Draft National Electricity Amendment (Improving the NEM access standards - Package 1) Rule 2025

The Australian Energy Market Commission makes the following Rule under the National Electricity Law to the extent applied by:

(a) the *National Electricity (South Australia) Act 1996* of South Australia;
(b) the *Electricity (National Scheme) Act 1997* of the Australian Capital Territory;
(c) the *Electricity - National Scheme (Queensland) Act 1997* of Queensland;
(d) the *National Electricity (New South Wales) Act 1997* of New South Wales;
(e) the *Electricity - National Scheme (Tasmania) Act 1999* of Tasmania;
(f) the *National Electricity (Victoria) Act 2005* of Victoria;
(g) the *National Electricity (Northern Territory) (National Uniform Legislation) Act 2015* of the Northern Territory; and
(h) the *Australian Energy Market Act 2004* of the Commonwealth.

Anna Collyer
Chairperson
Australian Energy Market Commission

Draft National Electricity Amendment (Improving the NEM access standards - Package 1) Rule 2025

1 Title of Rule

This Rule is the *Draft National Electricity Amendment (Improving the NEM access standards - Package 1) Rule 2025*.

2 Commencement

This Rule commences operation on [10 April 2025].

3 Amendment to the National Electricity Rules

The National Electricity Rules are amended as set out in Schedule 1.

4 Savings and Transitional Amendment to the National Electricity Rules

The National Electricity Rules are amended as set out in Schedule 2.

Schedule 1 Amendment to the National Electricity Rules

(Clause 3)

[1] Clause 3.6.3 Distribution losses

In clause 3.6.3, omit "*voltage*" wherever it appears, and substitute "voltage".

[2] Clause 3.9.3 Pricing in the event of intervention by AEMO

In clause 3.9.3(b3)(2), omit "*voltage*" and substitute "voltage".

[3] Clause 3.15.7 Payment to Directed Participants

In clause 3.15.7(a2)(4)(ii), omit "*voltage*" and substitute "voltage".

[4] Clause 3.15.8 Funding of Compensation for directions

In clause 3.15.8(b2), omit "*voltage*" and substitute "voltage".

[5] Clause 3.15.8A Funding of compensation for market suspension pricing schedule periods

In clause 3.15.8A(e), omit "*voltage*" and substitute "voltage".

[6] Clause 4.2.2 Satisfactory Operating State

In clause 4.2.2(b), omit "*voltage*" and substitute "voltage".

[7] Clause 4.3.1 Responsibility of AEMO for power system security

In clause 4.3.1(v)(2), omit "*voltages*" and substitute "voltages".

[8] Clause 4.3.5 Market Customer obligations

In the heading, omit "Market".

[9] Clause 4.3.5 Market Customer obligations

Omit clause 4.3.5(a), and substitute:

(a) All *Schedule 5.3 Participants* 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. 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* following the occurrence

of a *power system* under-frequency condition described in the *power system security standards*.

[10] Clause 4.3.5 Market Customer obligations

In clause 4.3.5(b), omit "*Market Customers*" and substitute "*Schedule 5.3 Participants*".

[11] Clause 4.4.2 Operational frequency control requirements

Omit clause 4.4.2(b) and substitute:

(b) each *Generator* and *Integrated Resource Provider* must ensure that all of its *production units* meet the technical requirements for *frequency* control in their *performance standards* established under clause S5.2.5.11;

[12] Clause 4.4.3 Generator protection requirements

In clause 4.4.3, omit "*voltage*" and substitute "voltage".

[13] Clause 4.5.1 Power system voltage control

In clause 4.5.1(a), omit "*voltages*" and substitute "voltages".

[14] Clause 4.5.1 Power system voltage control

In clause 4.5.1, omit "*voltage*" wherever it appears in paragraphs (b), (c), (d), (e) and (f), and substitute "voltage".

[15] Clause 4.5.2 Reactive power reserve requirements

In clause 4.5.2(b), omit "*voltages*" wherever it appears and substitute "voltages".

[16] Clause 4.5.2 Reactive power reserve requirements

In clause 4.5.2(b), omit "*voltage*" and substitute "voltage".

[17] Clause 4.5.3 Audit and testing

In clause 4.5.3, omit "*voltages*" and substitute "voltages".

[18] Clause 4.9.2 Instructions to Scheduled Generators, Semi-Scheduled Generators and Scheduled Integrated Resource Providers

In clause 4.9.2, omit "*voltage*" wherever it appears and substitute "voltage".

