greater than 40 milliseconds and a settling time of no greater than 70 milliseconds and must be adequately damped.
- (h) ~~Despite paragraph (f), a generating system or integrated resource system A schedule 5.2 plant:~~
- (1) ~~is not required to provide a response under paragraph (f) to the extent it is prevented from doing so by changed power system conditions or energy source availability beyond the Schedule 5.2 Participant's reasonable control; and~~
- (2) is not required to provide a capacitive reactive current response in accordance with subparagraph (f)(1)(i) where:
- (4i) ~~the plant generating system or integrated resource system is directly connected to the power system with no step-up or connection transformer; and~~
- (2ii) ~~voltage-voltage~~ at the connection point is 5% or lower of ~~normal voltage-nominal voltage~~.
- (i) Subject to paragraph (h), despite the amount of reactive current injected or absorbed during ~~voltage-voltage~~ disturbances, ~~and subject to thermal limitations and energy source availability~~, a ~~schedule 5.2 plant generating system or integrated resource system~~ must make available at all times:
- (1) sufficient current to maintain rated apparent power of all operating ~~asynchronous production units of the generating system or integrated resource system~~ (in the absence of a disturbance), for all connection point ~~voltages-voltages~~ above 115% ~~of nominal voltage~~ ~~(or otherwise,~~

~~above the over voltage range agreed in accordance with subparagraph (g)(1)); and~~

- (2) the maximum continuous current of all operating *asynchronous production units* ~~of the generating system or integrated resource system~~ (in the absence of a disturbance) for all connection point ~~voltages~~ *voltages* below 85% ~~of nominal voltage~~ ~~(or otherwise, above the over-voltage range agreed in accordance with subparagraph (g)(1)),~~

except that AEMO and the Network Service Provider may agree limits on active current injection where required to maintain power system security and/or the quality of supply to other Network Users.

#### Minimum access standard

- (j) The minimum access standard is:

~~(21)~~ for a *schedule 5.2 plant to the extent it comprises generating system or (to the extent it comprises production units) integrated resource system comprised solely of synchronous production units or synchronous condensers*, the requirements of paragraph ~~(mk)~~ and (l); and

~~(32)~~ for a *production system to the extent it comprises generating system or (to the extent it comprises production units) integrated resource system comprised solely of asynchronous production units*, the requirements of paragraphs ~~(nm)~~ to ~~(po)~~; and

~~(4)~~ for a *generating system or (to the extent it comprises production units) integrated resource system comprised of synchronous production units and asynchronous production units:*

(i) ~~for that part of the generating system or integrated resource system comprised of synchronous production units, the requirements of paragraph (m); and~~

(ii) ~~for that part of the generating system or integrated resource system comprised of asynchronous production units, the requirements of paragraphs (n) to (p).~~

#### ~~Synchronous plant only generating systems and synchronous integrated resource units~~

- ~~(mk)~~ Subject to ~~paragraph (l)~~, any ~~changed power system conditions or energy source availability beyond the Generator's or Integrated Resource Provider's reasonable control after clearance of the fault,~~ a *schedule 5.2 plant, for generating system or integrated resource system comprised of synchronous production units, in respect of disturbances caused by a type the types of fault described in subparagraph clause S5.2.5.5(k)(2),* must:

- (1) ~~after clearance of the fault,~~ deliver active power to the network, and supply or absorb leading or lagging reactive power, sufficient to ensure that the connection point ~~voltage~~ *voltage* is within the range for continuous uninterrupted operation agreed under clause S5.2.5.4; and
- (2) ~~within a period after the end of the disturbance agreed with the Network Service Provider and AEMO (which period may differ according to the type of fault and should account for expected plant responses~~

**Commented [A99]:** Drafting note - As this paragraph sets out which of the requirements apply to synchronous and asynchronous respectively, there is no need to repeat this in subsequent paragraphs.

**Commented [A100]:** Drafting note: This content should be covered by the amendments to (1) and (2) above

(consistent with good electricity industry practice), to conditions that may accompany a voltage disturbance, such as a frequency deviation or phase angle change), reach ~~return to~~ at least 95% of:

- (i) the pre-disturbance active power level; or
- (ii) during a frequency disturbance, a level of active power consistent with the performance standard established under clause S5.2.5.11 and the operation of the plant in accordance with clause 4.4.2(c1).

~~the pre-fault active power level, after clearance of the fault, within a period of time agreed by the Connection Applicant, AEMO and the Network Service Provider.~~

- (1) A schedule 5.2 plant is not required to provide a response under paragraph (k) to the extent it is prevented from doing so by changed power system conditions or energy source availability beyond the Schedule 5.2 Participant's reasonable control.

#### **Asynchronous ~~plant only generating systems and asynchronous integrated resource systems~~**

~~(m) Subject to any changed power system conditions or energy source availability beyond the Generator's or Integrated Resource Provider's reasonable control, Subject to paragraph (o), a schedule 5.2 plant, for disturbances caused by a type the types of fault described in clause S5.2.5.5(k)(2), a generating system or (to the extent comprised of production units) integrated resource system that in either case is comprised of asynchronous production units must:~~

- (1) for the types of fault described in subparagraph (k)(2), and to assist the maintenance of power system ~~voltages~~ voltages during the fault disturbance, have facilities capable of supplying ~~to~~ or absorbing at the connection point ~~from the network~~:
  - (i) capacitive reactive current in addition to its pre-disturbance level of a percentage greater than 0% of the maximum continuous current of ~~including~~ all operating asynchronous production units of the generating system or integrated resource system (in the absence of a disturbance) for each 1% reduction of ~~voltage~~ voltage at the connection point below the relevant point at which a reactive current response must commence, as identified in or agreed under paragraph (en)(1); and
  - (ii) inductive reactive current in addition to its pre-disturbance level of a percentage greater than 0% of the maximum continuous current of ~~including~~ all operating asynchronous production units of the generating system or integrated resource system (in the absence of a disturbance) for each 1% increase of ~~voltage~~ voltage at the connection point above the relevant point at which a reactive current response must commence, as identified in or agreed under paragraph (en)(1),

with the required responses (within the range of capabilities expressed in this paragraph (m)(1)) to be agreed with the Network Service

**Commented [A101]:** Drafting note: this word was inadvertently left in the IESS Amending Rule

Provider and AEMO at levels consistent with achieving the control objective, and without contributing excessively to voltage rise on unfaulted phases during unbalanced faults;

**Commented [A102]:** Drafting note - this requirement was previously in (u)(1A). Refer to drafting note there

~~(2)~~ substantially maintain a response required under sub-paragraph (1) during the disturbance and maintained until the end of the disturbance, connection point voltage recovers to between 90% and 110% of normal voltage, or until another point such other range agreed with the Network Service Provider and AEMO, except for voltages below the relevant threshold identified in paragraph (p); and

~~(23)~~ within a period after the end of the disturbance agreed with the Network Service Provider and AEMO (which period may differ according to the type of fault and should account for expected plant responses (consistent with good electricity industry practice), to conditions that may accompany a voltage disturbance, such as a frequency deviation or phase angle change), that are reach return to at least 95% of:

- (i) the pre-fault disturbance active power level; or
- (ii) during a frequency-frequency disturbance, a level of active power consistent with the performance standard established under clause S5.2.5.11 and the operation of the plant in accordance with clause 4.4.2(c1), a level of active power output consistent with the generating system's or integrated resource system's performance standard under clause S5.2.5.11,

after clearance of the fault and recovery of positive sequence voltage at the connection point to remain between 90% and 110% of normal voltage, within a period agreed by the Connection Applicant, AEMO and the Network Service Provider, which period may differ according to the type of fault.

~~(en)~~ For the purpose of paragraph (am):

(1) the schedule 5.2 plant generating system or integrated resource system must commence a response when or before the voltage-voltage reaches:

- (i) for under-voltage, 80% of nominal voltage or another percentage falls to a threshold of 80% of normal voltage or other percentage threshold agreed with AEMO and the Network Service Provider; or
- (ii) for over-voltage, 120% of nominal voltage or another percentage increases to a threshold of 120% of normal voltage or other percentage threshold agreed with AEMO and the Network Service Provider,

and in each case may commence a response before the threshold is reached; with the specific response initiating conditions being agreed with the Network Service Provider and AEMO, consistent with achieving the control objective;

~~(2)~~ **[Deleted];**

~~(2A)~~ the response initiating conditions must be agreed with AEMO and the Network Service Provider;

~~(32)~~ the reactive current *rise time* must be no longer than 80 milliseconds or a longer time agreed ~~to by~~ with the *Network Service Provider* and *AEMO*;

(43) the reactive current response must be adequately controlled;

(54) the reactive current response opposing the voltage disturbance must commence within 40 milliseconds of the response initiating conditions being met, or a longer period agreed with the *Network Service Provider* and *AEMO*, a period after the response initiating conditions of:

~~— (i) —~~ 40 milliseconds; or

~~— (ii) —~~ a longer time agreed to by the *Network Service Provider* and *AEMO*; and

~~(6) —~~ the time when the reactive current response commences may be measured at either:

~~(i) —~~ the *connection point*; or

~~(ii) —~~ if agreed with by the *Network Service Provider* and *AEMO*, the *production unit* terminals or a point between the *production unit* terminals and the *connection point*.

~~(o1)~~ For the purposes of paragraphs (n) and (o), the *performance standards* must record:

~~(1) —~~ the range applicable for subparagraph (n)(1);

~~(2) —~~ the period agreed for subparagraph (n)(2), where applicable for each type of fault;

~~(3) —~~ for subparagraph (o)(1), the percentage thresholds;

~~(4) —~~ for subparagraph (o)(2A), the response initiating condition;

~~(5) —~~ for subparagraph (o)(3), the reactive current rise time;

~~(6) —~~ for subparagraph (o)(5), the required response time; and

~~(7) —~~ for subparagraph (o)(6), where the time of commencement is to be measured.

~~(p0)~~ Despite paragraph (n), a *generating system* or *integrated resource system* Δ *schedule 5.2 plant*:

~~(1)~~ is not required to provide a response under paragraph (m) to the extent it is prevented from doing so by changed power system conditions or energy source availability beyond the *Schedule 5.2 Participant's* reasonable control; and

~~(2)~~ a *schedule 5.2 plant* ~~generating system or integrated resource system~~ is not required to provide a capacitive reactive current response in accordance with subparagraph ~~(m)~~ (1)(i) where:

(1) ~~voltage~~ voltage at the *connection point* is 15% or lower of ~~normal voltage~~ nominal voltage; or

(2) the schedule 5.2 plant ~~where the generating system or integrated resource system~~ is directly connected to the power system with no step-up or *connection transformer*, ~~voltage and~~ voltage at the

**Commented [A103]:** Drafting note - the format of the next 3 paragraphs should ideally be harmonised with the corresponding provisions for the AAS

**Commented [A104]:** Drafting note - Moved to general requirements

connection point is 20% or lower of ~~normal voltage~~ nominal voltage.

#### Provision of minimum access standard

~~(p1p)~~ For the purposes of providing *minimum access standards* under clauses 5.3.3(b1)(4) and S5.4B(b)(2) in respect of reactive current response, and for the purposes of clause 5.3.4A(b), a *Network Service Provider* may provide the times in paragraphs (n)(2) and (n)(4) ~~(o)(3) and (o)(5)(i)~~ or other longer times it may be prepared to agree.

**Commented [A105]:** Drafting note - Consider whether similar provisions are needed elsewhere in the schedules, or can be incorporated into general requirements 5.3.4A/S5.2.4 etc.

~~(p2q)~~ For the purposes of clause 5.3.4A, and subject to clauses 5.3.4A(b1) and (b2), when proposing a *negotiated access standard* in respect of reactive current response, the ~~Schedule 5.2 Participant Connection Applicant~~ may propose the times in paragraphs (n)(2) and (n)(4) ~~(o)(3) and (o)(5)(i)~~ or other longer times it is seeking to agree.

~~(p3)~~ ~~A negotiated access standard with a lower standard or longer time agreed to by the Network Service Provider and AEMO in accordance with paragraph (o) is taken to satisfy the requirements of clause 5.3.4A(b)(1) for a negotiated access standard to be no less onerous than the corresponding minimum access standard provided by the Network Service Provider under clauses 5.3.3(b1)(4) or S5.4B(b)(2).~~

**Commented [A106]:** Drafting note - Appears unnecessary as the MAS specifically includes the parameters that may be agreed at a lower level - however if considered necessary it may need to be a general provision capable of covering any access standard that has similar provisions

#### Negotiated access standard

~~(q)~~ ~~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:~~

**Commented [A107]:** Drafting note - Incorporated in 5.3.4A

- ~~(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.~~

**Commented [A108]:** Drafting note - Deleted as covered by proposed clause 5.3.4A(b)

#### General requirements

##### All generating systems and integrated resource systems

~~(s1)~~ The *performance standard* must include any operational arrangements to ensure the ~~schedule 5.2 plant generating system or integrated resource system including all operating production units~~ will meet its agreed performance levels under abnormal ~~network or plant network, generating system or integrated resource system~~ conditions.

##### Asynchronous generating systems and asynchronous integrated resource systems

~~(us)~~ ~~For the purpose of paragraphs (f) and (n) In respect of reactive current response:~~

- ~~(1) for a schedule 5.2 plant to the extent it comprises asynchronous production units:~~

- (i) ~~the reactive current contribution may be limited to the *maximum continuous current* of ~~all-its~~ operating asynchronous production units of the generating system or integrated resource system; and~~
  - ~~(1A) the reactive current contribution must not contribute excessively to voltage rise on unfaulted phases during unbalanced faults;~~
  - (ii) ~~the reactive current response commencement time and rise time may be measured at a location other than the connection point (including within the schedule 5.2 plant) where agreed with the Network Service Provider and AEMO;~~
- (2) ~~for any schedule 5.2 plant, the reactive current contribution and voltage voltage deviation described may be measured at a location other than the connection point (including within the schedule 5.2 plant-relevant generating system or integrated resource system) where agreed with AEMO and the Network Service Provider, in which case the required level of injection and absorption will be calculated for assessed at that agreed location, at levels consistent with the access standard at the connection point; and~~
- (3) ~~for a schedule 5.2 plant to the extent it comprises synchronous production units or synchronous condensers, the reactive current contribution may be limited to 250% of the maximum continuous current of its operating synchronous production units or synchronous condensers.~~
- ~~(3) the reactive current contribution required may be calculated using phase to phase, phase to ground or sequence components of voltages. The ratio of the negative sequence to positive sequence components of the reactive current contribution must be agreed with AEMO and the Network Service Provider for the types of disturbances listed in this clause 5.2.5.5; and~~
- ~~(4) the performance standards must record:~~
- ~~(i) all conditions (which may include temperature) considered relevant by AEMO and the Network Service Provider under which the reactive current response is required; and~~
  - ~~(ii) the maximum reactive current contribution to each phase.~~
- (t) ~~The performance standards must record, as applicable to the schedule 5.2 plant:~~
- ~~(1) the response to balanced and unbalanced faults and balanced and unbalanced transient over-voltages, which may be different for different types of disturbance, including:~~
    - ~~(i) the positive sequence reactive current response as a function of positive sequence voltage deviation and the negative sequence current response as a function of negative sequence voltage deviation; or~~
    - ~~(ii) the reactive current response, on a per phase (or phase to phase) basis as a function of voltage deviation per phase (or phase to phase); or~~

**Commented [A109]:** Drafting note - moved to the MAS, noting the AAS explicitly includes a requirement for balanced faults

**Commented [A110]:** Drafting note - current paragraph (o)(6) limits this to the unit terminals or a point between the terminals and the POC. However, flexibility is appropriate to allow for alternative acceptable solutions, such as response provided by a separate synchronous condenser.



- (iii) another method agreed with the *Network Service Provider* that describes the response effectively and concisely; and
- (iv) the method of prioritising response on reaching a current limit, such as active current versus reactive current priority or positive sequence versus negative sequence current priority;
- (2) for subparagraph (f)(1) or (m)(1), the range of response capabilities of the *facilities*, the required reactive current responses and any agreed point or voltage range for maintaining a response;
- (3) for subparagraph (f)(2), (k)(2), (m)(2) or (m)(3), any agreed periods;
- (4) for subparagraph (g)(1) or (n)(1), the response initiating conditions;
- (5) for a *negotiated access standard*, the reactive current response commencement time and *rise time*;
- (6) for subparagraphs (s)(1)(iii) and (s)(2), any agreed locations;
- (7) all conditions (which may include temperature) considered relevant by AEMO and the *Network Service Provider* under which the reactive current response is required; and
- (8) the maximum reactive current contribution to each phase.

#### **Synchronous generating systems and synchronous integrated resource systems**

- (v) ~~For a *generating system* or (to the extent comprised of *production units*) *integrated resource system* that in either case is comprised solely of *synchronous production units*, the reactive current contribution may be limited to 250% of the *maximum continuous current* of the *generating system* or *integrated resource system*.~~
- (w) ~~For a *synchronous production unit* within a *generating system* or *integrated resource system* (other than a *generating system* or *integrated resource system* described in paragraph (v)), the reactive current contribution may be limited to 250% of the *maximum continuous current* of that *synchronous production unit*.~~

#### **S5.2.5.6 Response to abnormal voltage quality Quality of electricity generated and continuous uninterrupted operation**

##### **Minimum access standard**

The *minimum access standard* is a ~~*schedule 5.2 plant generating system* or *integrated resource system*~~ including each of its operating *production units*, *synchronous condensers* and *reactive plant*, must not *disconnect* from the *power system* as a result of ~~*voltage-voltage*~~ fluctuation, harmonic ~~*voltage-voltage*~~ distortion and ~~*voltage-voltage*~~ unbalance conditions at the *connection point* within the levels specified in clauses S5.1a.5, S5.1a.6 and S5.1a.7.

Commented [A111]: Drafting note - Existing heading is not reflective of content

### S5.2.5.7 Partial load rejection for synchronous generation

(a0) This clause applies only to *synchronous production units*, and to a *production system* only to the extent of its *synchronous production units* (if any).

(a) In For the purposes of this clause S5.2.5.7 ~~minimum generation means minimum sent out generation for continuous stable operation.~~ a **relevant system** means a *production system* having *synchronous production units* with a combined *nameplate rating* equal to or more than the lower of:

(1) 30 MW; or

(2) the amount (in MW) that is 5% of any maximum *credible contingency event* size specified in the *frequency operating standard* for the relevant *region*.

(b) **[Deleted]**

#### Automatic access standard

(c) The *automatic access standard* is a ~~relevant system generating system or integrated resource system~~ must be capable of remain in continuous uninterrupted operation during and following a *power system load* reduction of 30% ~~from its pre-disturbance level~~ or equivalent impact from separation of part of the *power system* in less than 10 seconds, provided that the *loading level* remains above the combined *minimum operating level* of the operating *synchronous production units* ~~minimum generation~~.

#### Minimum access standard

(d) The *minimum access standard* is a ~~relevant system generating system or integrated resource system~~ must be capable of remain in 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 the combined *minimum operating level* of the operating *synchronous production units* ~~minimum generation~~.

**[Deleted]**

(e) **[Deleted]**

(f) **[Deleted]**

#### General requirements

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

(h) A relevant system is permitted to vary its *active power* and *reactive power* to the extent required to oppose a *voltage variation* or *frequency variation*.

### S5.2.5.8 Protection from power system disturbances

(a0) Paragraphs (a)(1), (b)(1), (b1), (b2) and (b3) of this clause S5.2.5.8 do not apply to *synchronous condensers*.

(a00) In this clause S5.2.5.8:

**Commented [A112]:** Drafting note - defined term *minimum operating level* has been substituted

**Commented [A113]:** Drafting note - This formulation allows for (currently) Tasmania to have a lower threshold based on materiality in relation to maximum contingency size, while preserving a general minimum size of 30 MW.

**Commented [A114]:** Drafting note - uses newly defined term

- (1) **droop** has the meaning given in clause S5.2.5.11(a)
- (2) a **relevant system** means a *production system* or (where applicable) a *synchronous condenser system, having production units or synchronous condensers* respectively with a combined *nameplate rating* equal to or more than the lower of:
- (i) 30 MW or 30 MVA (as applicable); or
  - (ii) the amount (in MW or MVA as applicable) that is 5% of any *maximum credible contingency event size* specified in the *frequency operating standard* for the relevant region.

Commented [A115]: See drafting note on S5.2.5.7

#### **Minimum access standard**

- (a) ~~The *minimum access standard* is:~~
- ~~(1) subject to subparagraph (2) and paragraph (e), for a *generating system* or *integrated resource system* or any of its *production units* that is required by a *Generator, Integrated Resource Provider* 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* or *integrated resource 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 relevant system (as defined in paragraph (a1)) *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* or *integrated resource 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* or *integrated resource 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*.~~
- ~~(a1) For subparagraph (a)(2), a relevant system means any of the following:~~
- ~~(1) a *generating system* with a *nameplate rating* of 30MW or more;~~

- ~~(2) a generating system comprised of generating units with a combined nameplate rating of 30 MW or more;~~
- ~~(3) an integrated resource system that (to the extent it comprises bidirectional units) is comprised of bidirectional units with a combined nameplate rating of 5 MW or more; and~~
- ~~(4) an integrated resource system that (to the extent it comprises generating units) is comprised of generating units with a combined nameplate rating of 30 MW or more.~~

~~(b) [Deleted]~~

#### **Automatic access standard**

- ~~(a) The automatic access standard is the requirements of paragraphs (a1) and (a2).~~
- ~~(a1) A relevant system must have an automatic droop response to an increase in frequency at the connection point, so as to have reduced the active power output of the relevant system from the level of output had there been no frequency disturbance, by:
  - ~~(1) at least 50%; or~~
  - ~~(2) if applicable, such lesser amount as is required to maintain the minimum operating level of its operating production units;~~before the expiry of 3 seconds after the frequency reaches a level that is 0.5 Hz below the upper limit of the extreme frequency excursion tolerance band, for a rate of change of frequency up to the maximum established for its performance standard under clause S5.2.5.3.~~
- ~~(a2) Any voltage-related protection systems must not act to disconnect the relevant system or any of its operating production units within 20 milliseconds of an over-voltage disturbance at the connection point.~~

#### **Minimum access standard**

- ~~(b) The minimum access standard is a relevant system must automatically disconnect operating production units so as to reduce active power output from the level of output had there been no frequency disturbance, by:
  - ~~(1) at least 50% within 3 seconds; or~~
  - ~~(2) a lesser amount or longer period agreed with the Network Service Provider and AEMO,~~if the frequency at the connection point exceeds a level nominated by AEMO (above the upper limit of the normal operating frequency band) for a duration nominated by AEMO.~~

#### **Negotiated access standard**

- ~~(b1) A proposed negotiated access standard for a relevant system may be accepted only to the extent that physical plant limitations prevent compliance with the automatic access standard in paragraph (a)(1).~~
- ~~(b2) For the purposes of paragraph (b1), a negotiated access standard may include:~~

- (1) a reasonable reduction of less than 50% or a reasonable period in excess of 3 seconds to achieve a reduction in generation proportional to the frequency deviation; or
  - (2) a requirement to reduce active power output by a reasonable amount within a reasonable period after the frequency has exceeded a level nominated by AEMO (above the upper limit of the normal operating frequency band) for a duration nominated by AEMO, and hold output at the reduced level until the frequency returns to within the normal operating frequency band.
- (b3) In determining a reasonable time period or reduction amount under paragraph (b2), the Schedule 5.2 Participant, the Network Service Provider and AEMO must have regard to the maximum rate of change of frequency established for the plant's performance standard under clause S5.2.5.3, in addition to physical plant limitations.
- (b4) A reduction in active power output should generally be achieved by fast ramping in preference to disconnection of production units.

#### **General requirements**

- (b5) The schedule 5.2 plant's protection settings must be set:
- (1) so that the plant remains in operation as required under the performance standards relevant to the type of protection; and
  - (2) except as otherwise required by AEMO or the Network Service Provider, to maximise the plant's capability to remain in operation for abnormal power system conditions for which the plant is not required to disconnect under any performance standard, while maintaining safe and stable operation of the plant within safety margins consistent with good electricity industry practice.

#### **Note**

While a schedule 5.2 plant is permitted to disconnect for conditions that exceed the requirements for it to remain in continuous uninterrupted operation under any one or more of clauses SS5.2.5.3, S5.2.5.4, S5.2.5.5, S5.2.5.6 or S5.2.5.7, sub-paragraph (2) confirms that protection settings should allow for operation beyond those limits where reasonable. This does not affect other requirements to disconnect that may apply, for example, to the provision of ancillary services.

- (b6) Vector shift protection or similar protective functions must not operate for phase shifts less than 20 degrees.
- (c) AEMO or the Network Service Provider may require that the performance standard ~~an access standard~~ include a requirement for the schedule 5.2 plant ~~generating system or integrated resource 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 load.
- (d) The performance standards must record any ~~access standard~~ ~~must include specification of~~ conditions for which the ~~schedule 5.2 plant: generating unit, generating system, bidirectional unit or integrated resource system~~

- (1) ~~must trip, where it would otherwise be required to remain in continuous uninterrupted operation; or and~~
- (2) ~~must not trip, where it would otherwise be permitted to trip, considering the arrangements described under paragraph (e).~~
- (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 ~~schedule 5.2 plant generating system or integrated resource 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 ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ and AEMO ~~or a Network Service Provider~~;
  - (2) where a ~~source of load~~ that is not part of the ~~schedule 5.2 plant generating system or integrated resource system~~ has the same connection point as the ~~schedule 5.2 plant generating system or integrated resource system~~ and AEMO and the Network Service Provider agree that the disconnection would in effect be under-frequency load shedding;
  - (3) where the ~~schedule 5.2 plant generating system or integrated resource system~~ is automatically disconnected under ~~its performance standard for this clause S5.2.5.8 paragraph (a), clause S5.2.5.9 or clause S5.2.5.10; or by an emergency frequency control scheme;~~
  - (4) where the ~~schedule 5.2 plant generating system or integrated resource system~~ is automatically disconnected ~~by an emergency frequency control scheme; under clause S5.2.5.10; or~~
  - (5) in accordance with an agreement between the ~~Schedule 5.2 Participant Generator or Integrated Resource Provider~~ 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; ~~or~~
  - (6) ~~where required for a special protection scheme, or runback scheme established by a Network Service Provider, with the agreement of AEMO.~~
- (f) ~~[Deleted] The Network Service Provider is not liable for any loss or damage incurred by the Generator or Integrated Resource Provider or any other person as a consequence of a fault on either the power system, or within the Generator's or Integrated Resource Provider's facility.~~

**Commented [A116]:** Drafting note - NSPs more commonly enter into NSCAS/network support agreements. AEMO is only the procurer of last resort for NSCAS

**Commented [A117]:** Drafting note - suggested move to schedule 5.6

### 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 ~~schedule 5.2 plant generating system or integrated~~

- ~~resource 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 ~~*Schedule 5.2 Participant-Generator or Integrated Resource Provider*~~ 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 ~~*schedule 5.2 plant generating system or integrated resource 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).

**[Deleted]**

- (d) **[Deleted]**

### General requirements

- (e) The *Network Service Provider* and the ~~*Schedule 5.2 Participant-Generator or Integrated Resource Provider*~~ 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~~ **Detection and response to unstable operation**

#### Automatic access standard

- (a) The *automatic access standard* is a ~~*schedule 5.2 plant generating system and an integrated resource system*~~ must have:
- (1) for its *synchronous production units and synchronous condensers*, have a *protection system* to ~~*disconnect it*~~ ~~*promptly*~~ when a condition that would lead to pole slipping is detected, to prevent pole slipping or other conditions where a ~~*generating unit*~~ *unit* causes *active power*, *reactive power* or ~~*voltage*~~ ~~*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) for its *asynchronous production units*; ~~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).~~
    - (i) have facilities to detect instability in voltage, reactive power and active power at the connection point;
    - (ii) have facilities capable of disconnecting units for unstable behaviour, with configurable enablement conditions and settings agreed with the Network Service Provider and AEMO; and
    - (iii) on detection of instability, execute a hierarchy of actions based on configurable trigger conditions, thresholds and timeframes agreed with the Network Service Provider and AEMO, where:



- (A) any hierarchy of actions that includes *disconnection* of units must account for available automated information on the *plant's* contribution to the instability; and
- (B) actions are automatically and promptly executed; and
- (3) for a *production system with active power capability* of 100 MW or more or a *synchronous condenser system* of 100MVA or more, have:
  - (i) access to a phasor measurement unit with capability to send data for the system to AEMO and the *Network Service Provider*; and
  - (ii) the capability to receive information from AEMO relating to the system's contribution to instability, when available, in a form nominated by AEMO.

#### **Minimum access standard**

- (b) The *minimum access standard* is: a *generating system* or *integrated resource system* 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*.
  - (1) a *schedule 5.2 plant* that, under normal or planned *outage* conditions of the *power system* and considering the range of *reactive power* and *active power* capability established under clause S5.2.5.1, can change voltage at its *connection point* by more than 1% from the voltage with the *plant* not electrically connected, must have:
    - (i) *facilities* to detect instability in voltage, *reactive power* and where relevant *active power* at the *connection point*;
    - (ii) for its *asynchronous production units*, a process to manage instability promptly on detection, in a manner to be agreed with the *Network Service Provider* and AEMO; and
    - (iii) for its *synchronous production units* or *synchronous condensers*, a *protection system* to disconnect the *plant* for sustained pole slipping if required by the *Network Service Provider* or AEMO; and
  - (2) a *production system* with *active power capability* of 100 MW or more, or a *synchronous condenser system* having *synchronous condensers* with a combined *nameplate rating* of 100 MVA or more, must have:
    - (i) if required by the *Network Service Provider* or AEMO, access to a phasor measurement unit with capability to send data for the system to AEMO and the *Network Service Provider*; and
    - (ii) if required by AEMO, the capability to receive information from AEMO relating to the system's contribution to instability, when available, in a form nominated by AEMO.

#### **Negotiated access standard General requirements**

- (c) The hierarchy of actions under paragraph (a)(2)(iii) or process under paragraph (b)(1)(ii) must prioritise measures to eliminate the instability over disconnecting the *plant*.

~~(d) Requirements and capabilities referable to instability are to be determined having regard to the *power system stability guidelines published under clause 4.3.4(h)*.~~

~~(e) If required by the *Network Service Provider* or *AEMO*, a *schedule 5.2 plant* must have the capability to communicate information from its detection system to their respective control centres.~~

~~(f) If required by the *Network Service Provider*, a *schedule 5.2 plant* must have the capability to receive a remote tripping signal from the *Network Service Provider*.~~

~~If the *Network Service Provider* and the *Generator* agree, a *protection system* may also trip any other part of the *generating system* or *integrated resource system* to cease the instability.~~

~~(d) Notwithstanding paragraph (c), a *protection system* must be provided in the *access standard* to trip the affected *production unit* where:~~

~~(1) the *Network Service Provider* considers it necessary to prevent consequential tripping of, or damage to, other *production 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*.~~

#### S5.2.5.11 Frequency control

~~(a0) This clause does not apply to *synchronous condensers*.~~

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

**droop** means, in relation to *frequency response mode*, the percentage change in *power system frequency* as measured at the *connection point*, divided by the percentage change in *power transfer* of the ~~*schedule 5.2 plant-generating system* or *integrated resource system*, to the extent it comprises *production units*~~, expressed as a percentage of ~~*its active power capability* the *maximum operating level* of the *generating system* or *integrated resource system*~~. Droop must be measured:

~~(1) at *frequencies* that are outside the *deadband*; and~~

~~(2) within the *power transfer capability* across the *connection point*, considering the *operating production units* of the *schedule 5.2 plant*. *limits of power transfer*.~~

~~**maximum operating level** means in relation to:~~

~~(1) a *non-scheduled generating unit* or *non-scheduled bidirectional*, the *maximum sent out generation* consistent with its *nameplate rating*;~~

~~(2) a *scheduled generating unit*, *scheduled bidirectional* or *semi-scheduled generating unit*, the *maximum generation* to which it may be *dispatched* and as provided to *AEMO* in the most recent *bid validation data*;~~

~~(3) a *non-scheduled generating system* or *non-scheduled integrated resource system*, the *combined maximum sent out generation*~~

**Commented [A118]:** Drafting note - See paragraph (i)(3), which is the only remaining place this term is used. Current definition:

- Should be essentially the same for scheduled, non-scheduled and semi-scheduled generating units, and for scheduled and non-scheduled bi-directional units, but references different concepts (one 'sent out' and one 'generation' (bid data)).
- Does not account for other operating limits.
- For a system, it is always used with reference to the units in operation at a point in time, and as used in this clause only needs to be defined at a unit level.

~~consistent with the nameplate ratings of its in-service production units (if any);~~

- ~~(4) a scheduled generating system or semi-scheduled generating system, the combined maximum generation to which its in-service generating units may be dispatched and as provided to AEMO in the most recent bid validation data; and~~
- ~~(5) a scheduled integrated resource system, the combined maximum sent out generation to which its in-service production units and in-service generating units may be dispatched and as provided to AEMO in the most recent bid validation 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;~~
- ~~(2A) a scheduled bidirectional unit or non-scheduled bidirectional unit, its minimum active power level for continuous stable operation;~~
- ~~(3) a non-scheduled generating system, the combined minimum operating level of its in-service generating units;~~
- ~~(4) a scheduled generating system or semi-scheduled generating unit system, the combined minimum sent out generation of its in-service generating units; and~~
- ~~(5) a scheduled integrated resource system or a non-scheduled integrated resource system, the combined minimum operating level of its in-service production units.~~

#### Automatic access standard

(b) The automatic access standard is:

- (1) ~~power transfer to the power system from a schedule 5.2 plant, generating system or, to the extent it comprises production units, an integrated resource system under relatively stable input energy, must not:~~
- ~~(i) increase in response to a rise in the frequency of the power system as measured at the connection point; or~~
- ~~(ii) decrease in response to a fall in the frequency of the power system as measured at the connection point;~~
- ~~(1A) power transfer from the power system to any bidirectional units of a schedule 5.2 plant must not:~~
- ~~(i) subject to energy absorption capability, decrease in response to a rise in the frequency of the power system as measured at the connection point; or~~
- ~~(ii) increase in response to a fall in the frequency of the power system as measured at the connection point; and~~

**Commented [A119]:** Drafting note - Moved to glossary (as used in other performance standards) and simplified. Current definition:

- Seems partly circular in that (3) and (5) refer to minimum operating level.
- Is not relevant for a bidirectional unit which (by definition) must be capable of transitioning smoothly between production and consumption.
- For a system, it is always used with reference to the units in operation at a point in time, and as used in this clause only needs to be defined at a unit level.

- (2) a ~~schedule 5.2 plant generating system~~ must be capable of operating in *frequency response mode* such that its *operating production units* automatically provides a proportional:
- (i) decrease in *power transfer to the power system* (or increase in *power transfer from the power system*) in response to a rise in the *frequency of the power system* as measured at the *connection point*; and
  - (ii) increase in *power transfer to the power system* (or decrease in *power transfer from the power system*) in response to a fall in the *frequency of the power system* as measured at the *connection point*,

sufficiently rapidly and sustained for a sufficient period for the ~~Schedule 5.2 Participant Generator or Integrated Resource Provider (as relevant)~~ to be in a position to offer measurable amounts of all *market ancillary services* for the provision of *power system frequency control* (and, for *bidirectional units*, incorporates a smooth change in bidirectional unit operating mode between production and consumption), and

- (3) ~~[Deleted] an integrated resource system, to the extent it comprises production units, must be capable of operating in frequency response mode such that it automatically provides a proportional:~~
- ~~(i) decrease in power transfer to the power system, with a continuous shift from one to the other mode, in response to a rise in the frequency of the power system as measured at the connection point accompanied by a smooth change in bidirectional unit operating mode between production and consumption; and~~
  - ~~(ii) increase in power transfer to the power system in response to a fall in the frequency of the power system as measured at the connection point accompanied by a smooth change in bidirectional unit operating mode between production and consumption;~~

~~sufficiently rapidly and sustained for a sufficient period for the Integrated Resource Provider (as relevant) to be in a position to offer measurable amounts of all market ancillary services for the provision of power system frequency control.~~

**Note**

Clause 4.4.2(b) of the *Rules* sets out the obligations on *Generators* and *Integrated Resource Providers* in relation to compliance with the technical requirements in clause S5.2.5.11, including being capable of operating in *frequency response mode*. Clause 4.4.2(c1) of the *Rules* sets out the obligations on *Scheduled* and *Semi-Scheduled Generators* and *Integrated Resource Providers* in relation to the operation of their *scheduled generating units*, *semi-scheduled generating units* and *scheduled bi-directional units* in accordance with the *Primary Frequency Response Requirements*.

**Minimum access standard**

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

- (1) ~~power transfer to the power system from a schedule 5.2 plant generating system or, to the extent it comprises production units, an integrated resource system, under relatively stable input energy, power transfer to the power system~~ must not:
- (i) increase by more than 2% per Hz in response to a rise in the frequency of the power system as measured at the connection point; and
  - (ii) decrease by more than 2% per Hz in response to a fall in the frequency of the power system as measured at the connection point;

(1A) power transfer from the power system to any bidirectional units of a schedule 5.2 plant must not:

- (i) subject to energy absorption capability, decrease by more than 2% per Hz in response to a rise in the frequency of the power system as measured at the connection point; or
  - (ii) increase by more than 2% per Hz in response to a fall in the frequency of the power system as measured at the connection point; and
- (2) a ~~schedule 5.2 plant generating system~~ must be capable of operating in frequency response mode such that, subject to energy source availability or energy absorption capability (as applicable), its operating production units automatically provides:
- (i) a decrease in power transfer to the power system (or increase in power transfer from the power system) in response to a rise in the frequency of the power system as measured at the connection point; or
  - (ii) an increase in power transfer to the power system (or decrease in power transfer from the power system) in response to a fall in the frequency of the power system as measured at the connection point,

where the change in active power is either proportional or otherwise as agreed with AEMO and the Network Service Provider. ~~and~~

- (3) ~~[Deleted] an integrated resource system, to the extent it comprises production units, must be capable of operating in frequency response mode such that, subject to energy source availability, it automatically provides:~~
- ~~(i) a decrease in power transfer to the power system, in response to a rise in the frequency of the power system as measured at the connection point; and~~
  - ~~(ii) increase in power transfer to the power system in response to a fall in the frequency of the power system as measured at the connection point,~~

~~where the change in active power is either proportional or otherwise as agreed with AEMO and the Network Service Provider.~~

#### Note

Clause 4.4.2(b) of the *Rules* sets out the obligations on *Generators* and *Integrated Resource Providers* in relation to compliance with the technical requirements in clause S5.2.5.11, including being capable of operating in *frequency response mode*. Clause 4.4.2(c1) of the *Rules* sets out the obligations on *Scheduled* and *Semi-Scheduled Generators and Integrated Resource Providers* in relation to the operation of their *scheduled generating units, semi-scheduled generating units and scheduled bi-directional units* in accordance with the *Primary Frequency Response Requirements*.

- (d) [Deleted]
- (e) [Deleted]
- (f) [Deleted]

#### 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.
- (i) For the purposes of subparagraphs (b)(2) ~~and (b)(3)~~, and with respect to a *negotiated access standard* proposed for the technical requirements relevant to this clause S5.2.5.11:
  - (1) the change in *power transfer* ~~to the power system~~ must occur with no delay beyond that required for stable operation, or inherent in the *plant* controls, once the *frequency* of the *power system* as measured at the *connection point* leaves a deadband around 50 Hz;
  - (2) a ~~*schedule 5.2 plant generating system or integrated resource system*~~ must be capable of setting the deadband and droop within the following ranges:
    - (i) the deadband referred to in subparagraph (1) must be set within the range of 0 to  $\pm 1.0$  Hz. Different deadband settings may be applied for a rise or fall in the *frequency* of the *power system* as measured at the *connection point*; and
    - (ii) the droop must be set within the range of 2% to 10%, or such other settings as agreed with the *Network Service Provider* and *AEMO*;
  - (3) nothing in subparagraph (b)(2) or ~~(c)(2) (b)(3)~~ is taken to require a ~~*production unit generating system or, to the extent it comprises production units, an integrated resource system*~~ to operate at a level of active power output or consumption:
    - (i) below its minimum operating level; or
    - (ii) above the maximum determined by reference to its nameplate rating and any operating limits consistent with the performance standards of the relevant production system under clauses S5.2.5.1 or S5.2.5.4; and

**Commented [A120]:** Drafting note - the maximum operating level is not necessarily a straightforward or constant value particularly for asynchronous and hybrid plant, as the maximum operating limit of any individual unit may depend on the combination of units at any given time, and operating requirements to meet other performance standards. This drafting is intended to capture the intended principle without unnecessarily restrictive or inapplicable definitions

~~below its minimum operating level in response to a rise in the frequency of the power system as measured at the connection point, or above its maximum operating level in response to a fall in the frequency of the power system as measured at the connection point;~~

**Commented [A121]:** Drafting note - References to frequency rise/fall deleted for streamlined drafting in view of the need to include maximum consumption by bidirectional units.

- (4) **[Deleted]**
- (5) the performance standards must record:
- (i) agreed values for ~~the minimum operating level maximum operating level and minimum operating level of the production units where applicable~~, and where relevant the method of determining the values; ~~and the values for:~~
    - ~~(A) a generating system must take into account its in-service generating units; and~~
    - ~~(B) an integrated resource system must take into account its in-service production units; and~~
  - (ii) for the purpose of subparagraphs (b)(2) ~~and (b)(3)~~, or a negotiated access standard offering measurable ~~measureable~~ amounts of market ancillary services under this clause S5.2.5.11, the market ancillary services, including the performance parameters and requirements that apply to each such market ancillary service.
- (j) If the Network Service Provider agrees that droop response may reasonably be controlled at production unit terminals (rather than the connection point), the performance standards must record the method of calculation of droop to satisfy this clause S5.2.5.11.

#### S5.2.5.12 Impact on network capability

(a0) Paragraph (b)(2) of this clause S5.2.5.12 does not apply to synchronous condensers.

##### Automatic access standard

- (a) The automatic access standard is a schedule 5.2 plant generating system or integrated resource system ~~generating system or integrated resource 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 schedule 5.2 plant generating system or integrated resource system ~~generating system or integrated resource system~~ were not electrically connected.

##### Minimum access standard

- (b) The minimum access standard is a schedule 5.2 plant generating system or integrated resource system ~~generating system or integrated resource system~~ must have plant capabilities, control systems and operational arrangements sufficient to ensure there is no reduction in:
- (1) the ability to supply to 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 production units.

### Negotiated access standard

- (c) ~~[Deleted] 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 schedule 5.2 plant's generating system's or integrated resource system's output if necessary to ensure that the plant is operated in a way that meets at least the minimum access standard under abnormal network or plant network, generating system and integrated resource 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 Schedule 5.2 Participant-Generator or Integrated Resource Provider, notwithstanding that change to the power system, but not changes to the generating system or integrated resource system, may reduce the efficacy of the plant capabilities, control systems and operational arrangements over time.
- (f) ~~[Deleted]~~

Commented [A122]: Drafting note - included in 5.3.4A(b)

### 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 schedule 5.2 plant generating system or integrated resource system (such as a ~~power system~~ power system stabiliser), the Network Service Provider and the Schedule 5.2 Participant-Generator or Integrated Resource Provider ~~(as the case may be)~~ 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) ~~[Deleted]~~ This clause S5.2.5.13 applies to synchronous condensers with the following modifications:
- (1) references to power factor controls or power factor setpoints are not applicable; and
  - (2) settling times for active power do not apply.



(a1) In this clause S5.2.5.13, a **relevant system** means a production system or (where applicable) a synchronous condenser system, having production units or synchronous condensers respectively with a combined nameplate rating equal to or more than the lower of:

(i) 30 MW or 30 MVA (as applicable); or

(ii) the amount (in MW or MVA as applicable) that is 5% of any maximum credible contingency event size specified in the frequency operating standard for the relevant region.

Commented [A123]: See note on S5.2.5.7

#### **Automatic access standard**

(b) The *automatic access standard* is:

(1) ~~subject to paragraph (o), a *schedule 5.2 plant generating system or integrated resource system* must have plant capabilities and control systems sufficient to ensure that:~~

(i) ~~power system oscillations, for the frequencies of oscillation of each of its ~~the production units and synchronous condensers~~ against any other production unit or synchronous condenser, are adequately damped;~~

(ii) ~~operation of the *schedule 5.2 plant generating system or integrated resource system* does not degrade the damping of any critical mode of oscillation of the power system; and~~

(iii) ~~operation of the *schedule 5.2 plant generating system or integrated resource system* does not cause instability (including hunting of tap-changing transformer control systems) that would adversely impact other *Network Users-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;

(2A) a ~~*schedule 5.2 plant generating system or integrated resource system* must have facilities with a control system to regulate voltage, reactive power and power factor;~~ with the ability to:

(i) ~~operate in any control mode; and regulate voltage, either as a primary control mode or, if the Network Service Provider requires a different primary control mode, as a secondary control mode;~~

(ia) where voltage is regulated as a primary control mode, regulate either reactive power or power factor as a secondary control mode; and

(ii) switch between control modes,

where the plant must operate in its primary control mode in normal operation, and may operate in secondary control mode as part of testing, for abnormal power system conditions or for abnormal plant operating

~~conditions as agreed with as shown in the manufacturer's and/or design specifications of the relevant equipment and demonstrated to the reasonable satisfaction of the Network Service Provider and AEMO;~~

- (2B) a ~~schedule 5.2 plant generating system or integrated resource system~~ must have a ~~voltage-voltage~~ control system that, ~~within at least the reactive power response range agreed in a performance standard under clause S5.2.5.1:~~
- (i) regulates ~~voltage-voltage~~ at the *connection point* or another agreed location in the *power system* (including within the ~~schedule 5.2 plant generating system or integrated resource system~~) to within 0.5% of the setpoint, where that setpoint may be adjusted to incorporate any ~~voltage-voltage~~ droop or reactive current compensation agreed with AEMO and the *Network Service Provider*;
  - (ii) regulates ~~voltage-voltage~~ in a manner that helps to support *network voltages-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-voltage~~ setpoint to be ~~continuously controllable configurable~~ in the range of at least ~~95% to 105% 5% of nominal voltage above and below~~ the target ~~voltage-voltage~~ (as determined by the *Network Service Provider* in accordance with clause S5.1.4(c); ~~and recorded in the connection agreement in accordance with clause S5.1.4) at the connection point or agreed location on the power system;~~
    - (iiiA) ~~does not rely without reliance on a tap-changing transformer as the means of voltage regulation and subject to the reactive power capability agreed with AEMO and the Network Service Provider under clause S5.2.5.1; and~~
  - (iv) has limiting devices ~~to that:~~
    - (A) ~~allow the plant to achieve at least the reactive power response range agreed in the performance standard under clause S5.2.5.1; and~~
    - (B) ensure that a ~~voltage-voltage~~ disturbance does not cause ~~the plant a production unit~~ to trip at the limits of its operating capability;
- (3) ~~a generating system or (to the extent it comprises production units) integrated resource system that is comprised of in respect of its synchronous production units and synchronous condensers, a schedule 5.2 plant~~ must have an *excitation control system* that:
- (i) **[Deleted]**
  - (ii) can operate the stator continuously at 105% of *nominal voltage* ~~with rated active power output up to the schedule 5.2 plant's active power capability;~~

**Note**

Active power capability is not considered for synchronous condensers.