[19] Clause 4.9.4 Dispatch related limitations on Scheduled Generators, Semi-Scheduled Generators and Scheduled Integrated Resource Providers

In clause 4.9.4(b), omit "*voltage*" and substitute "voltage".

[20] Clause 4.14 Acceptance of Performance Standards

Omit clause 4.14(n) and substitute:

(n) *AEMO* must establish and maintain a register of the *performance standards* applicable to *Registered Participants*' *plant* as advised to *AEMO* in accordance with clause 5.3.7(g)(1), 5.3.8(f), 5.3.9(h) or 5.3.12(h), or established in accordance with rule 4.16.

[21] Clause 4.14 Acceptance of Performance Standards

Omit clause 4.14(o) and substitute:

(o) **[Deleted]**

[22] Clause 4.14 Acceptance of Performance Standards

Omit clause 4.14(p) and substitute:

(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 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* and the *Network Service Provider*, 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*.

[23] Clause 4.14 Acceptance of Performance Standards

Omit clause 4.14(q) and substitute:

(q) **[Deleted]**

[24] Clause 5.1.2 Overview of Part B and connection and access under the Rules

Omit clause 5.1.2(d) and substitute:

(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 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. 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*: • is a *Registered Participant* or intends to become a *Registered Participant*; or • intends to apply for an exemption from a requirement to register under Chapter 2 (and is not eligible for an automatic exemption)	Rule 5.3 applies.

	Type of connection or access sought	Process
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*: • is a *Registered Participant* or intends to become a *Registered Participant* (and is not acting as the agent of a *retail customer*); • intends to apply for an exemption from a requirement to register under Chapter 2 (and is not eligible for an automatic exemption); • is a *non-registered DER provider* who has made an election for rule 5.3A to apply instead of Chapter 5A; or • intends to *connect* a *synchronous condenser system* or *large inverter based load*	Rule 5.3A applies, subject to clause 5.3.1A.
5.	Alteration of a *generating system*, *integrated resource system* or *synchronous condenser* by a *Schedule 5.2 Participant*	Clause 5.3.9 applies if the conditions in that clause are met.
6.	Alteration of *plant*: • that includes an *inverter based resource* by a *Schedule 5.3 Participant*; or • a *schedule 5.3a plant* by a *Schedule 5.3a Participant*	Clause 5.3.12 applies if the conditions in that clause are met.
7.	Access to a *prescribed transmission service* or *negotiated transmission service* not requiring establishment or modification of a *connection*.	Rule 5.3 applies, subject to modification as provided in clause 5.2A.3(c).
8.	*Distribution network user access* sought by an applicant who: • is a *Registered Participant* or intends to become a *Registered Participant* (and is not acting as the agent of a *retail customer*); or	Rule 5.3 or 5.3A (as applicable) and rule 5.3AA apply. The election is not available where *connecting* to a

	Type of connection or access sought	Process
	• is a *non-registered DER provider* who has made an election for rule 5.3A to apply instead of Chapter 5A	*regulated SAPS*.
9.	A *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* Any *load* or *non-registered DER provider connecting* to a *regulated SAPS* A *non-registered DER provider* 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).
10.	A *retail customer* (or a *retailer* or *Small Resource Aggregator* on behalf of that customer) seeking a *micro DER connection*	Chapter 5A applies.

[25] Clause 5.1A.1 Purpose and Application

Omit clause 5.1A.1(a)(2)(ii) and substitute:

(ii) to establish the process to be followed for establishing or modifying *connections* to a *network* by *Registered Participants* and, for certain types of *plant*, by other persons, and for altering certain types of *plant connected* to a *network*;

[26] Clause 5.1A.1 Purpose and Application

Omit clause 5.1A.1(a)(2)(iv) and substitute:

(iv) to establish processes to ensure ongoing compliance with the technical requirements applied under this Part B to facilitate management of the *national grid*.

[27] Clause 5.1A.1 Purpose and Application

Omit clause 5.1A.1(c) and substitute:

(c) **[Deleted]**

[28] Clause 5.1A.2 Principles

In clause 5.1A.2, after the first instance of "*national grid*", insert "for the types of connection to which this Chapter 5 applies".

[29] Clause 5.1A.2 Principles

In clause 5.1A.2(a), omit "*Registered Participants*" and substitute "*Connection Applicants*".

[30] Clause 5.1A.2 Principles

In clause 5.1A.2(b), omit "other *Registered Participants*" and substitute "each *Connection Applicant*".

[31] Clause 5.1A.2 Principles

Omit clause 5.1A.2(e), and substitute:

(e) the operation of the *Rules* should result in open communication and information flows relating to *connections* between *Registered Participants*, and between *Registered Participants* and *AEMO*, while ensuring the security of *confidential information* belonging to competitors in the *market*.

[32] Clause 5.2.1 Obligations of Registered Participants

In the heading, after "of", insert "all".

[33] Clause 5.2.1 Obligations of Registered Participants

Omit clause 5.2.1 and substitute:

(a) All *Registered Participants* must ensure that all *plant* and equipment that is part of their *facilities* is provided, maintained and operated in accordance with:

(1) relevant laws;

(2) the requirements of the *Rules*; and

(3) *good electricity industry practice*, all relevant *Australian Standards* and, to the extent specified in the *Rules*, relevant international instruments.

(b) All *Registered Participants* must ensure that the *connection agreements* to which they are a party require the provision, maintenance and operation 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.

[34] Clause 5.2.2 Connection agreements

Omit clause 5.2.2(a) and substitute:

(a) If requested to do so by a *Network User*, *AEMO* or the *AER*, a *Network Service Provider* and a *Network User* 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*.

[35] Clause 5.2.2 Connection agreements

Omit clause 5.2.2(d) and substitute:

(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:

(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.

(e) Subject to paragraph (d), a *Registered Participant* must plan, design, operate and maintain its *facilities* so as to comply with the terms of its applicable *connection agreements*.

[36] Clause 5.2.3 Obligations of network service providers

Omit clause 5.2.3(a) and substitute:

(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 clauses 5.2.1 and 5.2.2.

[37] Clause 5.2.3 Obligations of network service providers

Omit clause 5.2.3(b) and substitute:

(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.

[38] Clause 5.2.3 Obligations of network service providers

In clause 5.2.3(c), omit "a *connection agreement*", and substitute "the *connection agreement*".

[39] Clause 5.2.3 Obligations of network service providers

After clause 5.2.3(c), insert:

(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

(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.

[40] Clause 5.2.3 Obligations of network service providers

Omit clause 5.2.3(d)(11) and substitute:

(11) provide to *AEMO* the information required from relevant *Registered Participants* and *Connection Applicants* (including, where relevant, from the *Network Service Provider* itself) under schedules 5.2, 5.3 or 5.3a and details of any *connection points* with other *Network Service Providers*; and

[41] Clause 5.2.3 Obligations of network service providers

In clause 5.2.3(g), omit "Each *Network Service Provider* must in respect of new or altered equipment owned, operated or controlled by it for the purpose of providing a *market network service*" and substitute "Each *Network Service Provider* must in respect

of proposed new or altered *schedule 5.3a plant* (whether or not for the purpose of providing a *market network service*)"

[42] Clause 5.2.3 Obligations of network service providers

Omit clause 5.2.3(g)(1) and substitute:

(1) submit an *application to connect* and enter into a *connection agreement* with each other *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* to the *network* of that *Network Service Provider* or altered (as the case may be);

[43] Clause 5.2.3 Obligations of network service providers

Omit clause 5.2.3(g1) including the note, and substitute:

(g1) **[Deleted]**

[44] Clause 5.2.3A Obligations of Market Network Service Providers

In clause 5.2.3A, before paragraph (a), insert the following new paragraph:

(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 clauses 5.2.1 and 5.2.2 and as a *Network Service Provider* under clause 5.2.3.

[45] Clause 5.2.3A Obligations of Market Network Service Providers

Omit clause 5.2.3A(d) and substitute:

(d) **[Deleted]**

[46] Clause 5.2.4 Obligations of customers

Omit clause 5.2.4(a) including the note, and substitute:

(a) The obligations in this clause 5.2.4 apply to a *Customer* in addition to its obligations as a *Registered Participant* under clauses 5.2.1 and 5.2.2.

[47] Clause 5.2.4 Obligations of customers

In clause 5.2.4(b)(1), after “rule 5.3”, insert “or 5.3A”.

[48] Clause 5.2.4 Obligations of customers

Omit clause 5.2.4(f) and substitute:

(f) **[Deleted]**

[49] Clause 5.2.5 Obligations of generators

Omit clause 5.2.5(a) including the note, and substitute:

(a) The obligations in this clause 5.2.5 apply to a *Generator* in addition to its obligations as a *Registered Participant* under clauses 5.2.1 and 5.2.2.