- (iii) **[Deleted]**
- (iv) **[Deleted]**
- (v) **[Deleted]**
- (vi) has an excitation ceiling ~~voltage-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 apparent power output transfer of power at the nameplate rating for rated *power factor*, at rated speed and *nominal voltage*;

**Note**

Power factor is not considered for synchronous condensers.

- (vii) for the range of system impedances nominated by the Network Service Provider under paragraph (m) and subject to paragraph (l), has settling settling times within the applicable periods set out in Table S5.2.1 for a step change of voltage-voltage setpoint or voltage-step-like change in voltage at the location agreed under subparagraph (2B)(i) of:

~~(A) generated voltage less than 2.5 seconds for a 5% voltage disturbance with the production 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 production 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) can increase field ~~voltage-voltage~~ from rated field ~~voltage-voltage~~ to the excitation ceiling ~~voltage-voltage~~ in less than:
  - (A) 0.05 second for a *static excitation system*; or
  - (B) 0.5 second for other *excitation control systems*; and
- (ix) has a ~~power system~~ power system stabiliser or power oscillation damper with sufficient flexibility to enable damping performance to be maximised, with a power system stabiliser having the characteristics as described in paragraph (c);

- (4) in respect of its asynchronous production units, a schedule 5.2 plant a generating system or integrated resource system, other than one

**Commented [A124]:** Drafting note - A new table is proposed at the end of the AAS provisions to replace the remaining text, showing response periods when in different primary/secondary control modes - noting requirement that if voltage regulation is not primary then it must be secondary

~~comprised of synchronous production units,~~ must have a voltage control system that:

- (i) ~~[Deleted]~~
- (ii) ~~[Deleted]~~
- (iii) ~~[Deleted]~~
- (iv) ~~[Deleted]~~
- (v) for the range of system impedances nominated by the Network Service Provider under paragraph (m) and subject to paragraph (l), with the ~~schedule 5.2 plant generating system or integrated resource system~~ connected to the power system, has settling times and rise times within the applicable periods set out in Table S5.2.1 for ~~active power, reactive power and voltage~~ due to a step change of voltage setpoint or step-like change in voltage at the location agreed under ~~clause~~ subparagraph (2B)(i); ~~and, of less than:~~
  - (A) ~~5.0 seconds for a 5% voltage disturbance with the generating system or integrated resource 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 or integrated resource 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) ~~[Deleted] has reactive power rise time, for a 5% step change in the voltage setpoint, of less than 2 seconds; and~~
- (vii) has a power oscillation damping capability with sufficient flexibility to enable damping performance to be maximised:
  - (A) with characteristics as described in paragraph (c); or
  - (B) where AEMO has published characteristics for a schedule 5.2 plant comprising asynchronous production units, generating system or integrated resource system other than one comprised of synchronous production units, following consultation in accordance with the *Rules consultation procedures*, with characteristics as published by AEMO.

(c) A power system stabiliser provided under paragraph (b) must have:

- (1) for a *synchronous production unit*, measurements of rotor speed and active power output of the *production unit* as inputs, and otherwise, measurements of *power system frequency* and active power output of the *production unit* as inputs;
- (2) two washout filters for each input, with ability to bypass one of them if necessary;

Commented [A125]: See drafting note above

- (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 production unit* is continually adjustable over the range of -10% to +10% of stator ~~voltage~~ 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.
- (c1) A *reactive power* or *power factor control system* provided under paragraph (b)(2A) must:
- (1) regulate *reactive power* or *power factor* (as applicable) at the *connection point* or another agreed location in the *power system* (including within the ~~schedule 5.2 plant-generating system or integrated resource system~~), to within:
    - (i) for a ~~schedule 5.2 plant-generating system or integrated resource system~~ operating in *reactive power* mode, 2% of the rating (in MVA) of the ~~schedule 5.2 plant-generating system or integrated resource system~~ (expressed in MVAr); or
    - (ii) for a ~~schedule 5.2 plant-generating system or integrated resource system~~ operating in *power factor* mode, a *power factor* equivalent to 2% of the rating (in MVA) of the ~~schedule 5.2 plant-generating system or integrated resource system~~ (expressed in MVAr);
  - (2) allow the *reactive power* or *power factor* setpoint to be continuously controllable across the *reactive power* ~~capability~~ capability range established under clause S5.2.5.1; and
  - (3) ~~with the generating system or integrated resource system connected to the power system, and for a step change in setpoint of at least 50% of the reactive power capability agreed with AEMO and the Network Service Provider under clause S5.2.5.1, or a 5% voltage disturbance at the location agreed under subparagraph (1): for the range of system impedances nominated by the Network Service Provider under paragraph (m) and subject to paragraph (l), with the schedule 5.2 plant connected to the power system, have settling times within the applicable periods set out in Table S5.2.1 for a step change of voltage setpoint or step-like change in voltage at the location agreed under subparagraph (2B)(i).~~
    - (i) ~~have settling times for active power, reactive power and voltage of less than 5.0 seconds from an operating point where the voltage disturbance would not cause any limiting device to operate; and~~
    - (ii) ~~have settling times for active power, reactive power and voltage of less than 7.5 seconds 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.~~

~~The Network Service Provider may determine whether to use a setpoint step test or a 5% voltage disturbance test for the purposes of this subparagraph (e1)(3).~~

**Table S5.2.1 Automatic access standard for rise and settling times**

In this table, **limiting device condition** means either:

- A setpoint change or voltage disturbance equal to half of any percentage change specified in the relevant requirement would just cause a limiting device to operate; or
- A limiting device is operating when the setpoint change is made or the voltage disturbance commences.

| Control mode   | Maximum rise time   | Maximum settling time - setpoint change   | Maximum settling time – voltage disturbance  |
|--|---|---|--|
| <b>Voltage as primary – not synchronised<sup>1</sup></b> | No requirement  | <i>Synchronous production units and synchronous condensers only:</i><br>< 2.5 seconds for:<br><ul style="list-style-type: none"> <li>• voltage</li> <li>• 5% voltage disturbance typical to highest impedance.</li> </ul>   | No requirement   |
| <b>Voltage as primary</b>                                | <i>Asynchronous production units only:</i><br>< 3 seconds without limiting device condition for:<br><ul style="list-style-type: none"> <li>• reactive power</li> <li>• 2-5% voltage disturbance</li> <li>• typical to highest impedance.</li> </ul> | < 5 seconds without limiting device condition<br>< 7.5 seconds with limiting device condition<br>In both cases, for:<br><ul style="list-style-type: none"> <li>• voltage, reactive power and active power</li> <li>• 5% setpoint change</li> <li>• typical to highest impedance</li> <li>• setpoint input ramp rate limit, if applicable, may be disabled for test purposes.</li> </ul> | < 5 seconds without limiting device condition<br>< 7.5 seconds with limiting device condition<br>In both cases, for:<br><ul style="list-style-type: none"> <li>• voltage, reactive power and active power</li> <li>• voltage disturbance between 2% and 5%</li> <li>• typical to highest impedance.</li> </ul> |
| <b>Voltage as secondary</b>                              | No requirement  | No requirement  | < 5 seconds without limiting device condition<br>< 7.5 seconds with limiting device condition<br>In both cases, for:<br><ul style="list-style-type: none"> <li>• voltage, reactive power and active power</li> <li>• 5% voltage disturbance</li> <li>• typical impedance.</li> </ul>                           |
| <b>Power factor as primary</b>                           | No requirement  | Without limiting device condition:  | < 5 seconds without limiting device condition  |

<sup>1</sup> All other requirements apply to *synchronous production units* and *synchronous condensers* only when *synchronised* to the power system.

| Control mode                | Maximum rise time | Maximum settling time - setpoint change   | Maximum settling time – voltage disturbance   |
|-----------------------------|-------------------|---|---|
|                             |                   | <ul style="list-style-type: none"> <li>&lt; 5 seconds in conditions where response overshoots the sustained change or response is oscillatory</li> <li>&lt; 30 seconds otherwise</li> </ul> for: <ul style="list-style-type: none"> <li>reactive power and active power</li> <li>a setpoint change equivalent to at least half of the reactive power range (absorbing to injecting) established under clause S5.2.5.1</li> <li>typical to highest impedance.</li> </ul>                     | < 7.5 seconds with limiting device condition<br>In both cases, for: <ul style="list-style-type: none"> <li>reactive power and active power</li> <li>voltage disturbance between 2% and 5%</li> <li>typical to highest impedance.</li> </ul>                                 |
| Power factor as secondary   | No requirement    | No requirement  | < 5 seconds without limiting device condition<br>< 7.5 seconds with limiting device condition<br>In both cases, for: <ul style="list-style-type: none"> <li>reactive power and active power</li> <li>5% voltage disturbance</li> <li>typical impedance.</li> </ul>          |
| Reactive power as primary   | No requirement    | If limiting device does not operate: <ul style="list-style-type: none"> <li>&lt; 5 seconds in conditions where response overshoots the sustained change or response is oscillatory</li> <li>&lt; 30 seconds otherwise</li> </ul> for: <ul style="list-style-type: none"> <li>reactive power</li> <li>a setpoint change equivalent to at least half of the reactive power range (absorbing to injecting) established under clause S5.2.5.1</li> <li>typical to highest impedance.</li> </ul> | < 5 seconds without limiting device condition<br>< 7.5 seconds with limiting device condition<br>In both cases, for: <ul style="list-style-type: none"> <li>reactive power</li> <li>voltage disturbance between 2% and 5%</li> <li>typical to highest impedance.</li> </ul> |
| Reactive power as secondary | No requirement    | No requirement  | < 5 seconds without limiting device condition<br>< 7.5 seconds with limiting device condition<br>In both cases, for: <ul style="list-style-type: none"> <li>reactive power</li> <li>5% voltage disturbance</li> <li>typical impedance.</li> </ul>                           |

**Minimum access standard**

(d) The *minimum access standard* is:

- (1) ~~subject to paragraph (o), a schedule 5.2 plant-generating system or integrated resource system~~ must have plant capabilities and control

systems, including, if appropriate, a ~~power system~~ power system stabilizer or power oscillation damper, sufficient to ensure that:

- (i) *power system* oscillations, for the frequencies of oscillation of ~~each of its production units and synchronous condensers the production unit~~ against any other *production unit* or synchronous condenser, are *adequately damped*;
  - (ii) operation of the schedule 5.2 plant production 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 schedule 5.2 plant production unit does not cause instability (including hunting of *tap-changing transformer control systems*) that would adversely impact other *Registered Participants*;
- (1A) ~~[Deleted] an integrated resource system (to the extent it comprises production units) that is comprised of:~~
- ~~(i) bidirectional units with a combined nameplate rating of 5 MW or more; or~~
  - ~~(ii) 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;~~
- (2) ~~a generating system comprised of generating units with a combined nameplate rating of 30 MW or more~~ a relevant system must have facilities for testing its control systems sufficient to establish their dynamic operational characteristics;
- (2A) a schedule 5.2 plant generating system or integrated resource system must have ~~facilities with~~ a control system to regulate:
- (i) ~~voltage-voltage~~; or
  - (ii) either of *reactive power* or *power factor* with the agreement of AEMO and the *Network Service Provider*;
- (2B) a ~~voltage-voltage~~ control system for a schedule 5.2 plant generating system or integrated resource system must, within the reactive power response range agreed in a performance standard under clause S5.2.5.1:
- (i) regulate ~~voltage-voltage~~ at the *connection point* or another agreed location in the *power system* (including within the schedule 5.2 plant generating system or integrated resource system), to within 2% of the setpoint, where that setpoint may be adjusted to incorporate any ~~voltage-voltage~~ droop or reactive current compensation agreed with AEMO and the *Network Service Provider*; and



- (ii) allow the ~~voltage-voltage~~ setpoint to be controllable in the range of at least 98% to 102% of the target ~~voltage-voltage~~ (as determined by the *Network Service Provider* in accordance with clause S5.1.4(c)–and recorded in the *performance standards connection agreement in accordance with clause S5.1.4*) at the connection point or the agreed location, ~~subject to the reactive power capability agreed with AEMO and the Network Service Provider under clause S5.2.5.1;~~
- (3) a ~~schedule 5.2 plant's generating system's or integrated resource system's reactive power or power factor control system~~ must, within at least the reactive power response range agreed in a performance standard under clause S5.2.5.1:
  - (i) regulate *reactive power* or *power factor* (as applicable) at the connection point or another agreed location in the *power system* (including within the ~~schedule 5.2 plant-generating system or integrated resource system~~), to within:
    - (A) for a ~~schedule 5.2 plant-generating system or integrated resource system~~ operating in *reactive power* mode, 5% of the rating (in MVA) of the ~~schedule 5.2 plant-generating system or integrated resource system~~ (expressed in MVA); or
    - (B) for a ~~schedule 5.2 plant-generating system or integrated resource system~~ operating in *power factor* mode, a *power factor* equivalent to 5% of the rating (in MVA) of the ~~schedule 5.2 plant-generating system or integrated resource system~~ (expressed in MVA); and
  - (ii) allow the *reactive power* or *power factor* setpoint to be continuously controllable across the *reactive power capability* range established under clause S5.2.5.1;
- (4) a ~~relevant system (measured for the purpose of this requirement by reference to its synchronous production units and synchronous condensers only) generating system with synchronous generating units with a nameplate rating of 30 MW or more, or an integrated resource system (to the extent it comprises production units) comprising synchronous bidirectional units with a nameplate rating of 5 MW or more or synchronous generating units with a nameplate rating of 30 MW or more, in any case~~ with an *excitation control system* required to regulate ~~voltage-voltage~~ under subparagraph (d)(2A)(i) must:
  - (i) **[Deleted]**
  - (ii) have excitation ceiling ~~voltage-voltage~~ of at least 1.5 times the excitation required to achieve ~~transfer of power~~ *apparent power output* at the nameplate rating for rated *power factor*, at rated speed and nominal voltage; and

**Note**

*Power factor is not considered for synchronous condensers.*

- (iii) ~~[Deleted] subject to co-ordination under paragraph (i), have a settling time of less than 7.5 seconds for a 5% voltage disturbance with the production unit synchronised, from an operating point where such a voltage disturbance would not cause any limiting device to operate; and~~
- (iv) ~~[Deleted] have over and under excitation limiting devices sufficient to ensure that a voltage disturbance does not cause the production unit to trip at the limits of its operating capability;~~
- (5) ~~any relevant system generating system comprised of asynchronous generating units with a nameplate rating of 30 MW or more, with an excitation control system required to regulate voltage-voltage under subparagraph (d)(2A)(i) must:~~
  - (i) ~~[Deleted]~~
  - (ii) ~~for the range of system impedances nominated by the Network Service Provider under paragraph (m) and subject to paragraphs (i) and (l), with the schedule 5.2 plant connected to the power system, have settling times within the applicable periods set out in Table S5.2.2 for a step-like change in voltage at the location agreed under subparagraph (2B)(i); and~~

~~subject to co-ordination under paragraph (i), have a settling time of less than 7.5 seconds for a 5% voltage disturbance with the production unit electrically connected to the power system, from an operating point where the such a voltage disturbance would not cause any limiting device to operate; and~~
  - (iii) ~~have limiting devices to ensure that a voltage-voltage disturbance would not cause the generating unit to trip at the limits of its operating capability; and~~
- (6) ~~[Deleted] an integrated resource system (to the extent it comprises production units) comprised of asynchronous bidirectional units with a nameplate rating of 5 MW or more, or synchronous generating units with a nameplate rating of 30 MW or more, in either case with a voltage control system required to regulate voltage under subparagraph (d)(2A)(i) must:~~
  - (i) ~~subject to co-ordination under paragraph (i), have a settling time less than 7.5 seconds for a 5% voltage disturbance with the production 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~~
  - (ii) ~~have limiting devices to ensure that a voltage disturbance would not cause the production unit to trip at the limits of its operating capability.~~

**Table S5.2.2 Minimum access standard for rise and settling times**

| Control mode       | Maximum settling time without operation of limiting device – voltage disturbance |
|--------------------|--|
| Voltage as primary | < 7.5 seconds or longer time agreed with the Network Service Provider, for:      |

| Control mode              | Maximum settling time without operation of limiting device – voltage disturbance  |
|---------------------------|---|
|                           | <ul style="list-style-type: none"> <li>• voltage</li> <li>• 5% voltage disturbance</li> <li>• typical to highest impedance.</li> </ul>  |
| Power factor as primary   | <p>&lt; 7.5 seconds or longer time agreed with the <i>Network Service Provider</i>, for:</p> <ul style="list-style-type: none"> <li>• <i>reactive power</i> and <i>active power</i></li> <li>• 5% voltage disturbance</li> <li>• typical to highest impedance.</li> </ul> |
| Reactive power as primary | <p>&lt; 7.5 seconds or longer time agreed with the <i>Network Service Provider</i>, for:</p> <ul style="list-style-type: none"> <li>• <i>reactive power</i></li> <li>• 5% voltage disturbance</li> <li>• typical to highest impedance.</li> </ul>                         |

#### Negotiated access standard

- (e) **[Deleted]**
- (f) ~~The negotiated access standard proposed by the Generator or Integrated Resource Provider under clause 5.3.4A(b1) must be the highest level that the generating system or integrated resource system can reasonably achieve, including by installation of additional dynamic reactive power equipment, and through optimising its control systems. For a negotiated access standard where the schedule 5.2 plant cannot reasonably meet the automatic access standard at the highest or typical system impedance under paragraph (m), controls must be tuned to achieve performance as close as reasonably practicable to the automatic access standard, prioritising stability of response under high impedance conditions in the primary operating mode.~~
- (g) **[Deleted]**

#### General requirements

- (g1) ~~For the purposes of subparagraph (b)(2A), the Network Service Provider and AEMO will nominate one or more control modes to be implemented when the generating system or integrated resource system is commissioned, and may require additional control modes to be commissioned after connection if the Network Service Provider or AEMO reasonably considers such additional modes to be necessary to ensure power system security or quality of supply. Where a schedule 5.2 plant generating system or integrated resource system has been commissioned for more than one control mode, the Schedule 5.2 Participant Generator or Integrated Resource Provider (as relevant), Network Service Provider and AEMO must agree on a procedure for switching between control modes. The initial operating mode, other available modes and the procedure for switching between modes must be recorded in the performance standards, as part of the performance standard.~~
- (h) A limiting device provided under paragraphs (b) and (d) must:
- (1) not detract from the performance of any power system stabiliser or power oscillation damping capability; and
  - (2) be co-ordinated with all protection systems.

**Commented [A126]:** Drafting note - First part of paragraph deleted to avoid conflict with proposed amendments for operating modes

- (i) The *Network Service Provider* may require that the design and operation of the *control systems* of a ~~*schedule 5.2 plant production unit*~~ be coordinated with the existing ~~*voltage-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 *performance standards*.
- (k) The ~~assessment of~~ impact of the ~~*schedule 5.2 plant production units*~~ on *power system stability* and damping of *power system oscillations* ~~shall be~~ **must be assessed** in accordance with the guidelines for *power system stability* established under clause 4.3.4(h).
- (l) A settling time requirement under this clause S5.2.5.13 is taken to be met if, for a voltage step in any mode or for a voltage setpoint step, the magnitude of error does not exceed the greater of:
  - (1) the value calculated under the definition of settling time; and
  - (2) the higher of the following values, as applicable:
    - (i) for active power,  $\pm 0.5$  MW or  $\pm 2\%$  of the maximum active power ( $P_{max}$ ) recorded in the performance standard for clause S5.2.5.1;
    - (ii) for reactive power,  $\pm 0.5$  MVar or  $\pm 2\%$  of the reactive power capability under the performance standard for clause S5.2.5.1; or
    - (iii) for voltage,  $\pm 0.5\%$  of nominal voltage.
- (m) The Network Service Provider must nominate, and the Schedule 5.2 Participant must record in the relevant releasable user guide, the highest and typical system impedances for tuning of controls and assessment of compliance for the purposes of this clause S5.2.5.13, where:
  - (1) highest system impedance must be consistent with the system impedance at voltage close to nominal for a typical dispatch pattern and network configuration that corresponds to the minimum three phase fault level at the electrically closest system strength node, in combination with the network outage that would cause the greatest reduction in the three phase fault level at the connection point; and
  - (2) typical system impedance is a value that the Network Service Provider considers representative of a typical network configuration and typical levels of schedule 5.2 plant in service.
- (n) Limits on the rate of change of setpoint (rate limits) may be applied to a schedule 5.2 plant for normal operating conditions and, if so, the performance standards must record details of the rate limits applied.
- (o) Where the Schedule 5.2 Participant has elected in accordance with clause 5.3.4B(b1) to pay the system strength charge in relation to the schedule 5.2 plant, assessments under this clause S5.2.5.13 must take into account the performance required to be provided by the System Strength Service Provider at the relevant system strength node in accordance with clause S5.1.14.

#### S5.2.5.14 Active power control

- (a0) This clause S5.2.5.14 does not apply to synchronous condensers.
- (a) The *automatic access standard* is a ~~*schedule 5.2 plant generating system or integrated resource system*~~ must have an *active power control system* capable of:
- (1) for ~~*any scheduled generating units or scheduled bidirectional units; a scheduled generating unit, a scheduled generating system, scheduled bidirectional unit or scheduled integrated resource system;*~~
    - (i) maintaining and changing ~~*its*~~ the *active power level* in accordance with ~~*its*~~ *dispatch instructions*;
    - (ii) ramping ~~*its*~~ the *active power level* linearly from one level of *dispatch* to another; and
    - (iii) receiving and automatically responding to signals delivered from the *AGC*, as updated at a rate of once every 4 seconds (or such other period specified by *AEMO* as required);
  - (2) subject to energy source availability, for ~~*any non-scheduled generating units or non-scheduled bidirectional units; a non-scheduled generating unit, non-scheduled generating system, non-scheduled bidirectional unit or non-scheduled integrated resource system;*~~
    - (i) automatically reducing or increasing ~~*its*~~ the *active power level* 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 (iii);
    - (ii) automatically limiting ~~*its*~~ the *active power level*; to below the level specified in subparagraph (i); and
    - (iii) not changing ~~*its*~~ the *active power level* 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 ~~*any a semi-scheduled generating units or a semi-scheduled generating system;*~~
    - (i) automatically reducing or increasing ~~*its*~~ the *active power level* 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*~~ the *active power level*, to or below the level specified in subparagraph (i);
    - (iii) not changing ~~*its*~~ the *active power level* within 5 minutes by more than the raise and lower amounts specified in an instruction electronically issued by a *control centre*;
    - (iv) ramping ~~*its*~~ the *active power level* linearly from one level of *dispatch* to another; and
    - (v) receiving and automatically responding to signals delivered from the *AGC*, as updated at a rate of once every 4 seconds (or such other period specified by *AEMO* as required).

### Minimum access standard

- (b) The *minimum access standard* is a ~~schedule 5.2 plant generating system or integrated resource system~~ must have an active power control system capable of:
- (1) for ~~any scheduled generating units or scheduled bidirectional units; a scheduled generating unit, a scheduled generating system, scheduled bidirectional unit or scheduled integrated resource system:~~
    - (i) maintaining and changing ~~its-the~~ active power level in accordance with its *dispatch instructions*; and
    - (ii) receiving and automatically responding to signals delivered from the *AGC*, as updated at a rate of once every four seconds (or such other period specified by *AEMO* as required);
  - (2) for ~~any non-scheduled generating units or non-scheduled bidirectional units; a non-scheduled generating unit, non-scheduled generating system, non-scheduled bidirectional unit or non-scheduled integrated resource system:~~
    - (i) reducing ~~its-the~~ active power level, 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-the~~ active power level, to or below the level specified in subparagraph (i); and
    - (iii) subject to energy source availability, ensuring that the change of active power level in a 5 minute period does not exceed a value agreed with *AEMO* and the *Network Service Provider*; and
  - (3) subject to energy source availability, for ~~any a semi-scheduled generating units or a semi-scheduled generating system:~~
    - (i) maintaining and changing ~~its-the~~ active power level in accordance with its *dispatch instructions*;
    - (ii) not changing ~~its-the~~ active power level within five minutes by more than the rise and lower amounts specified in an instruction electronically issued by a *control centre*; and
    - (iii) receiving and automatically responding to signals delivered from the *AGC*, as updated at a rate of once every 4 seconds (or such other period specified by *AEMO* as required).

### 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 ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ to upgrade its *facilities* to receive electronic instructions and fully implement them within 5 minutes.
- (d) ~~A~~ 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 ~~schedule 5.2 plant generating system or integrated resource 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) **[Deleted]**

#### General requirements

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

#### S5.2.5.15 Short circuit ratio

- (a) This clause S5.2.5.15 applies only to asynchronous production units, and to a production system only to the extent of its asynchronous production units (if any).:

~~(1) applies to a generating system and (to the extent it comprises production units) an integrated resource system that in either case is comprised solely of asynchronous production units;~~

~~(2) does not apply to a generating system or (to the extent it comprises production units) an integrated resource system that in either case is comprised solely of synchronous production units; and~~

~~(3) for a generating system or (to the extent it comprises production units) an integrated resource system that is comprised of both synchronous production units and asynchronous production units, applies only to the asynchronous production units and to the generating system or integrated resource system to the extent it relates to its asynchronous production units.~~

#### Minimum access standard

- (b) The *minimum access standard* is a production system ~~generating system or (to the extent it comprises production units) an integrated resource system that is comprised of asynchronous production units~~ must have *plant capability* sufficient for its asynchronous production units to operate stably and remain *connected* at a *short circuit ratio* of 3.0, assessed in accordance with the methodology prescribed in the *system strength impact assessment guidelines* and subject to paragraph (e).

#### General requirements

- (c) The *performance standards* ~~in the connection agreement~~ must record:
- (1) the agreed value of the *short circuit ratio* which must be the minimum of 3.0 and the value at which the production generating system or integrated resource system has, subject to paragraph (e), *plant capability* sufficient to operate stably and remain *connected*;
  - (2) the ~~rated active power~~ active power capability used to calculate the value of the *short circuit ratio*; and
  - (3) any arrangements agreed under paragraph (e).
- (d) The *plant capability* referred to in paragraph (c)(1) may be demonstrated with any appropriate *control system* and/or *protection system* settings. The settings

**Commented [A127]:** Drafting note - given that (e) and (f) are not part of the MAS and if those arrangements apply the plant itself will not have that capability, adding this qualification here and in paragraph (c) makes the intent clear and minimises risk of alternative interpretations

used may be different to the setting required for compliance with other *performance standards* established under this clause S5.2.5.

- (e) If the ~~production generating system or integrated resource~~ system is not *otherwise* capable of meeting the *minimum access standard*, the *Schedule 5.2 Participant-Generator or Integrated Resource Provider* may, if agreed by AEMO, the *Network Service Provider* and the *System Strength Service Provider*, achieve compliance by demonstrating it has:
- (1) in accordance with paragraph (f), legally binding commitments to make additional investment in its *plant* or for the supply to it of services to remedy, at its cost, the shortfall in capability, either on *connection* or in agreed circumstances (such as the occurrence of an event that results in a change to the *three phase fault level* at the *connection point*); together with
  - (2) operational arrangements agreed with the *Network Service Provider* that apply when the investment or services referred to in subparagraph (1) have not yet been made or are not available.
- (f) For paragraph (e)(1), the *Schedule 5.2 Participant-Generator or Integrated Resource Provider* may<sup>22</sup>:
- (1) reach agreement with the *Network Service Provider* for the *Schedule 5.2 Participant-Generator or Integrated Resource Provider* to undertake investment in its *plant* to achieve *plant* capability sufficient to operate stably and remain *connected* at a *short circuit ratio* of 3.0; or
  - (2) procure from the *Network Service Provider*, the *System Strength Service Provider* or another *Registered Participant*, services to enable the *generating system* or *integrated resource system* to operate stably and remain *connected* at a *short circuit ratio* of 3.0 but calculated using a *three phase fault level* at the *connection point* that excludes any contribution from the facilities providing the service.

Commented [A128]: Drafting note - typo correction

#### S5.2.5.16 ~~Voltage phase angle shift~~

- (a) ~~This clause S5.2.5.16:~~
- (1) ~~applies to a *generating system* and (to the extent it comprises *production units*) an *integrated resource system* that in either case is comprised solely of *asynchronous production units*;~~
  - (2) ~~does not apply to a *generating system* or (to the extent it comprises *production units*) an *integrated resource system* that in either case is comprised solely of *synchronous production units*; and~~
  - (3) ~~for a *generating system* or (to the extent it comprises *production units*) an *integrated resource system* that is comprised of both *synchronous production units* and *asynchronous production units*, applies only to the *asynchronous production units* and to the *generating system* or *integrated resource system* to the extent it relates to its *asynchronous production units*.~~

Commented [A129]: Drafting note - suggested deletion on the basis of addition to S5.2.5.8(b6)



#### **Minimum access standard**

- (b) ~~The *minimum access standard* is a *generating system* or *integrated resource system* and each of its *asynchronous production units* must not include any vector shift or similar relay or protective function that acts upon *voltage* phase angle which might operate for phase angle changes less than 20 degrees at the *connection point*.~~

#### **General requirements**

- (c) ~~The agreed value of the settings of any *protection system* must be recorded in the *performance standards*.~~

### **S5.2.6 Monitoring and control requirements**

#### **S5.2.6.1 Remote Monitoring**

(a0) This clause S5.2.6.1 applies to *synchronous condensers* with the following modifications:

- (1) *active power* quantities are to be monitored at the *connection point* only;  
and
- (2) other *active power*-related quantities, *AGC* and turbine-related quantities are not required.

#### **Automatic access standard**

- (a) The *automatic access standard* is a *schedule 5.2 plant* ÷

- ~~(1) *scheduled generating unit*;~~  
~~(2) *scheduled generating system*;~~  
~~(3) *non-scheduled generating unit*;~~  
~~(4) *non-scheduled generating system*;~~  
~~(5) *semi-scheduled generating unit*;~~  
~~(6) *semi-scheduled generating system*;~~  
~~(7) *scheduled bidirectional unit*;~~  
~~(8) *scheduled integrated resource system*;~~  
~~(9) *non-scheduled bidirectional unit*; or~~  
~~(10) *non-scheduled integrated resource system*;~~

must have *remote monitoring equipment* and *remote control equipment* to transmit to, and receive from, *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 remote monitoring quantities referred to under paragraph (a) that *AEMO* may request include:
- (1) in respect of all relevant *schedule 5.2 plant* ~~a *generating system* or *integrated resource system* of a type referred to in subparagraphs (a)(1) to (10)~~:

- (i) the status of all switching devices that carry ~~the generation~~ or load;
  - (ii) ~~tap-changing transformer~~ tap position(s) and ~~voltages~~ voltages;
  - (iii) *active power* and *reactive power* aggregated for groups of identical *production units* or synchronous condensers;
  - (iv) either the number of identical *production units* or synchronous condensers operating or the operating status of each non-identical *production unit* or synchronous condenser;
  - (v) *active power* and *reactive power* for the schedule 5.2 plant generating system or integrated resource system; and
  - (vi) ~~voltage~~ voltage control system setpoint and mode (as applicable);
- (2) in respect of:
- (i) a *generating unit* with a nameplate rating of 30 MW or more; ~~or~~
  - (ii) a *bidirectional unit* with a nameplate rating of 5MW or more; or
  - (iii) a synchronous condenser with a nameplate rating of 30 MVA or more,
- current, ~~voltage~~ voltage, *active power* and *reactive power* in respect of ~~production unit or synchronous condenser generating unit or bidirectional unit~~ stators or power conversion systems (as applicable);
- (3) in respect of an auxiliary supply system with a capacity of 30 MW or more associated with a ~~schedule 5.2 plant generating unit, generating system, bidirectional unit or integrated resource system~~, *active power* and *reactive power*;
  - (4) in respect of *reactive power* equipment that is part of a schedule 5.2 plant generating system or integrated resource system but not part of a particular *production unit* or synchronous condenser, its *reactive power*;
  - (5) in respect of ~~a semi-scheduled generating system, or a semi-scheduled generating units, in an integrated resource system~~, all data specified as mandatory in the relevant *energy conversion model* applicable to ~~the corresponding that~~ type of *semi-scheduled generating unit-system*;
  - (6) in respect of a schedule 5.2 plant to the extent that it is a scheduled resource: scheduled generating system, semi-scheduled generating system, scheduled integrated resource system or scheduled bidirectional unit:
    - (i) maximum *active power* limit;
    - (ii) minimum *active power* limit;
    - (iii) maximum *active power* raise *ramp rate*; and
    - (iv) maximum *active power* lower *ramp rate*;
  - (7) in respect of a run-back scheme agreed with the *Network Service Provider*:
    - (i) run-back scheme status; and

- (ii) *active power, reactive power* or other control limit, as applicable;
  - (8) the mode of operation of ~~*each production unit or production system the generating unit, generating system, bidirectional unit or integrated resource system*~~ including the status of the frequency controller, turbine control limits, or other information required to reasonably predict the active power response of the ~~*schedule 5.2 plant generating system or integrated resource system*~~ to a change in power system frequency at the connection point; and
  - (9) any other quantity that AEMO reasonably requires to discharge its market and power system security functions as set out in Chapters 3 and 4.
- (b1) The remote control quantities referred to under paragraph (a) that AEMO may request include:
- (1) in respect of ~~*any schedule 5.2 plant: a generating system or integrated resource system:*~~
    - (i) ~~*voltage-voltage*~~ control setpoint; and
    - (ii) ~~*voltage-voltage*~~ control mode (where applicable);
  - (2) in respect of a ~~*schedule 5.2 plant to the extent that it is a scheduled resource, scheduled generating system, semi-scheduled generating system or scheduled integrated resource system;*~~ the AGC signal; and
  - (3) in respect of a ~~*schedule 5.2 plant that is non-scheduled, non-scheduled generating system or non-scheduled integrated resource system;*~~ to the extent required to manage network flows:
    - (i) *active power* limit; and
    - (ii) *active power* ramp limit.

**Minimum access standard**

- (c) The *minimum access standard* is a ~~*schedule 5.2 plant*~~ :

- ~~(1) *scheduled generating unit;*~~
- ~~(2) *scheduled generating system;*~~
- ~~(3) *non-scheduled generating system;*~~
- ~~(4) *semi-scheduled generating unit;*~~
- ~~(5) *semi-scheduled generating system;*~~
- ~~(6) *scheduled bidirectional unit;*~~
- ~~(7) *scheduled integrated resource system;*~~
- ~~(8) *non-scheduled bidirectional unit; or*~~
- ~~(9) *non-scheduled integrated resource 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.

- (d) The quantities referred to under paragraph (c) that AEMO may request include:
- (1) the *active power* level of the ~~schedule 5.2 plant-generating system or integrated resource system (as applicable)~~;
  - (2) if connected to a transmission system, the *reactive power* level of the ~~schedule 5.2 plant-generating unit or generating system (as applicable)~~; and
  - (3) in respect of ~~a semi-scheduled generating system, or a semi-scheduled generating unit~~, all data specified as mandatory in the relevant *energy conversion model* applicable to ~~the corresponding that~~ type of ~~semi-scheduled generating system or semi-scheduled generating unit~~;
  - (4) ~~[Deleted] the active power level of the bidirectional unit or integrated resource system (as applicable); and~~
  - (5) ~~[Deleted] if connected to a transmission system, the reactive power level of the bidirectional unit or integrated resource system (as applicable).~~

#### S5.2.6.2 Communications equipment

##### Automatic access standard

- (a) The *automatic access standard* is a ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ must:
- (1) provide and maintain two separate telephone *facilities* using independent telecommunications service providers, for the purposes of *operational communications* between the ~~Schedule 5.2 Participant's Generator's or Integrated Resource Provider'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 ~~schedule 5.2 plant generating system or integrated resource system~~ capable of keeping such equipment available for at least 3 hours following total loss of supply at the *connection point* for the relevant ~~schedule 5.2 plant production unit~~.

##### Minimum access standard

- (b) The *minimum access standard* is a ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~ must:
- (1) provide and maintain a telephone facility for the purposes of *operational communications* between the ~~Schedule 5.2 Participant's Generator's or Integrated Resource Provider'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 ~~schedule 5.2 plant generating system or integrated resource system~~ capable of keeping such equipment available for at least 1 hour following total loss of

supply at the *connection point* for the relevant *schedule 5.2 plant production 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 *Schedule 5.2 Participant Generator or Integrated Resource Provider* must provide communications paths (with appropriate redundancy) from the *remote monitoring equipment* or *remote control equipment* installed for its *schedule 5.2 plant each of its generating systems or integrated resource systems as appropriate*, to an interface for communication purposes in a location reasonably acceptable to the *Network Service Provider* at the relevant *schedule 5.2 plant-generation facility*.
- (e) Communications systems between the interface for communication purposes under paragraph (d) and the *control centre* must be the responsibility of the *Network Service Provider* unless otherwise agreed by the *Schedule 5.2 Participant Generator or Integrated Resource Provider* (as the case may be) and the *Network Service Provider*.
- (f) A *negotiated access standard* must include a requirement that the *Schedule 5.2 Participant Generator or Integrated Resource Provider* provide accommodation and secure power supplies for communications facilities provided by the *Network Service Provider* under this clause S5.2.6.2.

#### **S5.2.7 Power station Generation auxiliary supplies**

In cases where a *production system generating system or integrated resource system* takes its *auxiliary load* via a *connection point* through which its *generation* is not transferred to the *network*, the *access standards for the auxiliary load connection point* must be established under clause S5.3.5 as if the *Schedule 5.2 Participant Generator or Integrated Resource Provider* (as the case may be) were a *Schedule 5.3 Participant, Market Customer*.

#### **S5.2.8 Fault current**

##### **Automatic access standard**

- (a) The *automatic access standard* is:
  - (1) the contribution of the *schedule 5.2 plant generating system or integrated resource 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 ~~schedule 5.2 plant generating system's or integrated resource 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 ~~schedule 5.2 plant or any of its production units and synchronous condensers generating unit, generating system, bidirectional unit or integrated resource 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 ~~relevant plant, generating unit, generating system, bidirectional unit or integrated resource system~~, as specified in the *connection agreement*.

#### Minimum access standard

- (b) The *minimum access standard* is:
  - (1) the ~~schedule 5.2 plant generating system or integrated resource system~~ does not need to limit fault current contribution;
  - (2) a ~~schedule 5.2 plant generating system's or integrated resource 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 ~~schedule 5.2 plant or any of its production units or synchronous condensers generating unit, generating system, bidirectional unit or integrated resource 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 ~~relevant plant, generating unit, generating system, bidirectional unit or integrated resource 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 ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider (as the case may be)~~, impose the least obligation on the ~~Schedule 5.2 Participant-Generator or Integrated Resource Provider~~.
- (d) ~~[Deleted] 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:~~

Commented [A130]: Drafting note - Included in 5.3.4A(b)

- ~~(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 **Technical connection requirements for loads** **Conditions for Connection of Customers**

### S5.3.1a **Application of the schedule Outline of requirements**

- (a) This schedule sets out details of additional requirements and conditions that a person to whom this schedule applies (described in paragraph (a1)) must satisfy as a condition of connection to the power system of plant that consumes electricity from a network, including a distribution network or a source of load in an integrated resource system, but excluding schedule 5.2 plant and schedule 5.3a plant ("schedule 5.3 plant").

This schedule applies to the following classes of Network User:

- ~~(1) [Deleted]~~
- ~~(2) [Deleted]~~
- ~~(3) a Market Customer in respect of its market connection points;~~
- ~~(4) a Non Registered Customer in respect of its connection to a network; and~~
- ~~(5) a Distribution Network Service Provider in respect of its distribution network.~~

- (a1) This schedule applies to a person ("Schedule 5.3 Participant") in respect of schedule 5.3 plant if that person is one of the following:

- (1) the Connection Applicant in respect of a schedule 5.3 plant, who:
  - (i) is or intends to be the Registered Participant for that plant;
  - (ii) has appointed or intends to appoint an intermediary for that plant; or
  - (iii) wishes to establish a connection to a transmission network; or
- (2) the Connection Applicant in respect of a schedule 5.3 plant other than a person referred to in paragraph (1), but only to the extent that the Network Service Provider considers that the connection or operation of the schedule 5.3 plant would otherwise adversely affect the quality or security of network service to other Network Users.

- (b) For the purposes of this schedule 5.3 the term **Network Service Provider** ~~means 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) ~~[Deleted]~~

**Commented [A131]:** Drafting note - The changes proposed to this schedule at present relate to:

- Application provisions, minor corrections and common definitional changes; and
- Initial amendments to allow key performance capabilities to be identified/recorded and facilitate stability monitoring & protection for large inverter-based loads where needed. Detailed technical requirements will be addressed after a separate review.

**Commented [A132]:** Drafting note - this seeks to narrow the application of the schedule (which currently conflicts with the rest of Chapter 5) to provide more consistent and realistic application criteria.

**Commented [A133]:** Drafting note - Note that (D)NSPs can register as intermediaries

**Commented [A134]:** Drafting note - as for schedule 5.2, the intent is to provide flexibility to apply only some of the standards in these cases

**Commented [A135]:** Drafting note - to align with 5.2.3(b)(3)

~~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~~ with a Schedule 5.3 Participant, as applicable to its schedule 5.3 plant:

(1) ~~the relevant provisions~~ each provision of this schedule ~~that is expressed as an obligation~~ on a Schedule 5.3 Participant Network User; and

(2) ~~each the relevant agreed performance standards with which the Schedule 5.3 Participant must comply. and an obligation to comply with it.~~

(e) ~~[Deleted] 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.~~

(f) This schedule does not apply to a Network Service Provider or a Network User in relation to a connection to a regulated SAPS.

**Commented [A136]:** Drafting note - deletion suggested given the application of the schedule more broadly than a rule 5.3 connection process.

### S5.3.1 Information

(a) Before a ~~Schedule 5.3 Participant Network User~~ connects any new or additional equipment to a network, the ~~Schedule 5.3 Participant 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 Schedule 5.3 Participant 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.
- (a1) Before a ~~*Schedule 5.3 Participant Network User*~~ connects any new or additional equipment to a *network* or if earlier, in accordance with the requirements of this Chapter, the ~~*Schedule 5.3 Participant Network User*~~ must submit:
- (1) to AEMO and the relevant *Network Service Provider(s)*, information about the *protection systems* of the equipment;
  - (2) to AEMO and the relevant *Network Service Provider(s)*, information about the *control systems* of the equipment including:
    - (i) a set of functional block diagrams, including all functions between feedback signals and output;
    - (ii) the parameters of each functional block, including all settings, gains, time constants, delays, deadbands and limits;
    - (iii) the characteristics of non-linear elements;
    - (iv) encrypted models in a form suitable for the software simulation products nominated by AEMO in the *Power System Model Guidelines*;
- (2A) if requested by the *Network Service Provider* after consulting with AEMO, information about the capability of the equipment to remain connected to the power system and in operation following one or more frequency or voltage disturbances (ride-through capability):
- (3) to AEMO and the relevant *Network Service Provider(s)*, any other information specified in the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*;
  - (4) to AEMO, model source code (in the circumstances required by the *Power System Model Guidelines*) associated with the model in subparagraph (2)(iv) in an unencrypted form suitable for at least one of the software simulation products nominated by AEMO in the *Power System Model Guidelines* and in a form that would allow conversion for use with other software simulation products nominated by AEMO in the *Power System Model Guidelines*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (a2) The information provided under paragraph (a1) must contain sufficient detail for AEMO and the relevant *Network Service Provider(s)* to perform *power*

system simulation studies in accordance with the requirements and circumstances specified in the *Power System Model Guidelines*.

- (a3) Notwithstanding paragraph (a1), AEMO may exempt a ~~Schedule 5.3 Participant Network User~~ or class of ~~Schedule 5.3 Participants Network Users~~ from the requirement to provide some or all of the information specified in paragraph (a1), and must do so in accordance with the circumstances set out in the *Power System Model Guidelines*.
- (a4) All information provided to AEMO and the relevant *Network Service Provider(s)* under paragraph (a1) or pursuant to paragraph (a3) must be treated as *confidential information* by those recipients. ~~A Schedule 5.3 Participant who receives information under this clause and is not a Registered Participant must comply with rule 8.6 as if it were a Registered Participant.~~
- (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-voltage~~ fluctuation, harmonic ~~voltage-voltage~~ distortion and ~~voltage-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-voltage~~ fluctuations, harmonic ~~voltage-voltage~~ distortion and ~~voltage-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 ~~Schedule 5.3 Participant Connection Applicant~~ agrees the *Network Service Provider* may provide alternative or less detailed technical information in satisfaction of this clause ~~S5.3.1.(b)~~ S5.3.1(b).

### S5.3.2 Design standards

A ~~Schedule 5.3 Participant Network User~~ must ensure that:

- (a) the electrical *plant within the schedule 5.3 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 ~~schedule 5.3 plant 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 ~~schedule 5.3 plant Network User's facilities~~ from the Network Service Provider's facilities is capable of withstanding, without damage, power frequency ~~voltages~~ ~~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 ~~Schedule 5.3 Participant 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 ~~Schedule 5.3 Participant Network User~~ must cooperate in the design and implementation of protection systems to comply with this clause in a manner consistent with achieving the system standards, 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; and
- (4) design and implementation of *protection systems* and settings under paragraph (a):
  - (1) so that the *schedule 5.3 plant* remains in operation as required by the *performance standards* relevant to the type of protection; and
  - (2) except as otherwise required by *AEMO* or the *Network Service Provider*, to maximise the *schedule 5.3 plant's* capability to remain in operation for abnormal *power system* conditions for which the *plant* is not required to *disconnect* under any *performance standard*, while maintaining safe and stable operation of the *plant* within safety margins consistent with *good electricity industry practice*.

**Note**

While a *schedule 5.3 plant* is permitted to *disconnect* for conditions that exceed the requirements for it to remain in operation under any individual *performance standard*, sub-paragraph (2) confirms that protection settings should allow for operation beyond those limits where reasonable. This does not affect other requirements to *disconnect* that may apply, for example, to the provision of *ancillary services*.

Before the ~~*schedule 5.3 plant Network User*~~ installation is connected to the *Network Service Provider's* transmission system or distribution system ~~its the *Network User's*~~ protection system must be tested and the ~~*Schedule 5.3 Participant 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 ~~*Schedule 5.3 Participant 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 ~~*Schedule 5.3 Participant Network User*~~ must not allow its *plant* to take *supply* of electricity from the *power system* without such prior approval.