[50] Clause 5.2.5 Obligations of generators

Omit clause 5.2.5(c) including the note, and substitute:

(c) **[Deleted]**

[51] Clause 5.2.5A Obligations of integrated Resource Providers

Omit clause 5.2.5A(a) and substitute:

(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 clauses 5.2.1 and 5.2.2.

[52] Clause 5.2.5A Obligations of integrated Resource Providers

Omit clause 5.2.5A(c) and substitute:

(c) **[Deleted]**

[53] Clause 5.2.6A AEMO review of technical requirements for connection

In clause 5.2.6A, omit "Schedule" wherever it appears and substitute "schedule".

[54] Clause 5.3.1 Process and procedures

Omit clause 5.3.1(b) and substitute:

(b) 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.

[55] Clause 5.3.1 Process and procedures

In clause 5.3.1(b1), omit "*Registered Participant*, or person intending to become a *Registered Participant*,", and substitute "person".

[56] Clause 5.3.1 Process and procedures

Omit clause 5.3.1(c) and substitute:

(c) A *Schedule 5.2 Participant* wishing to alter any *connected generating system*, *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* to whom clause 5.3.12 applies must comply with clause 5.3.12.

[57] Clause 5.3.1 Process and procedures

Omit clause 5.3.1(d) and substitute:

(d) **[Deleted]**

[58] Clause 5.3.1A Application of rule to connection of distribution connected systems

Omit clause 5.3.1A(b) and substitute:

(b) If a *Connection Applicant* wishes to *connect* a *generating system*, 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.

[59] Clause 5.3.1A Application of rule to connection of distribution connected systems

Omit clause 5.3.1A(c) and substitute:

(c) For the purposes of paragraph (b), a reference to a *Connection Applicant* is to a:

(1) *Registered Participant* or person who intends to be a *Registered Participant*;

(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*.

[60] Clause 5.3.1A Application of rule to connection of distribution connected systems

After clause 5.3.1A(c), insert:

(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:

(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*.

[61] Clause 5.3.3 Response to connection enquiry

Omit clause 5.3.3(b1)(7), and substitute:

(7) the information required under clause 5.3.2(f).

[62] Clause 5.3.4A Negotiated access standards

Omit clause 5.3.4A(b), and substitute:

(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 under clause 5.3.9(b)(3) or 5.3.12(b)(3), or a proposed amendment under clause 4.14(p), be, if the existing *performance standard* for that technical requirement is less onerous than the *minimum access standard*, no less onerous than the existing *performance standard* that corresponds to the technical requirement that is affected by the alteration to the relevant *plant*, unless otherwise as agreed by *AEMO* and the *Network Service Provider*;

(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) subject to subparagraph (1A), 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.

[63] Clause 5.3.4B System strength mitigation requirement

Omit clause 5.3.4B(a) and substitute:

(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*; or

(2) a *proposed new connection* of a *schedule 5.3a plant* that is not subject to *transmission service* regulation under Chapter 6A; 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) where clause 5.3.9 or 5.3.12 applies.

[64] Clause 5.3.4B System strength mitigation requirement

Omit clause 5.3.4B(a1) and substitute:

(a1) In this clause, a reference to a *Connection Applicant* includes a reference to a *Schedule 5.2 Participant* to whom clause 5.3.9 applies and a *Schedule 5.3 Participant* or *Schedule 5.3a Participant* to whom clause 5.3.12 applies.

[65] Clause 5.3.4B System strength mitigation requirement

In clause 5.3.4B(a2), omit "a *generating system*, *integrated resource system* or other *connected*".

[66] Clause 5.3.4B System strength mitigation requirement

In clause 5.3.4B(c)(3), insert "and" after the semicolon.

[67] Clause 5.3.4B System strength mitigation requirement

Omit clause 5.3.4B(c)(4) and substitute:

(4) a *Connection Applicant* who proposes an alteration to which clause 5.3.9 or clause 5.3.12 applies and for which a full assessment is required under paragraph (a2)(3),

[68] Clause 5.3.4B System strength mitigation requirement

Omit clause 5.3.4B(c)(5) and substitute:

(5) **[Deleted]**

[69] Clause 5.3.4B System strength mitigation requirement

In clause 5.3.4B(q), omit "*Registered Participant*" and substitute "party".