If a ~~*Schedule 5.3 Participant 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 ~~*Schedule 5.3 Participant 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 ~~Schedule 5.3 Participant 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 ~~Schedule 5.3 Participant 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 ~~Schedule 5.3 Participant 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 ~~Schedule 5.3 Participant Network User~~ to change a setting within 18 months of a previous request, the *Network Service Provider* must pay the ~~Schedule 5.3 Participant Network User~~ its reasonable costs of changing the setting and conducting the tests as requested.

#### **S5.3.4A Disturbance ride through capability**

If information was provided under clause S5.3.1(a1)(2A), the *Network Service Provider* may require the ride-through capability of the *schedule 5.3 plant* to be recorded in the *performance standards*, consistent with the information provided.

If the *performance standards* record the ride-through capability, the *Network Service Provider* must provide a copy of the *performance standards* to *AEMO*.

#### **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 ~~*schedule 5.3 plant 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 ~~Schedule 5.3 Participant Network User~~ must, where required by the Network Service Provider in order to maintain satisfactory ~~voltage-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 ~~Schedule 5.3 Participant 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-voltage~~ levels at the connection point.

### S5.3.6 Balancing of load currents

A Network Service Provider may require a ~~schedule 5.3 plant's connected Registered Participant's~~ load to be balanced across all phases in order to maintain the negative sequence ~~voltage-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-voltage~~ level.

*Automatic access standard:* A ~~Schedule 5.3 Participant Network User~~ must ensure that:

- (a) for connections at 30 kV or higher ~~voltage-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-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 ~~schedule 5.3 plant Network User~~ may cause current unbalance greater than that specified in the automatic access standard provided the ~~schedule 5.3 plant 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 ~~Schedule 5.3 Participant 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 [schedule 5.3 plant Registered Participant](#).

The limit to *load current unbalance* must be included in the [performance standards 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-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-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-voltage~~ fluctuation emission limits and any specified conditions must be included in the [performance standards 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-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-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-voltage~~ distortion emission limits and any special conditions must be included in the [performance standards connection agreement](#), and is subject to verification of compliance by the *Network Service Provider*.

### S5.3.9 Design requirements for Network Users' substations

A ~~Schedule 5.3 Participant 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-voltage~~, harmonics, unbalance and ~~voltage-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

- (a) ~~Schedule 5.3 Participants 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*, which:
  - (1) must be capable of being disconnected; and
  - (2) may also be capable of fast reduction.
- (b) The performance standards must record the nature of the load shedding capability provided as interruptible load under this clause S5.3.10, including any quantities of active power available for fast reduction and the corresponding rates of reduction.
- (c) *Load shedding procedures* may be applied by AEMO, or *EFCS settings schedules* may be determined, in accordance with the provisions of clause 4.3.2 of the *Rules* for the shedding of all *loads* including *sensitive loads*.

#### S5.3.11 Short circuit ratio (customers)

- (a) This clause S5.3.11 applies only to ~~schedule 5.3 plant that a Network User where the plant to be connected~~ includes any an inverter based load that is a large inverter based resource.

##### Minimum access standard

- (b) The *minimum access standard* is electrical *plant* must have *plant* capability sufficient to operate stably and remain *connected* at a *short circuit ratio* of 3.0, or a reasonable higher value agreed with the Network Service Provider and AEMO having regard to expected three phase fault levels at the connection point, assessed in accordance with the methodology prescribed in the *system strength impact assessment guidelines*.

**Commented [A137]:** Drafting note - AEMO recommended further consideration of the application of commercial arrangements to meet this requirement as part of its Load Technical Standards Review



### General requirements

- (c) The *performance standards* ~~in the connection agreement~~ must record:
- (1) the agreed value of the *short circuit ratio*, which must be the ~~minimum of 3.0~~ lower of the value determined under paragraph (b) and the value at which the plant has plant capability sufficient to operate stably and remain connected; and
  - (2) the *maximum demand* used to calculate the agreed value.
- (d) For paragraphs (b) and (c), the *plant* capability may be demonstrated with any appropriate *control system* and/or *protection system* settings. The settings used may be different to the setting required for compliance with other *performance standards* established under this schedule.

### S5.3.12 Detection and response to unstable operation

- (a) This clause S5.3.12 applies to *schedule 5.3 plant*:
- (1) only if it includes an *inverter based load* component that is a *large inverter based resource* and the *Network Service Provider* or *AEMO* considers that the operation of the *schedule 5.3 plant* could reasonably contribute to instability in voltage, reactive power or active power at its *connection point*; and
  - (2) as if references to a *schedule 5.3 plant* include all such *plant* that is operated as a *single integrated facility*, even where different components of that facility are connected at multiple separate *connection points*.

### Automatic access standard

- (b) The *automatic access standard* is a *schedule 5.3 plant* must:
- (1) have *facilities* to detect instability in voltage, reactive power or active power at the *connection point*;
  - (2) have *facilities* capable of *disconnecting* the *inverter based load* for unstable behaviour, with configurable enablement conditions and settings agreed with the *Network Service Provider* and *AEMO*;
  - (3) on detection of instability, execute a hierarchy of actions based on configurable trigger conditions, thresholds and timeframes agreed with the *Network Service Provider* and *AEMO*, where:
    - (i) any hierarchy of actions that includes *disconnection* of *plant* must account for available automated information on the *plant's* contribution to the instability; and
    - (ii) actions are automatically and promptly executed; and
  - (4) if the *inverter based load* component of the *schedule 5.3 plant* is 100 MW or more, have:
    - (i) access to a phasor measurement unit with capability to send data for the *plant* to *AEMO* and the *Network Service Provider*; and

- (ii) the capability to receive information from AEMO relating to the plant's contribution to instability, when available, in a form nominated by AEMO.

#### **Minimum access standard**

(c) The minimum access standard is:

- (1) a schedule 5.3 plant having an inverter based load component that, under normal or planned outage operating conditions of the power system and considering the maximum demand and power factor established under clause S5.3.5, can change the voltage at the connection point by more than 1% from the voltage with the inverter based load not electrically connected, must have:
  - (i) facilities to detect instability in voltage, reactive power or active power at the connection point; and
  - (ii) a process to manage instability promptly on detection, in a manner to be agreed with the Network Service Provider and AEMO.
- (2) a schedule 5.3 plant having an inverter based load component of 100 MW or more must have:
  - (i) if required by the Network Service Provider or AEMO, access to a phasor measurement unit, with capability to send data to AEMO and the Network Service Provider; and
  - (ii) if required by AEMO, the capability to receive information from AEMO relating to the plant's contribution to instability, when available, in a form nominated by AEMO.

#### **General requirements**

- (d) The hierarchy of actions under paragraph (b)(3) or process under paragraph (c)(1)(ii) must prioritise measures to eliminate the instability over disconnecting the plant.
- (e) Requirements and capabilities referable to instability are to be determined having regard to the power system stability guidelines published under clause 4.3.4(h).
- (f) If required by the Network Service Provider or AEMO, a schedule 5.3 plant must have the capability to communicate information from its detection system to their respective control centres.
- (g) If required by the Network Service Provider, a schedule 5.3 plant must have the capability to receive a remote tripping signal from the Network Service Provider.

**Schedule 5.3a** ~~Conditions for connection of Market Network Services Technical requirements for high voltage direct current networks~~

**Commented [A138]:** Drafting note - The mark-up includes changes to several clauses where no technical requirements have changed, to better align the drafting format with schedule 5.2

**S5.3a.1a** ~~Introduction to the schedule Application of 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 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.~~

- (a) ~~This schedule sets out details of additional requirements and conditions that a person to whom this schedule applies (described in paragraph (b)) must satisfy as a condition of connection to the power system of a schedule 5.3a plant.~~
- (b) ~~This schedule applies to a person (“Schedule 5.3a Participant”) in respect of schedule 5.3a plant if that person is:~~
- ~~(1) the person who is, or intends to be, registered as a Market Network Service Provider in respect of that plant; or~~
  - ~~(2) any other Network Service Provider, or a person exempted under clause 2.5.1(d) from the requirement to register as a Network Service Provider, in respect of a schedule 5.3a plant that:~~
    - ~~(i) is, or will be, connected to the alternating current network of a registered Network Service Provider; or~~
    - ~~(ii) is, or will be, interfaced only with alternating current sections of the person’s own network.~~
- (c) ~~This schedule applies to a Schedule 5.3a Participant described in paragraph (b)(2)(ii) with the following modifications:~~
- ~~(1) where this schedule contemplates that a matter is to be agreed with or approved by the Network Service Provider, the Schedule 5.3a Participant must determine that matter in a manner consistent with achieving all relevant system standards and the performance requirements of schedule 5.1 for the broader network, and subject to any requirement for AEMO’s agreement or approval;~~
  - ~~(2) the Schedule 5.3a Participant must consult with AEMO on AEMO advisory matters and determine those matters consistently with AEMO’s advice;~~
  - ~~(3) requirements to co-operate with, or provide information to, the Network Service Provider do not apply; and~~
  - ~~(4) references to the connection point of the schedule 5.3a plant are taken to refer to each of the interfaces between the schedule 5.3a plant and the alternating current network elements, as designated by the Schedule 5.3a Participant and recorded in the performance standards.~~
- (d) ~~In this schedule:~~
- ~~(1) except in paragraph (b), the term Network Service Provider refers to each Network Service Provider to whose alternating current network the schedule 5.3a plant is or will be connected, and not to a Network Service Provider in its capacity as a Schedule 5.3a Participant; and~~
  - ~~(2) except where paragraph (c)(4) applies, references to a connection point are to each of the connection points agreed with the relevant Network Service Provider and AEMO for the purposes of applying the requirements in this schedule 5.3a.~~

- (e) This schedule also sets out the requirements and conditions which, subject to clause 5.2.3 or 5.2.3A of the Rules (as applicable), are obligations on Schedule 5.3a Participants:
- (1) to co-operate with the relevant Network Service Provider on technical matters relating to schedule 5.3a plant;
  - (2) to provide information to the Network Service Provider or AEMO; and
  - (3) to observe and apply the relevant provisions of the system standards contained in schedule 5.1a in relation to the planning, design and operation of schedule 5.3a plant.
- (f) The Network Service Provider must record all access standards determined for a schedule 5.3a plant under this schedule as the plant's performance standards in (as applicable):
- (1) a connection agreement for the relevant schedule 5.3a plant; or
  - (2) where the Schedule 5.3a Participant is a person described in paragraph (b)(2)(ii), a standalone document that it must provide to AEMO and keep up to date.

#### **S5.3a.1 Provision of Information**

- (a) Before a ~~Schedule 5.3a Participant Market Network Service Provider~~ connects any new or additional equipment to a network, the ~~Schedule 5.3a Participant 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 ~~Schedule 5.3a Participant 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.

- (a1) Before a ~~*Schedule 5.3a Participant-Market Network Service Provider*~~ connects any new or additional equipment to a *network*, the ~~*Schedule 5.3a Participant-Market Network Service Provider*~~ must submit:
- (1) to AEMO and the relevant *Network Service Provider(s)*, information about the *protection systems* of the equipment;
  - (2) to AEMO and the relevant *Network Service Provider(s)*, information about the *control systems* of the equipment including:
    - (i) a set of functional block diagrams, including all functions between feedback signals and output;
    - (ii) the parameters of each functional block, including all settings, gains, time constraints, delays, deadbands and limits;
    - (iii) the characteristics of non-linear elements;
    - (iv) encrypted models in a form suitable for the software simulation products nominated by AEMO in the *Power System Model Guidelines*;
  - (3) to AEMO and the relevant *Network Service Provider(s)*, any other information specified in the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*;
  - (4) to AEMO, model source code (in the circumstances required by the *Power System Model Guidelines*) associated with the model in subparagraph (2)(iv) in an unencrypted form suitable for at least one of the software simulation products nominated by AEMO in the *Power System Model Guidelines* and in a form that would allow conversion for use with other software simulation products nominated by AEMO in the *Power System Model Guidelines*.

**Note**

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

- (a2) The information provided under paragraph (a1) must contain sufficient detail for AEMO and the relevant *Network Service Provider(s)* to perform *power system simulation studies* in accordance with the requirements and circumstances specified in the *Power System Model Guidelines*.
- (a3) ~~All information provided to AEMO and the relevant *Network Service Provider(s)* under paragraph (a1) must be treated as confidential information by those recipients.~~
- (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 ~~*schedule 5.3a plant market network service facility*~~ includes:
- (1) ~~the highest and lowest expected single phase fault level and three phase fault level at the connection point and the X/R ratio, with the schedule 5.3a plant not electrically connected;~~
  - (2) ~~the mid-point voltage for the purposes of clause S5.3a.8;~~

**Commented [A139]:** Drafting note - new paragraph (c) covers entire clause

**Commented [A140]:** Drafting note - amendments proposed to improve consistency with corresponding information requirements in schedule 5.2

- (3) the highest and typical expected system impedance levels at the connection point with the schedule 5.3a plant not connected, as required for the purposes of clause S5.3a.15;
  - (4) any other matters that AEMO or the Network Service Provider may specify, nominate or require for the purposes of any access standard in this schedule 5.3a;
  - (5) 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;
  - (6) the expected limits of voltage fluctuation, harmonic voltage distortion and voltage unbalance at the connection point with the schedule 5.3a plant not connected;
  - (7) technical information relevant to the connection point with the schedule 5.3a plant not electrically connected 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;
  - (8) other 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; and
  - (9) the Network Service Provider's expected three phase fault level at the connection point for the schedule 5.3a plant following the connection of the schedule 5.3a plant.
- (c) All information provided under this clause S5.3a.1 must be treated as confidential information. A Schedule 5.3a Participant who receives information under this clause and is not a Registered Participant must comply with rule 8.6 as if it were a Registered Participant.
- ~~(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 ~~Schedule 5.3a Participant 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 an AEMO advisory matter, ~~one that would involve AEMO under clause 5.3.4A(e) of the Rules~~, also by AEMO. A ~~Schedule 5.3a Participant Market Network Service Provider~~ must not allow its ~~schedule 5.3a plant market network service facilities~~ to supply electricity to, or take electricity from, the power system without such prior approval.

If a ~~Schedule 5.3a Participant 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 an AEMO advisory matter, ~~one that would involve AEMO under clause 5.3.4A(e) of the Rules~~, AEMO, reasonably determines that the changed setting would cause the ~~schedule 5.3a plant 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 an AEMO advisory matter, ~~one that would involve AEMO under clause 5.3.4A(e) of the Rules~~, AEMO, reasonably determines that a setting of a ~~schedule 5.3a plant's 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 ~~Schedule 5.3a Participant 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 ~~Schedule 5.3a Participant Market Network Service Provider~~ to apply a setting or to conduct a test.

A ~~Schedule 5.3a Participant 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 ~~Schedule 5.3a Participant 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 ~~Schedule 5.3a Participant 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 ~~Schedule 5.3a Participant~~

Commented [A141]: Drafting note - For consistency with S5.2.2



~~Market Network Service Provider~~ to change a setting within 18 months of a previous request, the *Network Service Provider* must pay the Schedule 5.3a Participant 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 ~~Schedule 5.3a Participant 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 schedule 5.3a plant market network service facility to another 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

##### Automatic access standard

- (a) The automatic ~~Automatic~~ access standard is:
  - (I) ~~Each a schedule 5.3a plant market network service facility~~ must have in respect of each connection point or pole (as applicable):
    - (i) remote monitoring equipment to transmit to *AEMO's control centres* in real time, ~~all 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;
    - (ii) access to a phasor measurement unit with capability to send data for the schedule 5.3a plant to AEMO and the Network Service Provider;
    - (iii) the capability to receive information from AEMO relating to the schedule 5.3a plant's contribution to instability, when available, in a form nominated by AEMO; and
    - (iv) if required by the Network Service Provider, the capability to receive a remote tripping signal from the Network Service Provider.

**Commented [A142]:** Drafting note - clause S5.2.5.10- equivalent requirements applicable to asynchronous plant have been added to this clause

**Commented [A143]:** Drafting note - 'or pole' is added to cater for a bi-pole HVDC link where both poles connect behind the same connection point. In this case it is possible for one to become unstable and the other to provide damping, with separate monitoring therefore desirable.

- (2) ~~[Deleted] 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.~~

**Minimum access standard**

- (b) ~~The minimum ~~Minimum~~ access standard is:~~

~~Each a schedule 5.3a plant market network service facility must have:~~

- (1) ~~remote monitoring equipment to transmit to AEMO's control centres in real time in respect of each connection point or pole (as applicable):~~
  - ~~(A*i*) connection point active power flow, reactive power flow and ~~voltage-voltage~~;~~
  - ~~(B*ii*) active power, reactive power and ~~voltage-voltage~~ for AC power lines, transformers and busbars, and power and voltage (or alternatively current) for DC power lines; and~~
  - ~~(C*iii*) the status of circuit breakers, transformer tap positions, and blocking mode;~~
  - ~~(iv) alternating current voltage control mode; and~~
  - ~~(v) direct current control mode and the associated voltage, power, current and angle; and~~
- (2) ~~if required by the Network Service Provider or AEMO, access to a phasor measurement unit with capability to send data for the schedule 5.3a plant to the Network Service Provider and AEMO;~~
- (3) ~~if required by AEMO, the capability to receive information from AEMO relating to the schedule 5.3a plant's contribution to instability, when available, in a form nominated by AEMO; and~~
- (4) ~~if required by the Network Service Provider, the capability to receive a remote tripping signal from the Network Service Provider.~~

- (c) ~~[Deleted]~~

**S5.3a.4.2 ~~[Deleted] Detection and response to unstable operation~~**

**Automatic access standard**

- (a) ~~The automatic access standard is a schedule 5.3a plant must:~~

- (1) ~~have facilities to detect instability in voltage, reactive power or active power at each connection point;~~
- (2) ~~have facilities capable of managing the schedule 5.3a plant for unstable behaviour, with the capabilities, configurable enablement conditions and settings to be agreed with the Network Service Provider and AEMO;~~
- (3) ~~on detection of instability, execute a hierarchy of actions based on configurable trigger conditions, thresholds and timeframes agreed with the Network Service Provider and AEMO, where;~~

- (i) any hierarchy of actions that includes *disconnection* of the *schedule 5.3a plant* must account for available automated information on the *plant's* contribution to the instability; and
- (ii) actions are automatically and promptly executed; and
- (4) have the capability to send information from the detection system to a *control centre*.

#### **Minimum access standard**

- (b) The *minimum access standard* is a *schedule 5.3a plant* must have:
  - (1) the capability to detect instability of voltage, reactive power and active power at each *connection point*;
  - (2) a process to manage instability promptly on detection, in a manner to be agreed with the *Network Service Provider* and *AEMO*; and
  - (3) if required by the *Network Service Provider* or *AEMO*, the capability to send information from the detection system to a *control centre*.

#### **General requirements**

- (c) The hierarchy of actions under paragraph (a)(2) or process under paragraph (b)(2) must prioritise measures to eliminate the instability over *disconnecting the plant*.
- (d) Requirements and capabilities referable to instability are to be determined having regard to the *power system stability guidelines published* under clause 4.3.4(h).

### **S5.3a.4.3 Communications equipment**

A ~~*Schedule 5.3a Participant-Market Network Service Provider*~~ must provide electricity supplies for remote monitoring equipment and remote control equipment installed in relation to its ~~*schedule 5.3a plant 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 ~~*schedule 5.3a plant market network service facility*~~.

A ~~*Schedule 5.3a Participant-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 *schedule 5.3a plant market network service facilities*~~ to a interface for communication purposes in a location reasonably acceptable to the *Network Service Provider* at the relevant *connection point*. Communications systems between this interface for communication purposes and the *control centre* are the responsibility of the *Network Service Provider* unless otherwise agreed by the ~~*Schedule 5.3a Participant-Market Network Service Provider*~~ and the *Network Service Provider*.

Telecommunications between *Network Service Providers* and ~~*Schedule 5.3a Participants-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 ~~*Schedule 5.3a Participant -Market Network Service Provider's responsible Engineer/Operator*~~ and AEMO control centres.

The *facilities* to be provided, including the interface requirement between the *Network Service Provider's* equipment and the ~~*Schedule 5.3a Participant's 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 ~~*Schedule 5.3a Participant-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 ~~*schedule 5.3a plant-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 ~~*schedule 5.3a plant-Market Network Service Provider's facilities*~~ from the *Network Service Provider's facilities* is capable of withstanding, without damage, power frequency ~~*voltages-voltages*~~ and impulse levels nominated by the *Network Service Provider* in accordance with the relevant provisions of the *system standards* and recorded in the ~~*performance standards-relevant connection agreement*~~.

### S5.3a.6 Protection systems and settings

(a0) A ~~*Schedule 5.3a Participant-Market Network Service Provider*~~ must ensure that all *connections of the schedule 5.3a plant* to the *Network Service Provider's 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 requirements of this clause S5.3a.6. following provisions:

**Automatic access standard**

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

- (1) ~~P~~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) ~~E~~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) ~~B~~reaker 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).

#### Minimum access standard

- (b) The *minimum access standard* is:
  - (1) ~~P~~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) .; and
  - (2) ~~I~~f 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).

#### General requirements

- (c) The *Network Service Provider* and the ~~*Schedule 5.3a Participant-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.
- (d) ~~The *Schedule 5.3a Participant-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 ~~*Schedule 5.3a Participant-Market Network Service Provider*~~ must provide details of the protection scheme implemented ~~for the *schedule 5.3a plant* by the *Market Network Service*~~

~~Provider~~ to the *Network Service Provider* and must liaise with the *Network Service Provider* when determining gradings and settings.

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

(f) Before the ~~schedule 5.3a plant—Market Network Service Provider's installation~~ is connected to the *Network Service Provider's* transmission system or distribution system the ~~Market Network Service Provider's~~ protection system must be tested and the ~~Schedule 5.3a Participant—Market Network Service Provider~~ must submit the appropriate test certificate to the *Network Service Provider*.

### S5.3a.7 Short circuit ratio

(a) ~~[Deleted] This clause S5.3a.7 applies to all Market Network Service Providers specified in clause S5.3a.1a.~~

#### Minimum access standard

(b) The *minimum access standard* is an installation comprised of electrical *plant* must have *plant* capability sufficient to operate stably and remain *connected* at a *short circuit ratio* of 3.0, assessed in accordance with the methodology prescribed in the *system strength impact assessment guidelines* and subject to paragraph (e).

#### General requirements

(c) The *performance standards* in the *connection agreement* must record:

- (1) the agreed value of the *short circuit ratio* which must be the minimum of 3.0 and the value at which the *plant* has *plant* capability sufficient to operate stably and remain *connected*; and
- (2) the ~~rated~~ *power transfer capability* used to calculate the value.

(d) For paragraphs (b) and (c), the *plant* capability may be demonstrated with any appropriate *control system* and/or *protection system* settings. The settings used may be different to the setting required for compliance with other *performance standards* established under this schedule.

(e) If the *plant* is not otherwise capable of meeting the *minimum access standard*, the *Schedule 5.3a Participant* may, if agreed by *AEMO*, the *Network Service Provider* and the *System Strength Service Provider*, achieve compliance by demonstrating it has:

- (1) in accordance with paragraph (f), legally binding commitments to make additional investment in its *plant* or for the supply to it of services to remedy, at its cost, the shortfall in capability, either on *connection* or in agreed circumstances (such as the occurrence of an event that results in a change to the *three phase fault level* at the *connection point*); together with
- (2) operational arrangements agreed with the *Network Service Provider* that apply when the investment or services referred to in subparagraph (1) have not yet been made or are not available.

(f) For paragraph (e)(1), the *Schedule 5.3a Participant* may:

**Commented [A144]:** Drafting note - given that (e) and (f) are not part of the MAS and if those arrangements apply the plant itself will not have that capability, adding this qualification here and in paragraph (c) makes the intent clear and minimises risk of alternative interpretations

**Commented [A145]:** Drafting note - This change, with (e) and (f), is proposed to align with the allowance for commercial arrangements schedule 5.2, consistent with AEMO's high level recommendation. However, given the underlying SCR requirement exists in the NER and is relatively recent, it is proposed as a standard rule change to allow for additional consultation if required on the specific change

- (1) reach agreement with the Network Service Provider for the Schedule 5.3a Participant to undertake investment in its plant to achieve plant capability sufficient to operate stably and remain connected at a short circuit ratio of 3.0; or
- (2) procure from the Network Service Provider, the System Strength Service Provider or another Registered Participant, services to enable the plant to operate stably and remain connected at a short circuit ratio of 3.0 but calculated using a three phase fault level at the connection point that excludes any contribution from the facilities providing the service.

### S5.3a.8 **Reactive power capability**

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

~~Additional reactive power 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.~~

(a) In this clause S5.3a.8:

- (1) the maximum active power of a schedule 5.3a plant refers to its power transfer capability (disregarding for the purpose of this clause any network limitations on that capability), less any applicable temperature derating; and

**Note**

Maximum active power should reflect the capacity of the schedule 5.3a plant itself, because its reactive power capability should not be reduced if the level of active power is reduced (through network limitations or otherwise)

- (2) temperature derating is an amount (which may be calculated by reference to one or more inputs or measurements) by which power transfer capability may be reduced if the relevant plant's production or consumption capacity is materially affected by ambient or operating temperatures.

#### **Automatic access standard**

- (b) The automatic access standard is a schedule 5.3a plant, operating at any level of power transfer, must be capable of supplying or absorbing reactive power

**Commented [A146]:** Drafting note - this clause is replaced with equivalent requirements to S5.2.5.1 in each direction of transfer

continuously at its connection point of amounts at least equal to those specified as the automatic access standard for schedule 5.2 plant in clause S5.2.5.1, for equivalent conditions and by reference to the maximum active power of the schedule 5.3a plant.

#### **Minimum access standard**

- (c) The minimum access standard is a schedule 5.3a plant must meet requirements equivalent to those specified as the minimum access standard for schedule 5.2 plant in clause S5.2.5.1, and a reference in those requirements to clause S5.2.5.13 is taken to refer to the equivalent provision as applied to the schedule 5.3a plant under clause S5.3a.15.

#### **Negotiated access standard**

- (d) The provisions applicable to negotiated access standards for schedule 5.2 plant in clause S5.2.5.1 apply to the Schedule 5.3a Participant, the Network Service Provider and AEMO in respect of the schedule 5.3a plant, to the extent relevant to that plant.

#### **General requirements**

- (e) The general requirements applicable to schedule 5.2 plant in clause S5.2.5.1 apply in respect of the schedule 5.3a plant to the extent relevant to that plant, and a reference in those requirements to any other clause of schedule 5.2 is taken to refer to the corresponding clause of this schedule 5.3a.

### **S5.3a.9 Balancing of load currents**

- (a) A Network Service Provider may require a schedule 5.3a plant's ~~Market Network Service Provider's~~ power transfer to be balanced at a connection point in order to maintain the negative sequence ~~voltage-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-voltage~~ level.

#### **Automatic access standard**

- (b) ~~Automatic access standard: A Market Network Service Provider~~ The automatic access standard is a Schedule 5.3a Participant must ensure that for connections at 11kV or higher ~~voltage-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**

- (c) ~~Minimum access standard: Where~~ The minimum access standard is, where agreed with the relevant Network Service Provider and subject to any specific conditions imposed, a ~~schedule 5.3a plant-Market Network Service Provider~~ may cause current unbalance greater than that specified in the automatic access standard provided the ~~schedule 5.3a plant-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*.

#### **Negotiated access standard**

~~(d) Where these requirements cannot be met the Market Network Service Provider To meet the requirements of a negotiated access standard, a Schedule 5.3a 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 ~~schedule 5.3a plant~~ Market Network Service Provider.

#### **General requirement**

~~(e) The performance standards must record the limit to power transfer current unbalance, which must be included in the connection agreement and~~ is subject to verification of compliance by the Network Service Provider.

### **S5.3a.10 Voltage fluctuations**

#### **Automatic access standard**

(a) ~~Automatic access standard: The voltage~~ The automatic access standard is the voltage fluctuations caused by variations in *loading level* at the *connection point*, including those arising from *energisation*, de-energisation or other operation of the schedule 5.3a plant, must not exceed the limits determined under clause S5.1.5(a).

#### **Minimum access standard**

(b) ~~Minimum access standard: The voltage~~ The minimum access standard is the voltage fluctuations caused by variations in *loading level* at the *connection point*, including those arising from *energisation*, de-energisation or other operation of the schedule 5.3a plant, must not exceed the limits determined under clause S5.1.5(b).

#### **General requirement**

The ~~performance standards must record the must be included in the connection agreement and voltage~~ voltage fluctuation emission limits and any specified conditions, ~~which 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**

#### **Automatic access standard**

(a) ~~Automatic access standard: The~~ The automatic access standard is the harmonic ~~voltage~~ voltage distortion caused by non-linearity, commutation of power electronic equipment, harmonic resonance and other effects within the schedule 5.3a plant, must not exceed the limits determined under clause S5.1.6(a).

#### **Minimum access standard**

- (b) ~~The minimum access standard is the Minimum access standard.~~ The harmonic ~~voltage-voltage~~ distortion caused by non-linearity, commutation of power electronic equipment, harmonic resonance and other effects within the schedule 5.3a plant, must not exceed the limits determined under clause S5.1.6(b).

#### **General requirements**

- (c) A ~~Schedule 5.3a Participant-Market Network Service Provider~~ must ensure that its schedule 5.3a plant ~~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*.
- (d) The performance standards must record the harmonic ~~voltage-voltage~~ distortion emission limits and any special conditions, ~~which 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 ~~Schedule 5.3a Participant-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-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~~ Response to disturbances in the power system**

**Commented [A147]:** Drafting note - this clause combines equivalent provisions to S5.2.5.3 and S5.2.5.4

**Automatic access standard**

- ~~(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*.~~
- ~~(a) The *automatic access standard* is a *schedule 5.3a plant* must remain in continuous uninterrupted operation:~~
- ~~(1) for *frequencies* and rate of change of *frequency* in the ranges specified for the *automatic access standard* for *schedule 5.2 plant* in clause S5.2.5.3(b); and~~
  - ~~(2) for voltage variations within the ranges specified for the *automatic access standard* for *schedule 5.2 plant* in clause S5.2.5.4(a).~~

**Minimum access standard**

- ~~(c) The *minimum access standard* is a *schedule 5.3a plant* must remain in continuous uninterrupted operation:~~
- ~~(1) for *frequencies* and rate of change of *frequency* in the ranges specified for the *minimum access standard* for *schedule 5.2 plant* in clause S5.2.5.3(c) (which apply irrespective of the *schedule 5.3a plant's* *power transfer capability*); and~~
  - ~~(2) for voltage variations within the ranges specified for the *minimum access standard* for *schedule 5.2 plant* in clause S5.2.5.4(b).~~

**General requirements**

- ~~(d) The *general requirements* applicable to *schedule 5.2 plant* in clause S5.2.5.4 apply in respect of the *schedule 5.3a plant* to the extent relevant to that *plant*, and a reference in those requirements to any other clause of schedule 5.2 is taken to refer to the corresponding clause of this schedule 5.3a.~~
- ~~(e) If required by the *Network Service Provider* or *AEMO*, the *performance standard* must include any operational arrangements necessary to minimise the *power system* impacts of tripping of the *schedule 5.3a plant*.~~
- ~~(g)(b) The equipment associated with each *schedule 5.3a plant* *market network service* must be designed to withstand without damage or reduction in life expectancy the harmonic distortion and ~~voltage-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 ~~each the~~ *connection point*.~~

**S5.3a.14 ~~Protection of market network services from power system disturbances~~ Disturbance ride through and response capability**

(a) For the purpose of this clause S5.3a.14, a disturbance (other than a frequency disturbance) is taken to end when the voltage at the connection point recovers to within 90% to 110 % of nominal voltage and remains within that range for at least 20 milliseconds.

**Automatic access standard**

(b) The automatic access standard is a schedule 5.3a plant must:

(1) remain in continuous uninterrupted operation for the types of disturbances specified for the automatic access standard for schedule 5.2 plant in clauses S5.2.5.5(c) and (d);

(2) have facilities capable of supplying or absorbing capacitive reactive current and inductive reactive current at each connection point at levels equivalent to those specified for the automatic access standard for schedule 5.2 plant in clauses S5.2.5.5A(f)(1) and (f)(2), in the conditions specified in those clauses; and

(3) within 100 milliseconds after the end of the disturbance, reach at least 95% of:

(i) the pre-disturbance power transfer level; or

(ii) during a frequency disturbance, a level of power transfer agreed with AEMO and the Network Service Provider, consistent with the schedule 5.3a plant's frequency control arrangements (if applicable),

with, in the case of subparagraphs (2) and (3), equivalent requirements, conditions and exclusions as those specified in clauses S5.2.5.5A(f), (g), (h) and (i).

**Minimum access standard**

(c) The minimum access standard is a schedule 5.3a plant must:

(1) remain in continuous uninterrupted operation for the types of disturbances specified for the minimum access standard for schedule 5.2 plant in clauses S5.2.5.5(k) and (l);

(2) have facilities capable of supplying or absorbing capacitive reactive current and inductive reactive current at each connection point at levels equivalent to those specified for the minimum access standard for schedule 5.2 plant in clauses S5.2.5.5A(m)(1) and (m)(2) in the conditions specified in those clauses; and

(3) from a period after the end of the disturbance agreed with the Network Service Provider and AEMO (which period may differ according to the type of fault), return to at least 95% of:

(i) the pre-disturbance power transfer level; or

(ii) during a frequency disturbance, a level of power transfer agreed with AEMO and the Network Service Provider, consistent with

**Commented [A148]:** Drafting note - references are to the proposed renumbering after splitting existing clause S5.2.5.5

the schedule 5.3a plant's frequency control arrangements (if applicable),

with, in the case of subparagraphs (2) and (3), equivalent requirements, conditions and exclusions as those specified in clauses S5.2.5.5A(m), (n) and (o).

#### **Negotiated access standard**

(d) The provisions applicable to negotiated access standards for schedule 5.2 plant in clause S5.2.5.5 apply to the Schedule 5.3a Participant, the Network Service Provider and AEMO in respect of the schedule 5.3a plant, to the extent relevant to that plant.

#### **General requirements**

(e) The general requirements applicable to schedule 5.2 plant in clauses S5.2.5.5 and S5.2.5.5A apply in respect of the schedule 5.3a plant, to the extent relevant to that plant, and a reference in those requirements to any other clause of schedule 5.2 is taken to refer to the corresponding clause of this schedule 5.3a.

~~(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) [Deleted]~~

- (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.~~

**Commented [A149]:** Drafting note - see proposed paragraph in schedule 5.6

### **S5.3a.15 Voltage and reactive power control**

#### **Automatic access standard**

- (a) ~~The automatic access standard is the plant capabilities, equipment and control systems of a schedule 5.3a plant must meet requirements equivalent to those specified as the automatic access standard for schedule 5.2 plant in clauses S5.2.5.13(b), S5.2.5.13(c) and S5.2.5.13(c1), except that:~~
- ~~(1) requirements expressed to apply only to synchronous production units and synchronous condensers do not apply to a schedule 5.3a plant; and~~
  - ~~(2) a reference to clause S5.2.5.1 is taken to refer to clause S5.3a.8.~~

**Commented [A150]:** Drafting note - new equivalent to S5.2.5.13

#### **Minimum access standard**

- (b) ~~The minimum access standard is the plant capabilities, equipment and control systems of a schedule 5.3a plant must meet requirements equivalent to those specified as the minimum access standard for schedule 5.2 plant in clause S5.2.5.13(d), except that:~~
- ~~(1) requirements expressed to apply only to synchronous production units and synchronous condensers do not apply to a schedule 5.3a plant;~~
  - ~~(2) clause S5.2.5.13(d)(5) applies to all schedule 5.3a plant; and~~
  - ~~(3) a reference to clause S5.2.5.1 is taken to refer to clause S5.3a.8.~~

#### **Negotiated access standard**

- (c) ~~For a negotiated access standard where the schedule 5.3a plant cannot reasonably meet the automatic access standard at the highest or typical system impedance established in an equivalent manner to clause S5.2.5.13(m), controls must be tuned to achieve performance as close as reasonably practicable to the automatic access standard, prioritising stability of response under high impedance conditions in the primary operating mode.~~

#### **General requirements**

- (d) ~~The general requirements applicable to schedule 5.2 plant in clause S5.2.5.13 apply in respect of the schedule 5.3a plant, to the extent relevant to that plant, and a reference in those requirements to any other clause of schedule 5.2 is taken to refer to the corresponding clause of this schedule 5.3a.~~

### **S5.3a.16 Active power control**

#### **Automatic access standard**

- (a) ~~The automatic access standard is a schedule 5.3a plant must have an active power control system capable of:~~
- ~~(1) maintaining and changing the level and direction of power transfer in accordance with dispatch targets;~~

**Commented [A151]:** Drafting note - new equivalent to S5.2.5.14, with 'dispatch instruction' replaced with 'dispatch target' given that new HVDC links may not be operated by an MNNSP

- (2) ramping the power transfer linearly from one level of dispatch to another, including between each direction of transfer; and
- (3) receiving and automatically responding to signals delivered from the AGC, as updated at a rate of once every 4 seconds (or such other period specified by AEMO as required).

#### **Minimum access standard**

- (b) The minimum access standard is a schedule 5.3a plant must have an active power control system capable of:
  - (1) maintaining and changing the level and direction of power transfer in accordance with dispatch targets; and
  - (2) receiving and automatically responding to signals delivered from the AGC, as updated at a rate of once every four seconds (or such other period specified by AEMO as required).

#### **Negotiated access standard**

- (c) A negotiated access standard may include additional requirements, such as operation in response to changes in frequency or phase angle changes, which may otherwise prevent power transfer changing in accordance with a dispatch instruction.
- (d) A negotiated access standard must document to AEMO's satisfaction any operational arrangements necessary to manage network flows for the purpose of achieving compliance with dispatch instructions.

#### **General requirements**

- (e) Each control system used to meet the requirements of this clause S5.3a.16 must be adequately damped.

## **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* and demand of whole *plant* – (maximum MW and/or MVA, or average over 15 minutes or similar).
- (d) Expected *energy* production and consumption (MWh per month).
- (e) *Plant* type and configuration – (eg. number and type of *production units* or number of separate production lines).
- (f) Nature of any disturbing source of *load* (size of disturbing component MW/MVA<sub>r</sub>, duty cycle, nature of power electronic *plant* which may produce harmonic distortion).

- (g) Technology of proposed *production unit* (e.g. *synchronous production unit*, induction generator, photovoltaic array, etc).
- (h) When *plant* is to be in service – (eg. estimated date for each *production unit*).
- (i) Name, ABN, ACN 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 5.4A Preliminary Response

For the purposes of clause 5.3A.7(a), the following information must be included in the preliminary response:

- (a) relevant technical information about the *Distribution Network Service Provider's distribution network*, including guidance on how the *Connection Applicant* may meet the following requirements if it were to proceed to prepare an *application to connect*:
  - (1) primary protection and backup protection;
  - (2) other protection and control requirements applicable to *distribution connected units* and associated *plant*;
  - (3) *remote monitoring equipment* and control communications *facilities*;
  - (4) insulation co-ordination and lightning protection;
  - (5) existing maximum and minimum fault levels and *fault clearance times* of relevant local *zone substations*";
  - (6) switching and *isolation* facilities;
  - (7) interlocking and *synchronising* arrangements;
  - (8) *metering installations*; and
  - (9) remedy or avoid a *general system strength impact* caused by the *connection*;
- (b) if not otherwise provided in accordance with paragraph (a), to the extent the *Distribution Network Service Provider* holds technical information necessary to prepare an *application to connect*, that information;
- (c) information relevant to each technical requirement of the proposed *plant* as relevant to:
  - (1) the *automatic access standards*;
  - (2) any relevant *minimum access standards*; and
  - (3) any applicable *plant standards*; ~~and~~
  - (4) ~~[Deleted] the normal voltage level, if it is expected to change from the nominal voltage level;~~
- (d) the identity of other parties that the *Distribution Network Service Provider* considers:



- (1) will need to be involved in planning to make the *connection* or must be involved under clause 5.3A.10(c); and
- (2) must be paid for *transmission services* or *distribution services*;
- (e) whether it will be necessary for any of the parties identified in subparagraph (d) to enter into an agreement with the *Connection Applicant* in respect of the provision of *connection services* or other *transmission services* or *distribution services* or both, to the *Connection Applicant*;
- (f) where relevant the *Distribution Network Service Provider* is to identify whether any service required to *establish a connection* is *contestable* in the relevant *participating jurisdiction*;
- (g) worked examples of *connection service* charges relevant to the enquiry and an explanation of the factors on which the charges depend;
- (h) information regarding the *Distribution Network Service Provider* and its *network*, system limitations for *sub-transmission lines* and *zone substations* and other information relevant to constraints on the *network* as such information is relevant to the *application to connect*;
- (i) an indication of whether *network augmentation* may be required and if required, what work the *network augmentation* may involve;
- (i1) an indication of whether the new *connection* is expected in the reasonable opinion of a *Network Service Provider* to have a *general system strength impact* and whether a *system strength locational factor* can be calculated in relation to the new *connection*;
- (j) a hyperlink to the *Distribution Network Service Provider's information pack*;
- (k) the contact details for the relevant point of contact within the *Distribution Network Service Provider* managing the *connection* enquiry;
- (l) the *Distribution Network Service Provider's* response to the objectives of the *connection* sought as included by the *Connection Applicant* in its enquiry under clause 5.3A.5(c)(1);
- (m) a description of the process for the provision of the *detailed response*, including the further information to be provided by the *Connection Applicant* and analysis to be undertaken by the *Distribution Network Service Provider* as part of the preparation of the *detailed response*;
- (n) an overview of any available options for *connection* to the *Distribution Network Service Provider's network*, as relevant to an enquiry lodged, at more than one *connection point* in a *network*, including:
  - (1) example single line diagram and relevant *protection systems* and *control systems* used by existing *connection* arrangements;
  - (2) a description of the characteristics of supply; and
  - (3) an indication of the likely impact on terms and conditions of *connection*,as relevant to each optional differing *connection point*;
- (o) a statement of further information required from the *Connection Applicant* for the preparation of the *detailed response*, 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 paragraphs (a) to (c); and
- (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) the *Connection Applicant's* proposal for any *system strength remediation scheme*;
- (p) an estimate of the enquiry fee payable by the *Connection Applicant* for the *detailed response*, including details of how components of the fee were calculated;
- (q) the component of the estimate of the enquiry fee payable by the *Connection Applicant* to request the *detailed response*;
- (r) an estimate of the application fee which is payable on submitting an *application to connect*; and
- (s) any additional information relevant to the enquiry.

#### **Schedule 5.4B Detailed Response to Enquiry**

For the purposes of clause 5.3A.8(g), the following information must be included in the *detailed response*:

- (a) the contact details for the relevant point of contact within the *Distribution Network Service Provider* who will manage the *application to connect*;
- (b) written details of each technical requirement relevant to the proposed *plant* as relevant to the:
  - (1) *automatic access standards*;
  - (2) *minimum access standards*; and
  - (3) any applicable *plant standards*; ~~and~~
  - (4) ~~[Deleted] normal voltage level, if that is to change from the nominal voltage level;~~

together with the technical information to be provided by the *Distribution Network Service Provider* in accordance with the relevant requirements of schedule 5.2, 5.3 or 5.3a;
- (c) details of the *connection* requirements based on the *Connection Applicant's* specifications of the *facility to be connected*;
- (d) details of the level and standard of service of *power transfer capability* that the *Distribution Network Service Provider*, with reasonable endeavours, considers the *network* provides at the location of the *connection point* or *connection points*, if options have been made available under clause S5.4A(n);
- (e) *negotiated access standards* that will require *AEMO's* involvement in accordance with clause 5.3.4A(c);

- (e1) written details of:
- (1) the minimum *three phase fault level* at the *connection point*;
  - (2) the results of the *Network Service Provider's* preliminary assessment of the impact of the new *connection* undertaken in accordance with the *system strength impact assessment guidelines* and clause 5.3.4B; and
  - (3) except where, under clause 5.3.4B(a3), the *Network Service Provider* is not required to calculate the *system strength locational factor*:
    - (i) the indicative *system strength quantity* for the *connection point*;
    - (ii) the *system strength locational factor* for the *connection point*; and
    - (iii) the relevant *system strength node* and the indicative *system strength charge* for the *connection point* using the then applicable *system strength unit price*.
- (f) 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*. The list provided under this paragraph (f) will generally be in the nature of the information set out in schedule 5.5 but may be varied by the *Distribution Network Service Provider* as appropriate to suit the size and complexity of the proposed *facility* to be *connected*;
- (g) commercial information to be supplied by the *Connection Applicant* to allow a *Network Service Provider* (as is relevant) to make an assessment of the ability of the *Connection Applicant* to satisfy the prudential requirements set out in rules 6.21 and 6A.28;
- (h) so far as is relevant, and in relation to services that the *Distribution Network Service Provider* intends to provide, an itemised estimate of *connection* costs including:
- (1) *connection services* charges;
  - (2) costs associated with the proposed metering requirements for the *connection*;
  - (3) costs of any *network extension*;
  - (4) details of *augmentation* required to provide the *connection* and associated costs;
  - (5) details of the interface equipment required to provide the *connection* and associated costs;
  - (6) details of any ongoing operation and maintenance costs and charges to be undertaken by the *Distribution Network Service Provider*; and
  - (7) other incidental costs and their basis of calculation;
- (i) an explanation of the factors affecting each component of the itemised estimate of *connection* costs and the further information that will be taken into account by the *Distribution Network Service Provider* in preparing the final itemised statement of *connection* costs to be provided under clause 5.3.6(b2)(1);

- (j) using reasonable endeavours, all risks and obligations in respect of the proposed *connection* associated with planning and environmental laws not contained in the *Rules*;
- (k) a draft *connection agreement* that contains the proposed terms and conditions for *connection* to the *network* including those of the kind set out in schedule 5.6 and:
  - (1) an explanation of the terms and conditions in the *connection agreement* that need to be finalised; and
  - (2) if relevant, further information necessary from the *Connection Applicant* to finalise the *connection agreement*;
- (l) a description of the process for lodging the *application to connect*, including:
  - (1) the options open to the *Connection Applicant* in submitting an *application to connect* in accordance with clause 5.3A.9;
  - (2) the further analysis to be undertaken by the *Distribution Network Service Provider* as part of the *Distribution Network Service Provider's* assessment of the *application to connect*;
  - (3) further information required from the *Connection Applicant* for the *Distribution Network Service Provider* to assess the *application to connect*; and
  - (4) an outline of proposed milestones (and their timeframes) 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;
- (m) the application fee payable when submitting an *application to connect*;
- (n) whether the *Distribution Network Service Provider* agrees to the *detailed response* remaining valid for a specified period of time to allow the *Connection Applicant* to lodge an *application to connect* within that time; and
- (o) any additional information relevant to the *application to connect*.

## **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.

The *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet* identify for each type of data, its category in terms of clause S5.5.2.

Codes:

S = Standard Planning Data;

D = Detailed Planning Data;

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

#### **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 *Power System Model Guidelines*, *Power System Design Data Sheet*, *Power 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 *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*;
- (b) *Customers* and *Network Service Providers*: schedules 5.5.3, 5.5.4 and the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*;
- (c) *Customers*: schedule 5.5.5 and the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*; and
- (d) ~~Market~~ *Network Service Providers (in respect of schedule 5.3a plant)*: schedules 5.5.3 and 5.5.4 and the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*.

#### S5.5.5 Asynchronous production unit data

A *Generator* or an *Integrated Resource Provider* that connects a *schedule 5.2 plant that includes generating system, that comprises any asynchronous production units generating unit, or an Integrated Resource Provider that connects an integrated resource system that (to the extent it comprises production units) comprises any asynchronous bidirectional units,* must be given exemption from complying with those parts of the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Design Data Sheet* that are determined by the *Network Service Provider* to be not relevant to *that schedule 5.2 plant-such generating systems or integrated resource systems,* but must comply with those parts of schedules 5.5.3, 5.5.4, and 5.5.5 that are relevant to *that schedule 5.2 plant-such generating systems or integrated resource systems,* as determined by the *Network Service Provider*.

#### S5.5.6 Generating units smaller than 30MW data

A *Generator* or an *Integrated Resource Provider* that connects a *generating unit* smaller than 30 MW or *generating units* totalling less than 30 MW to a *connection point* to a *distribution network* must submit registered system planning data and registered data to *AEMO* and the relevant *Network Service Provider* in accordance

**Commented [A152]:** Drafting note - parts of clauses S5.5.4 to S5.5.7 will require revision to reflect the decoupling of plant type from registered participant category, and other consequential changes

with the requirements specified in the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*.

Codes:

S = Standard Planning Data

D = Detailed Planning Data

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

#### **S5.5.6A Bidirectional units smaller than 5MW data**

An *Integrated Resource Provider* that connects a *bidirectional unit* smaller than 5 MW or *bidirectional units* totalling less than 5 MW to a *connection point* to a *distribution network* must submit registered system planning data and registered data to AEMO and the relevant *Network Service Provider* in accordance with the requirements specified in the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*.

Codes:

S = Standard Planning Data

D = Detailed Planning Data

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

#### **S5.5.7 Power System Design Data Sheet, Power System Setting Data Sheet and Power System Model Guidelines**

- (a) AEMO must, subject to paragraphs (b) and (c), develop, *publish* and maintain, in accordance with the *Rules consultation procedures*:
- (1) a *Power System Design Data Sheet* describing, for relevant *plant technologies*, *plant* design parameters including *plant* configurations, impedances, time constants, non-linearities, ratings and capabilities to be provided under clauses 3.11.5(b)(5), 3.11.9(g), 4.3.4(o), 5.2.3(j), 5.2.3(k), 5.2.3A(a), 5.2.4(c), 5.2.4(d), 5.2.5(d), 5.2.5(e), 5.3.9(b)(2), 5.3.12(b)(2), S5.2.4, S5.3.1, S5.3a.1 and this schedule 5.5;
  - (2) a *Power System Setting Data Sheet* describing, for relevant *power systems* and *control system* technologies, the *protection system* and *control system* functions and their settings, including configurations, gains, time constants, delays, deadbands, non-linearities and limits to be provided under clauses 3.11.5(b)(5), 3.11.9(g), 4.3.4(o), 5.2.3(j), 5.2.3(k), 5.2.3A(a), 5.2.3A(b), 5.2.4(c), 5.2.4(d), 5.2.5(d), 5.2.5(e), 5.2.5A(d), 5.2.5A(e), 5.3.9(b)(2), 5.3.9(b)(2A), 5.3.12(b)(2), S5.2.4, S5.3.1, S5.3a.1 and this schedule 5.5; and
  - (3) *Power System Model Guidelines* describing, for relevant *power system* technologies at the *transmission system* and *distribution system* level, AEMO's requirements when developing mathematical models for *plant*, including the impact of their *control systems* and *protection systems* on *power system security* to be provided under clauses 3.11.5(b)(5), 3.11.9(g), 4.3.4(o), 5.2.3(j), 5.2.3(k), 5.2.3A(a), 5.2.3A(b), 5.2.4(c), 5.2.4(d), 5.2.5(d), 5.2.5(e), 5.2.5A(d), 5.2.5A(e), 5.3.9(b)(2),

5.3.9(b)(2A), 5.3.12(b)(2), S5.2.4, S5.3.1, S5.3a.1 and this schedule 5.5.

- (b) When developing, *publishing* and maintaining the *Power System Model Guidelines*, the *Power System Design Data Sheet* and the *Power System Setting Data Sheet* under paragraph (a), *AEMO* must have regard to the purpose of the *Power System Model Guidelines*, the *Power System Design Data Sheet* and the *Power System Setting Data Sheet*, which is to:
- (1) allow *plant* and equipment to be mathematically modelled by *AEMO* 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) the assessment of proposed *negotiated access standards*;
    - (iii) settings of *control systems* and *protection systems* of *plant* and *networks* to be assessed and quantified for maximum practical performance of the *power system*; and
    - (iv) the efficient procurement of *SRASs* and *NSCASs*; and
  - (2) identify for each type of data its category in terms of clause S5.5.2.
- (b1) The *Power System Model Guidelines* must specify:
- (1) the information, including the types of models, that:
    - (i) *Generators* and *Integrated Resource Providers* must provide under clause 5.2.5(d), clause 5.2.5(e), clause 5.2.5A(d), clause 5.2.5A(e), clause 5.3.9(b)(2), 5.3.9(b)(2A), clause S5.2.4 and clause S5.5.6;
    - (ii) *Network Service Providers* must provide under clause 4.3.4(o), clause 5.2.3(j) and clause 5.2.3(k);
    - (iii) *Network Users* must provide under clause 5.2.4(c), clause 5.2.4(d), clause 5.3.12(b)(2) and clause S5.3.1(a1);
    - (iv) *Market Network Service Providers* must provide under clause 5.2.3A(a), clause 5.2.3A(b), clause 5.3.12(b)(2) and clause S5.3a.1(a1);
    - (v) prospective *NSCAS* tenderers must provide under clause 3.11.5(b)(5); and
    - (vi) prospective *SRAS Providers* must provide under clause 3.11.9(g);
  - (2) the model accuracy requirements that are applicable to each type of model provided, as well as the types of *generating systems*, *integrated resource systems* and *plant* and equipment that the model accuracy requirements apply to;
  - (3) when information to which the *Power System Model Guidelines* relates must be provided;
  - (4) a process to be followed in circumstances where a person is unable to provide information required to be provided under clauses 3.11.5(b)(5), 3.11.9(g), 4.3.4(o), 5.2.3(j), 5.2.3(k), 5.2.3A(a), 5.2.3A(b), 5.2.4(c),



- 5.2.4(d), 5.2.5(d), 5.2.4(e), 5.2.5A(d), 5.2.5A(e), 5.3.9(b)(2), 5.3.9(b)(2A), 5.3.12(b)(2), S5.2.4, S5.3.1, S5.3a.1, S5.5.6, schedule 5.5 or as otherwise required by the *Power System Model Guidelines*, *Power System Design Data Sheet* or *Power System Setting Data Sheet*;
- (5) guidance on the factors that *AEMO* will take into account when determining the circumstances under which *AEMO* will request information to be provided, including the *power system* conditions that necessitate the usage of a certain type of model in order to achieve the desired level of accuracy;
  - (6) the format in which information must be provided and any material *AEMO* requires to assess the accuracy of information provided to it; and
  - (7) the circumstances in which model source code is required to be provided.
- (c) In developing and amending the *Power System Model Guidelines*, the *Power System Design Data Sheet* and the *Power System Setting Data Sheet*, *AEMO* must:
- (1) have regard to the reasonable costs of efficient compliance by *Registered Participants* with those guidelines and data sheets compared to the likely benefits from the use of the information provided under the guidelines and data sheets;
  - (2) have regard to any requirements to protect the intellectual property and confidential information of third parties, including where those third parties are not *Registered Participants*; and
  - (3) have regard to *Distribution Network Service Providers'* and *Transmission Network Service Providers'* requirements for data and modelling information that is reasonably necessary for the relevant provider to fulfil its obligations under the *Rules* or *jurisdictional electricity legislation*.
- (d) *AEMO* may amend the *Power System Model Guidelines*, the *Power System Design Data Sheet* or the *Power System Setting Data Sheet* from time to time.
- (e) Any person may submit a written request (with reasons) for *AEMO* to amend the *Power System Model Guidelines*, the *Power System Design Data Sheet* or the *Power System Setting Data Sheet* from time to time.
- (f) In developing and amending the *Power System Model Guidelines*, the *Power System Design Data Sheet* or the *Power System Setting Data Sheet*, *AEMO* must, subject to paragraph (g), consult with *Registered Participants* and such other persons who, in *AEMO's* reasonable opinion have, or have identified themselves as having, an interest in the *Power System Model Guidelines*, in accordance with the *Rules consultation procedures*.
- (g) *AEMO* is not required to comply with the *Rules consultation procedures* when making minor or administrative amendments to the *Power System Model Guidelines*, the *Power System Design Data Sheet* or the *Power System Setting Data Sheet*.

- (h) *AEMO* may at the conclusion of the *Rules consultation procedures* under paragraph (f) or otherwise under paragraph (g), 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**

| <b>Data Description</b>  | <b>Units</b>   | <b>Data Category</b> |
|--|----------------|----------------------|
| <b>Voltage Rating</b>  |                |                      |
| <i>Nominal voltage</i>   | kV             | S, D                 |
| <i>Highest voltage</i>   | kV             | D                    |
| <b>Insulation Co-ordination</b>                                      |                |                      |
| Rated lightning impulse withstand <i>voltage</i>                     | kVp            | D                    |
| Rated short duration power <i>frequency</i> withstand <i>voltage</i> | kV             | D                    |
| <b>Rated Currents</b>  |                |                      |
| 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                  |
| <b>Earthing</b>  |                |                      |
| System Earthing Method   | Text           | S, D                 |
| Earth grid rated current   | kA for seconds | D                    |
| <b>Insulation Pollution Performance</b>                              |                |                      |
| Minimum total creepage   | mm             | D                    |

| Data Description   | Units                | Data Category |
|--|----------------------|---------------|
| Pollution level  | Level of IEC 815     | D             |
| <b>Controls</b>  |                      |               |
| Remote control and data transmission arrangements  | Text                 | D             |
| <b>Metering Provided by Customer</b>   |                      |               |
| 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            |
| <b>Network Configuration</b>   |                      |               |
| 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      |
| <b>Network Impedance</b>   |                      |               |
| For each item of <i>plant</i> :<br>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      |
| <b>Short Circuit Infeed to the Network</b>   |                      |               |
| Maximum generator 3-phase short circuit infeed including infeeds from <i>production units connected</i>  | kA symmetrical       | S, D, R1      |

| Data Description   | Units             | Data Category |
|--|-------------------|---------------|
| to the <i>Registered Participant's</i> system, calculated by method of AS 3851 (1991).               |                   |               |
| 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 at connection point</i> .     | % on 100 MVA base | D, R1         |
| Minimum negative sequence impedance of <i>Registered Participant's network at connection point</i> . | % on 100 MVA base | D, R1         |

#### Load Transfer Capability:

Where a *load*, or group of *loads*, may be fed from alternative *connection points*:

|   |      |       |
|---|------|-------|
| <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 Distribution Connected Units to the Network:

For all ~~production generating~~ *units*, all connecting lines/cables, *transformers* 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 *generating units*, *generating systems*, *bidirectional units* and *integrated resource systems* as per the *Power System Design Data Sheet*, *Power System Setting Data Sheet* and the *Power System Model Guidelines* where such details are not *confidential information*

Commented [A153]: Drafting note - omission from IESS rule

| Data Description | Units | Data Category |
|------------------|-------|---------------|
|------------------|-------|---------------|

***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 |
| 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:**

| Data Description   | Units        | Data Category |
|--|--------------|---------------|
| 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 operating characteristics can be determined | Text | D, R1 |

**FACTS Installation:**

|  |                                    |          |
|--|------------------------------------|----------|
| Data sufficient to enable static and dynamic performance of the installation to be modelled  | Text, diagrams<br>control settings | S, D, R1 |
| Transmission line flow control device  | Text,                              | 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) | diagrams                           |          |
| 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,<br>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        |

| Data Description   | Units   | Data Category |
|--|---------|---------------|
| 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             |

#### Short circuit ratio

|  |               |          |
|--|---------------|----------|
| The value of the <i>short circuit ratio</i> in the <i>minimum access standard</i> in clause S5.2.5.15(b), clause S5.3.11(b) or clause S5.3a.7(b) (as applicable) or if the procedures in clause 5.3.4A have been followed, a <i>negotiated access standard</i> agreed pursuant to clause S5.2.5.15(c), clause S5.3.11(c) or clause S5.3a.7(c) (as applicable). | Numeric ratio | S, D, R1 |
|--|---------------|----------|

#### Schedule 5.5.5 Load Characteristics at Connection Point

| Data Description  | Units            | Data Category |
|---|------------------|---------------|
| <b>For all Types of Load</b>  |                  |               |
| Type of <i>Load</i><br>eg controlled rectifiers or large motor drives | Text             | S             |
| <b>For Fluctuating Loads</b>  |                  |               |
| Cyclic variation of <i>active power</i> over period                   | Graph<br>MW/time | S             |

| Data Description   | Units              | Data Category |
|--|--------------------|---------------|
| Cyclic variation of <i>reactive power</i> over period  | Graph<br>MVar/time | S             |
| Maximum rate of change of <i>active power</i>  | MW/s               | S             |
| Maximum rate of change of <i>reactive power</i>  | MVar/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> | MVar | S |

## Schedule 5.6 Terms and Conditions of Connection agreements and network operating agreements

### Part A Connection agreements

~~The connection agreements~~ A connection agreement must contain the specific conditions that have been agreed to for *connection* and access to the *transmission network* 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 Connection Applicant ~~Registered Participant~~ and all related conditions of agreement resulting from the application of any access provisions contained in schedule 5.1, 5.2, 5.3 or 5.3a, as applicable; schedule 5.1 for Network Service Providers, or schedule 5.2 for Generators and Integrated Resource Providers, or schedule 5.3 for Customers, or schedule 5.3a for Market Network Service Providers;
- (c2) details of any *system strength remediation scheme* agreed, determined or modified in accordance with clause 5.3.4B and associated terms and conditions;
- (c3) details of any *system strength connection works*;
- (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's facility* for breach of commercial undertakings;
- (g1) terms confirming that the *Network Service Provider* is not liable for any loss or damage incurred by the *Connection Applicant* or any other person as a consequence of a fault on either the *power system*, or within the *Connection Applicant's facility*;
- (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* or *bidirectional unit*, to be connected to a *network*, has a *peak load* requirement in excess of 10 MW, the provision, installation, operation and maintenance of automatic *load shedding* ~~shedding~~ facilities for 60 percent of the *load* at any time ~~anytime~~;
- (l) terms and conditions of access to the *metering installation* for the *Metering Provider* and access to *metering installations* type 4A, 5 and 6 for the *Metering Data Provider*;
- (m) the arrangements for the provision of services relating to *non-contestable IUSA components* (if applicable);
- (n) the functional specifications for the *contestable IUSA components*; and
- (o) if the *Connection Applicant* has obtained services related to a *contestable IUSA components* other than from the *Primary Transmission Network Service Provider* and intends to transfer ownership of some or all of those components to the *Primary Transmission Network Service Provider*, arrangements for the transfer of ownership of those components upon energisation of the *identified user shared asset* to the *Primary Transmission Network Service Provider* (if applicable) and how any defects liabilities will be managed.

~~The connection agreements~~ A *connection agreement* 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.

**Commented [A154]:** Drafting note - It is the equipment rather than the participant that would be disconnected. Refer to comment on the definition of 'disconnect'.

**Commented [A155]:** Drafting note - Proposed to replace corresponding paragraph in S5.2.5.8 and S5.3a.14. Alternatively this could sit in schedule 5.11

**Commented [A156]:** Drafting note - paragraph indent decreased

## Part B Network Operating Agreements

A *network operating agreement* between the *Primary Transmission Network Service Provider* and the owner of *contestable IUSA components* or *designated network assets* must include provisions relating to:

- (a) agreed boundaries and physical connection obligations and interface between the *identified user shared asset*, *designated network asset* and the rest of the *transmission network*;

- (b) conditions to transfer operational control of the asset to the *Primary Transmission Network Service Provider*;
- (c) the standard of care to apply to the *Primary Transmission Network Service Provider* in providing operation and maintenance services;
- (d) insurance obligations;
- (e) termination, events of default and force majeure regime;
- (f) liability and indemnity; and
- (g) defect warranties.

[...]

**Schedule 5.13 SAPS Performance Requirements to be defined by Distribution Network Service Providers**

- (a) The *SAPS performance and supply standards* of a *Distribution Network Service Provider* must specify:
  - (1) the standards for the performance of its *regulated SAPS* covering each of the parameters in table S5.13.1 and including at a minimum the information specified in that table;
  - (2) the planning, design and operating standards and requirements for coordination with *Network Users* that the *Distribution Network Service Provider* will apply in relation to its *regulated SAPS* to:
    - (i) achieve adequate levels of *network power transfer capability* and quality of *supply* in its *regulated SAPS*;
    - (ii) achieve a specific level of *network service* at an individual *connection point* in a *regulated SAPS*; and
    - (iii) observe and apply the relevant provisions of the quality of supply and system standards specified in accordance with subparagraph (1); and
  - (3) the contingencies taken into account by the *Distribution Network Service Provider* in the planning and design of a *regulated SAPS*.
- (b) The standards, approaches and other matters in schedule 5.1a and schedule 5.1 must where relevant be considered in the development of *SAPS performance and supply standards*.

**Table S5.13.1**

| <b>Parameter</b>        | <b>Minimum content of standards</b>  |
|-------------------------|--|
| <i>Frequency</i>        | <i>Frequency band in normal operation</i><br><i>Frequency band following a contingency and the maximum permitted time for excursions outside this band</i> |
| <i>System stability</i> | <i>Transient, oscillatory or voltage stability requirements to ensure stable supply in a regulated SAPS</i>  |

| Parameter                         | Minimum content of standards  |
|-----------------------------------|---|
| Power frequency voltage           | <p><del>Normal</del> <u>Nominal</u> voltage of supply at connection points</p> <p>Acceptable limits of supply voltage variation from <del>normal</del> <u>nominal</u> voltage in normal operation and following a contingency</p> <p>Maximum time for which voltage may vary from <del>normal</del> <u>nominal</u> voltage for any given variation from <del>normal</del> <u>nominal</u> voltage</p> <p>These are to be set to achieve distortion free <del>voltage</del> <u>voltage</u> supply for the efficient and safe operation of equipment in customer installations</p> |
| Voltage fluctuations (flicker)    | Maximum <del>voltage</del> <u>voltage</u> fluctuation level of supply   |
| Voltage waveform distortion       | Permitted <del>voltage</del> <u>voltage</u> distortion (harmonics)  |
| Voltage unbalance (if applicable) | <p><del>Voltage</del> <u>Voltage</u> unbalance is to be measured as negative sequence <del>voltage</del> <u>voltage</u></p> <p>Maximum average <del>voltage</del> <u>voltage</u> unbalance in normal operation, measured at a connection point, over a specified averaging period</p> <p>Maximum average <del>voltage</del> <u>voltage</u> unbalance following a contingency</p>  |
| Fault clearance times             | <p>Maximum allowed fault clearance times at <del>nominal</del> <u>nominal</u> voltage levels</p> <p>Fault ride through requirements as necessary to meet stability requirements</p> <p>These must be reasonable and sufficiently fast that they ensure stability and safety with respect to a regulated SAPS</p>  |
| Reliability                       | <p>Performance targets for frequency and duration of supply interruptions in a regulated SAPS</p> <p>Performance targets for expected load not served in a regulated SAPS</p>   |

## CHAPTER 6A

### 6A. Economic Regulation of Transmission Services

#### 6A.23.5 System strength charge

- (a) This clause applies to a *Transmission Network Service Provider* who is a *System Strength Service Provider*.
- (b) In this clause:  
**system strength charging period** means, for a *System Strength Service Provider*, each period running from the start of the second *regulatory year* in a *regulatory control period* of the *System Strength Service Provider* to the end of the first *regulatory year* in its next *regulatory control period*.
- (c) The *pricing methodology* of a *Transmission Network Service Provider* who is a *System Strength Service Provider* must provide for the *System Strength Transmission Service User* for a *system strength connection point* to pay an *annual system strength charge* for the *system strength connection point* determined in accordance with this rule, in equal monthly instalments from the time determined in accordance with the *pricing methodology guidelines*.
- (d) If the obligation to pay the *system strength charge* in relation to a *system strength connection point* commences part way through a *regulatory year*, the *System Strength Service Provider* must calculate the monthly instalments of the *annual system strength charge* for the remaining months of the *regulatory year* on a pro rata basis.
- (e) The *annual system strength charge* for a *system strength connection point* for a *regulatory year* must be calculated in accordance with the following formula:

$$SSC = SSUP \times SSL \times SSQ$$

where:

SSC is the *annual system strength charge* for the *regulatory year* (in \$);

SSUP is the *system strength unit price* of the *System Strength Service Provider* for the *system strength charging period* in which the *regulatory year* falls (in \$/MVA) and for the *system strength node* used to determine the *system strength locational factor* for the *system strength connection point*;

SSL is the *system strength locational factor* applicable to the *system strength connection point* for the *system strength charging period* in which the *regulatory year* falls, determined in accordance with paragraph (h); and

SSQ is the *system strength quantity* for the *system strength connection point*, determined in accordance with paragraph (j) (in MVA).

- (f) The *system strength unit price* of a *System Strength Service Provider* for a *system strength node* must be the same for each *regulatory year* in a *system strength charging period* except to the extent the *pricing methodology guidelines* permit indexation.
- (g) A *System Strength Service Provider* must determine the *system strength node* used to determine the *system strength locational factor* for a *system strength connection point* in accordance with the *system strength impact assessment guidelines*.
- (h) The *system strength locational factor* applicable to a *system strength connection point* is determined by the *Network Service Provider* for the *system strength connection point*. Where:
  - (1) the *System Strength Service Provider* is also the *Network Service Provider* for the *system strength connection point*, the *System Strength Service Provider* must calculate the *system strength locational factor* applicable to each *system strength connection point* for which it is the *Network Service Provider* for each year of a *system strength charging period* in accordance with the *system strength impact assessment guidelines*; and
  - (2) the *System Strength Service Provider* is not the *Network Service Provider* for the *system strength connection point*, the *System Strength Service Provider* must request the relevant *Network Service Provider* under clause 5.3.4C(c) to calculate and notify to the *System Strength Service Provider* the *system strength locational factor*.
- (i) A *System Strength Service Provider* must not change the *system strength locational factor* used to calculate the *system strength charge* for a *system strength connection point* during a *system strength charging period*.
- (j) Subject to paragraph (k), the *system strength quantity* for a *system strength connection point* must be calculated by the *System Strength Service Provider* for the *system strength connection point* in accordance with the methodology in the applicable version of the *system strength impact assessment guidelines* as determined under paragraph (j1), using:
  - (1) the *short circuit ratio*; and
  - (2) the ~~*rated active power*~~, ~~*rated active power capability*~~, *power transfer capability* or *maximum demand* for the *system strength connection point*,

each as agreed in accordance with clause S5.2.5.15, clause S5.3.11 or clause S5.3a.7 (as applicable) and recorded in the relevant *performance standards* for the *plant connected* at the *system strength connection point*.

- (j1) The applicable version of the *system strength impact assessment guidelines* for a *system strength connection point* is the version that was in effect:
- (1) subject to subparagraph (2), at the time the election to pay the *system strength service charge* was notified under clause 5.3.4B(b1) in respect of the *system strength connection point*; or
  - (2) where the *connected plant* has been altered and clause 5.3.9 or 5.3.12 applied in respect of that alteration, at the time the latest election to pay the *system strength charge* was notified under clause 5.3.4B(b1) in respect of the *system strength connection point*.
- (k) If a change to the *short circuit ratio*, ~~*rated active power*~~, ~~*rated active power capability*~~, *power transfer capability* or *maximum demand* (as applicable) for a *system strength connection point* (as recorded in the *performance standards* applicable to the *plant connected* at the *system strength connection point*) comes into effect part way through a *regulatory year*, the *System Strength Service Provider* must calculate the monthly instalments of the *annual system strength charge* for the remaining months of the *regulatory year* using the new *system strength quantity*.

## CHAPTER 10

### 10. Glossary

Relevant definitions extracted. Not all are amended, some provide context only

#### *access standard*

Either an *automatic access standard* or a *negotiated access standard* for a particular technical requirement ~~as recorded in a connection agreement.~~

#### *active power capability*

The maximum ~~amount of active power that rate at which active energy~~ may be transferred ~~to a connection point~~ from a ~~generating unit or a bidirectional unit generating system or integrated resource system to a connection point~~ as specified or proposed to be specified in a *performance standard or connection agreement* ~~(as the case may be).~~

*For a generating system or integrated resource system that is a scheduled resource, the active power capability is equivalent to the aggregate of the maximum generation quantities specified in the bid validation data for all its production units, after accounting for auxiliary load and losses within the relevant system.*

#### *adequately damped*

In relation to a *control system*, when tested with a step change of a feedback input or corresponding reference, or otherwise observed, any oscillatory response at a *frequency* of:

- (a) 0.05 Hz or less, has a damping ratio of at least 0.4;
- (b) between 0.05 Hz and 0.6 Hz, has a halving time of 5 seconds or less (equivalent to a damping coefficient  $-0.14$  nepers per second or less); and
- (c) 0.6 Hz or more, has a damping ratio of at least 0.05 in relation to a *minimum access standard* and a damping ratio of at least 0.1 otherwise.

#### *adverse system strength impact*

An adverse impact, assessed in accordance with the *system strength impact assessment guidelines*, on the ability under different operating conditions of:

- (a) the *power system* to maintain system stability in accordance with clause S5.1a.3; or
- (b) ~~plant a generating system, integrated resource system, market network service facility or inverter based load forming part of the power system~~ to maintain

**Commented [A157]:** Drafting note - once recorded in the connection agreement an access standard becomes the plant performance standard for that matter

**Commented [A158]:** Drafting note - this term intended to replace rated active power in the performance standards.

stable operation including following any *credible contingency event* or *protected event*,

so as to maintain the *power system* in a *secure operating state*.

***AEMO advisory matter***

A matter that relates to *AEMO's* functions under the *NEL* and a matter in which *AEMO* has a role under clause 5.3.4B or in schedules 5.1a, 5.1, 5.2, 5.3 and 5.3a. Advice on the acceptability of *negotiated access standards* under the following clauses are deemed to be *AEMO advisory matters*: S5.1.9, S5.2.5.1, S5.2.5.3 to S5.2.5.5, S5.2.5.7 to ~~S5.2.5.15~~~~S5.2.5.16~~, S5.2.6.1, S5.2.6.2, ~~S5.3.5~~, S5.3.11, ~~S5.3.12~~, S5.3a.4.1, ~~S5.3a.4.2~~, ~~S5.3a.7~~, ~~S5.3a.8~~ and ~~S5.3a.13 to S5.3a.16 and S5.3a.7~~.

**Commented [A159]:** Drafting note - These are added because they require AEMO to be consulted

***asynchronous generating unit***

A *generating unit* that is not a *synchronous generating unit*.

***asynchronous production unit***

A *production unit* that is not a *synchronous production unit*.

***automatic access standard***

In relation to a technical requirement of access, a standard of performance, identified in a schedule of Chapter 5 as an automatic access standard for that technical requirement, such that a *plant* that meets that standard would not be denied access because of that technical requirement.

***bidirectional unit***

- (a) Subject to paragraphs (b) and (c), a *production unit* that also consumes electricity.

**Note:**

Consumption of electricity includes the use of electricity to charge a *production unit* or to pump water for a pumped hydro *production unit*.

- (b) For paragraph (a), disregard *auxiliary load*.
- (c) A *bidirectional unit* within the meaning of paragraph (a) of this definition, that has been classified as a *scheduled generating unit* under clause 2.2.2(b2), is taken for the purposes of the *Rules* (except rules 2.1A and 2.1B and clauses 2.2.2(a) to (b4) or as otherwise provided in the *Rules*) to be a *generating unit* (and not a *bidirectional unit*) and a *scheduled load*.

**Note:**

Clause 2.2.2(b2) provides for the classification of a *bidirectional unit* that is not capable of transitioning linearly from consuming to producing electricity and vice versa. In general terms, these units are *bidirectional units* for registration and classification purposes and otherwise, are *generating units* and *scheduled loads*. Unless the system the unit is part of would satisfy the definition of *integrated resource system* for other reasons, in general terms the system will be an *integrated resource system* for registration and classification purposes and otherwise, a *generating system* and a *scheduled load*.



### **connect**

To form a physical link to or through a *transmission network* (including to a *network connection asset* or through a *dedicated connection asset* that is physically linked to that *transmission network*) or *distribution network*.

#### **Note:**

In the context of Chapter 5A, the above definition has been displaced by a definition specifically applicable to that Chapter. See clause 5A.A.1.

### **connection agreement**

An agreement between a *Network Service Provider* and a *Registered Participant* or other person by which the *Registered Participant* or other person is *connected* to the *Network Service Provider's transmission network* or *distribution network* and/or receives *transmission services* or *distribution services*. In some *participating jurisdictions*, the *Registered Participant* or other person may have one *connection agreement* with a *Network Service Provider* for *connection services* and another agreement with a different *Network Service Provider* for *network services* provided by the *transmission network*.

### **Connection Applicant**

A person who wants to establish or modify *connection* to a *transmission network* or *distribution network* and/or who wishes to receive *network services* and who makes a *connection enquiry* as described in clause 5.3.2 or clause 5.3A.5.

In respect of establishing or modifying a *connection* to a *transmission network* of a *Primary Transmission Network Service Provider*, a *Connection Applicant* includes:

- (a) a person seeking to *connect* its *facilities* to the *transmission network* of that *Primary Transmission Network Service Provider* including through a *dedicated connection asset*; and
- (b) a person seeking to negotiate a *network operating agreement* for a *third party IUSA* or *designated network asset* not owned by the *Primary Transmission Service Provider*.

#### **Note**

In the context of Chapter 5A, the above definition has been displaced by a definition specifically applicable to that Chapter. See clause 5A.A.1.

### **continuous uninterrupted operation**

In respect of a schedule 5.2 plant or a schedule 5.3a plant generating system, generating unit, integrated resource system or bidirectional unit operating immediately prior to a *power system* disturbance:

- (a) not *disconnecting* from the rest of the power system except as required or permitted under its *performance standards* ~~established under clauses S5.2.5.8 and S5.2.5.9;~~
- (b) during the disturbance contributing active and reactive current or active power and reactive power as required or permitted by its *performance standards* ~~established under clause S5.2.5.5;~~

**Commented [A160]:** Drafting note - CUO requirements for schedule 5.3 plant will be proposed following load technical requirements review

- (c) after clearance of any electrical fault that caused the disturbance, not only substantially varying its *active power* and *reactive power* except as required or permitted by its *performance standards* ~~established under clauses S5.2.5.5, S5.2.5.11, S5.2.5.13 and S5.2.5.14~~; and
- (d) not exacerbating or prolonging the disturbance or causing a subsequent disturbance for other *connected plant*, except as required or permitted by its *performance standards*,

with all essential auxiliary and *reactive plant* remaining in service and accounting for, where applicable:

- (e) inherent or programmed responses, in accordance with good electricity industry practice, opposing rate of change of frequency (inertial response) or opposing phase angle jumps; and
- (f) responses consistent with the operation of the plant in accordance with clause 4.4.2(c1) (primary frequency response).

**disconnect**

The operation of switching equipment or other action so as to prevent the flow of electricity to or from connected equipment at a connection point.

**facilities**

A generic term associated with the apparatus, equipment, buildings and necessary associated supporting resources provided at, typically:

- (a) a *power station, generating system* or *integrated resource system*;
- (b) a *substation* or *power station switchyard*;
- (c) a *control centre* (being a *AEMO control centre*, or a *distribution* or *transmission network control centre*);
- (d) facilities providing an *exit service*.

**generated**

In relation to a *production unit*, the amount of electricity produced by the *production unit* as measured at its terminals.

**generating plant**

In relation to a *connection point*, includes all equipment involved in generating electrical *energy*.

**generating system**

- (a) Subject to paragraph (b), for the purposes of the *Rules*, a system comprising one or more *generating units*, other than an *integrated resource system*.
- (b) For the purposes of clause 2.1B.1(c), clause 2.1B.2(b)(4), clause 4.9.2, Chapter 5 and a *jurisdictional derogation* from Chapter 5, a system comprising one or more *generating units*, other than in *integrated resource system*, and includes auxiliary or *reactive plant* that is located on the *Generator's* side of the *connection point* and is necessary for the *generating system* to meet its *performance standards*.

**Commented [A161]:** Drafting note - these changes reflect the fact that the term 'disconnect' is not always used to mean preventing the flow of electricity at the connection point. In some instances the term is intended to be more limited, e.g. disconnecting only faulted equipment or clearing a fault within a network, which does not necessarily involve action being taken at a connection point. The revised clause is broad enough to cover both the entire connection point and specific equipment disconnection. In AEMO's view the context in every instance makes the extent of the necessary disconnection quite clear. One clarification has been made in schedule 5.6

- (c) For the purposes of the *Rules* (except rules 2.1A, 2.1B and 2.2 and except as otherwise provided under the *Rules*), a reference to a *generating unit* in paragraph (a) or (b) of this definition is taken to include a *bidirectional unit* that has been classified as a *scheduled generating unit* as provided for in clause 2.2.2(b2).

**Note**

In relation to paragraph (c), refer to the note to *bidirectional unit*.

**high voltage (HV)**

A ~~voltage~~-voltage greater than 1 kV.

**independently controllable two-terminal link**

A *two-terminal link* through which the *power transfer* can be independently controlled within a range determined by the *power transfer capability* of the *two-terminal link* and the conditions prevailing in the rest of the *power system*.

**integrated resource system**

- (a) Subject to the remaining paragraphs of this definition, any of the following:
- (1) a system comprising one or more *bidirectional units* (and which may also comprise one or more *generating units* or other connected *plant* that is not part of a *bidirectional unit*); and
  - (2) a system comprising one or more *generating units* (and which may also comprise other *connected plant*) where the *connection point* for the system is used to supply electricity for consumption on the system side of the *connection point*.
- (b) For the purposes of paragraph (a)(2), disregard consumption to the extent it is *auxiliary load*.
- (c) For the purposes of clause 2.1B.2(b)(4), clause 4.9.2 and Chapter 5, an *integrated resource system* includes *auxiliary or reactive plant* that is located on the *Integrated Resource Provider's* side of the *connection point* and is necessary for the *integrated resource system* to meet its *performance standards*.
- (d) For the purposes of the *Rules* (except rules 2.1A and 2.1B and except as otherwise provided in the *Rules*) a *bidirectional unit* that has been classified as a *scheduled generating unit* as provided for in clause 2.2.2(b2) is taken to be a *generating unit* (and not a *bidirectional unit*) under paragraph (a) of this definition.

**Note**

In relation to paragraph (d), refer to the note to *bidirectional unit*.

### **interruptible load**

A *load* which is able to be *disconnected* **or reduced**, either manually or automatically initiated, which is provided for the restoration or control of the *power system frequency* by AEMO to cater for *contingency events* or shortages of *supply*.

**Commented [A162]:** Drafting note - For consistency with the definition of *load shedding*. Helps clarify that, while there must be disconnection capability, large loads can also provide fast ramping capability for load shedding

### **load**

According to context:

- (a) The amount of electrical power (in MW) *supplied* from a *network* at a defined instant to a *connection point*, or aggregated over a defined set of *connection points*; or
- (b) a *connection point* or defined set of *connection points* at which electrical power is delivered to a person or to another *network*.

### **load shedding**

~~Reducing or disconnecting~~ **Disconnecting or reducing** *load* from the *power system*, other than by means of *wholesale demand response*.

**Commented [A163]:** Drafting note - Reversed for consistency

### **maximum continuous current**

In respect of a ~~*schedule 5.2 plant-generating system or integrated resource system*~~:

- (a) where ~~assessed-measured~~ at the *connection point*, the current at the *connection point* corresponding to the largest amount of *apparent power* ~~power~~ required by the *generating system's* or *integrated resource system's* performance standard ~~under for clause S5.2.5.1~~, at the ~~nominal normal~~ voltage; and
- (b) where ~~assessed-measured~~ at any other point, the current at that point assessed in the manner agreed by the *Network Service Provider* for the *transmission system* or *distribution system* to which the *generating system* or *integrated resource system* is connected ~~and recorded in the performance standards and recorded in the connection agreement~~.

### **maximum demand**

The highest amount of electrical power delivered, or forecast to be delivered, over a defined period (*day*, *week*, *month*, *season* or *year*) either at a *connection point*, or simultaneously at a defined set of *connection points*.

### **minimum access standard**

In relation to a technical requirement of access, a standard of performance, identified in a schedule of Chapter 5 as a minimum access standard for that technical requirement, such that a *plant* that does not meet that standard will be denied access because of that technical requirement.

### **minimum operating level**

In relation to a *generating unit*, the minimum *generation* required for its continuous stable operation.

### **nameplate rating**

In relation to an *item of equipment*, its ~~The~~ maximum continuous output or consumption in MW, or *apparent power* in MVA for *synchronous condensers*, ~~of an item of equipment~~ as specified by the manufacturer, or as subsequently modified.

In relation to *bidirectional units*, for the purposes of the *Rules* the *nameplate rating* is measured separately for output and consumption and a nameplate rating threshold in the *Rules* will be met or exceeded by:

- (a) a *bidirectional unit*, if it is met or exceeded with respect to either output or consumption of the *bidirectional unit* (or both); and
- (b) a group of *bidirectional units*, if it is met or exceeded with respect to either the combined *nameplate rating* of the *bidirectional units* for output or the combined *nameplate rating* of the *bidirectional units* for consumption (or both).

#### ***negotiated access standard***

In relation to a technical requirement of access in a schedule of Chapter 5, a standard of performance for a particular plant that is agreed in accordance with the requirements for negotiated access standards identified in clause 5.3.4A and the applicable schedule, an agreed standard of performance determined in accordance with clause 5.3.4A and identified as a negotiated access standard for that technical requirement in a connection agreement.

#### ***nominal voltage***

The design voltage ~~voltage~~ level, nominated for a particular location on the *power system*, such that power lines and circuits that are electrically connected other than through *transformers* have the same *nominal voltage* regardless of operating voltage ~~voltage and normal voltage~~.

#### ***normal voltage***

~~In respect of a connection point, its nominal voltage or such other voltage up to 10% higher or lower than nominal voltage, as approved by AEMO, for that connection point at the request of the Network Service Provider who provides connection to the power system.~~

#### ***performance standard***

A standard of performance for a particular plant that, as applicable:

- (a) is ~~established as a result of it being~~ taken to be an applicable performance standard in accordance with clause 5.3.4A(i); ~~or~~
  - (b) is included in the register of *performance standards* established and maintained by *AEMO* under rule 4.14(n);
  - (c) is documented in the connection agreement for a Schedule 5.2 Participant, Schedule 5.3 Participant or Schedule 5.3a Participant, where the connection and access process set out in rule 5.3 or rule 5.3A is not applicable to that plant;  
or
  - (d) is documented by a Network Service Provider in respect of its own relevant plant and provided to AEMO under clause 5.2.3(c1).
- ~~as the case may be.~~

**Commented [A164]:** Drafting note - definition amended to identify the Rule requirements that make something a negotiated access standard.

**plant**

- (a) In relation to a *connection point*, includes all equipment involved in, or supporting, the generation, consumption or conveyance of electricity. ~~generating, consuming or transmitting electrical energy.~~
- (b) In relation to *dispatch bids, scheduled resources*.
- (c) In relation to the *statement of opportunities* prepared by AEMO, individually controllable generating and bidirectional facilities registered or capable of being registered with AEMO.
- (d) In relation to the *regulatory investment test for transmission*, any of the definitions of *plant* in paragraphs (a) to (c) relevant to the application of the *regulatory investment test for transmission* to a RIT-T project.
- (e) In relation to the *regulatory investment test for distribution*, any of the definitions of *plant* in paragraphs (a) to (c) relevant to the application of the *regulatory investment test for distribution* to a RIT-D project.
- (f) In relation to a *system strength remediation scheme*, includes all equipment involved in the implementation of the scheme.
- (g) In relation to the *power system*, includes all equipment involved in the *generation, transmission or distribution* of electrical energy.
- (h) In relation to a *market ancillary service*, includes all equipment involved in providing the *market ancillary service*.

**power transfer**

The instantaneous rate at which *active energy* is transferred across a connection point or network element, or between locations in one or more networks ~~connection points~~.

**power transfer capability**

The maximum permitted *power transfer* through a *transmission network* or *distribution network* or part thereof.

### production system

A term used in schedule 5.2 to refer to either:

- (a) a generating system; or
- (b) an integrated resource system, but only to the extent of its production units and synchronous condensers (as applicable), and any auxiliary or reactive plant located on the Integrated Resource Provider's side of the connection point and necessary for the integrated resource system to meet its performance standards.

#### **Note**

Plant that is part of an integrated resource system but is neither a production unit nor consuming auxiliary load, may be schedule 5.3 plant under clause S5.3.1a.

### production unit

Plant used in the production of electricity and all related equipment essential to its functioning as a single entity.

#### **Note**

Generating units and bidirectional units are production units.

### rated active power

- ~~(a) — In relation to a production unit, the maximum amount of active power that the generating unit can continuously deliver at the connection point when operating at its nameplate rating.~~
- ~~(b) — In relation to a generating system or integrated resource system, the combined maximum amount of active power that its in-service production units can deliver at the connection point, when its in-service production units are operating at their nameplate ratings.~~

**Commented [A165]:** Drafting note - other than the access standards and provisions relating to SCR (now replaced by a modified definition of active power capability), this term is only used in Chapter 9, where it has been separately defined

### rated maximum demand

- ~~(a) — In relation to a bidirectional unit, the maximum amount of active power that the plant can continuously consume at the connection point when operating at its nameplate rating.~~
- ~~(b) — In relation to an integrated resource system, the combined maximum amount of active power that its in-service bidirectional units can consume at the connection point, when its in-service bidirectional units are operating at their nameplate ratings.~~

**Commented [A166]:** Drafting note - To be replaced by 'maximum demand' in the access standards

### reactive power capability

The ~~maximum~~ amount of reactive power that a plant is capable of supplying to or absorbing from the network at its rate at which reactive energy may be transferred from a production unit to a connection point as specified or proposed to be specified in a connection agreement (as the case may be).

### rise time

In relation to a control system, the time taken for an output quantity to rise from 10% to 90% of the ~~maximum~~ mean sustained change induced in that quantity by a step

change of an input quantity, disregarding longer-term dynamics and external influences following the step change.

***RMS phase voltage***

~~The voltage of supply measured as the average of the root mean square of the voltages between each pair of phases.~~

***Schedule 5.2 Participant***

A person described in clause S5.2.1(b) in respect of a *schedule 5.2 plant*.

***schedule 5.2 plant***

Plant described in clause S5.2.1(a) to which some or all *access standards* in schedule 5.2 apply.

***Schedule 5.3 Participant***

A person described in clause S5.3.1a(a1) in respect of a *schedule 5.3 plant*.

***schedule 5.3 plant***

Plant described in clause S5.3.1a to which some or all *access standards* in schedule 5.3 apply.

***Schedule 5.3a Participant***

A person described in clause S5.3a.1a(b) in respect of a *schedule 5.3a plant*.

***schedule 5.3a plant***

A system comprising high voltage direct current technology with a power transfer capability of 5 MW or more, used to transfer electricity to, from or between one or more alternating current networks (or parts of an alternating current network) of a Network Service Provider.

***scheduled integrated resource system***

An integrated resource system that ~~to the extent it is comprised of production units,~~ is comprised of *scheduled bidirectional units* or a combination of *scheduled bidirectional units* and other plant.

***scheduled network service***

- (a) A *network service* which is classified as a *scheduled network service* in accordance with Chapter 2.
- (b) For the purposes of Chapter 3 (except clause 3.8.3A(b)(1)(ii)) and rule 4.9, two or more *scheduled network services* referred to in paragraph (a) that have been aggregated in accordance with clause 3.8.3.

***Scheduled Network Service Provider***

A *Network Service Provider* who has classified any of its *network services* as a *scheduled network service*.

***settling time***

In relation to 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 the sustained change induced in that output quantity.;

~~(a) — 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~~

~~(b) — the sustained change induced in that output quantity.~~

#### **short circuit ratio**

For a *connection point* for *plant*, the synchronous *three phase fault level* (expressed in MVA) at the *connection point* for the *plant* divided by:

- (a) in the case of a *generating system or integrated resource system*, its ~~rated active power~~ *active power capability* (expressed in MW);
- (b) in the case of a *schedule 5.3a plant, market network service facility*, its ~~rated power transfer capability~~ (expressed in MW); and
- (c) in the case of an *inverter based load*, its *maximum demand* at the *connection point* (expressed in MW); ~~and~~
- (d) ~~[Deleted] in the case of an integrated resource system, its rated active power (expressed in MW);~~

to avoid doubt, in each case excluding any *fault current contribution* from the *plant* side of the *connection point* when calculating the *three phase fault level*.

For the purpose of clauses S5.2.5.15(b), S5.3.11(b) and S5.3a.7(b), the *short circuit ratio* must be assessed in accordance with the methodology prescribed in the *system strength impact assessment guidelines*.

#### **synchronous ~~condenser~~ condensers**

~~Apparatus or equipment~~ Plant similar in construction to a *synchronous generating unit*, which operates at the equivalent speed of the *frequency* of the *power system*, and, when operating in steady state conditions, neither generates nor consumes active power other than consumption for losses within the plant.

#### **synchronous condenser system**

A system comprising one or more synchronous condensers that are not part of a generating system or integrated resource system including, for the purposes of Chapter 5, auxiliary or reactive plant that is necessary for the system to meet its performance standards.

#### **Note**

Where a synchronous condenser is located with a generating system or integrated resource system on the same side of its connection point and operated in conjunction with that system, it is considered to be part of the relevant generating system or integrated resource system.

#### **synchronous generating unit**

A *generating unit* that is a *synchronous production unit*.

#### **synchronous production unit**

A *production unit* comprising alternating current generators which operate at a speed which is synchronised to the *frequency* of the *power system*.

*voltage*

~~The electronic force or electric potential between two points that gives rise to the flow of electricity.~~

**Commented [A167]:** Drafting note - all instances of 'voltage' in the NER, where not part of a separately defined composite term, will need to be un-italicised