[70] Clause 5.3.4C Information about system strength connection points

In clause 5.3.4C(b1), omit "*rated active power*, *rated*" and substitute "*active power capability*,".

[71] Clause 5.3.6 Offer to connect

In clause 5.3.6(j), omit "*Distribution Connected Resource Provider* or a *Market Network Service Provider*" and substitute "*Connection Applicant* specified in rule 5.3AA(a)(2)".

[72] Clause 5.3.7 Finalisation of connection agreements and network operating agreements

After clause 5.3.7(f2), insert:

(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*.

[73] Clause 5.3.7 Finalisation of connection agreements and network operating agreements

Omit clause 5.3.7(g), and substitute:

(g) Within 20 *business days* of execution of a *connection agreement* in respect of which this paragraph (g) applies, the *Network Service Provider* responsible for the *connection point* and the *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*, 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.

[74] Clause 5.3.7 Finalisation of connection agreements and network operating agreements

Omit clause 5.3.7(h) and substitute:

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

[75] Clause 5.3.8 Provision and use of information

In clause 5.3.8(b)(1), remove space after "services".

[76] Clause 5.3.8 Provision and use of information

In clause 5.3.8(b)(2)(i), omit "*generating plant*" and substitute "a *facility*"

[77] Clause 5.3.8 Provision and use of information

Omit clause 5.3.8(f) and substitute:

(f) A *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 incomplete, inaccurate or out of date, advise provide *AEMO* with the updated information.

[78] Clause 5.3.9 Alteration of a generating system or integrated resource system

In the heading of clause 5.3.9, omit "a generating system or integrated resource system" and substitute "schedule 5.2 plant".

[79] Clause 5.3.9 Alteration of a generating system or integrated resource system

In clause 5.3.9, omit paragraphs (a) to (d) and substitute:

(a) Subject to paragraph (a1), this clause 5.3.9 applies where a *Schedule 5.2 Participant* proposes to alter a *connected schedule 5.2 plant* 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) will affect the performance of the *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) will, in *AEMO*'s reasonable opinion, have a *general system strength impact*; or

(3) 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 in order to comply with the *Primary Frequency Response Requirements* as applicable to a *schedule 5.2 plant*.

(b) A *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, details of the design data and 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*;

(2A) **[Deleted]**

(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*, the proposed amendments to the *plant's* existing corresponding *performance standard* for that technical requirement; and

(4) where relevant, the *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 under subparagraph (b)(3).

(c1) Clause 5.3.4B applies to a submission under subparagraph (b)(4). A *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 *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, S5.2.5.5A, S5.2.5.12, S5.2.5.13, S5.2.5.15, S5.2.8
reactive compensation plant	

Column 1 (altered equipment)	Column 2 (clause)
	S5.2.5.1, S5.2.5.2, S5.2.5.5, S5.2.5.5A, S5.2.5.12, S5.2.5.13
excitation control system	S5.2.5.5, S5.2.5.5A, S5.2.5.7, S5.2.5.12, S5.2.5.13
voltage *control system*	S5.2.5.5, S5.2.5.5A, S5.2.5.7, S5.2.5.12, S5.2.5.13
governor *control system*	S5.2.5.7, S5.2.5.11, S5.2.5.14
power *control system*	S5.2.5.11, S5.2.5.14
protection system	S5.2.5.3, S5.2.5.4, S5.2.5.5, S5.2.5.5A, 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

[80] Clause 5.3.9 Alteration of a generating system or integrated resource system

Omit clause 5.3.9(h) and substitute:

(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, the *Network Service Provider* and the *Schedule 5.2 Participant* must immediately jointly advise *AEMO*, including the details of any *performance standards* amended pursuant to this clause 5.3.9.

[81] Clause 5.3.10 Acceptance of performance standards for plant that is altered

In clause 5.3.10, omit paragraphs (a) to (b), and substitute:

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

(a1) **[Deleted]**

(b) In relation to altered *plant*, 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) must be satisfied that:

(1) the *Schedule 5.2 Participant* has complied with clause 5.3.9; and

(2) each amended *performance standard* submitted by the *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.

[82] Clause 5.3.10 Acceptance of performance standards for plant that is altered

In clause 5.3.10(c), insert ", if applicable" after "paragraph (b)".

[83] Clause 5.3.11 Notification of request to change normal voltage

In the heading of 5.3.11, omit "Notification of request to change normal voltage" and substitute "**[Deleted]**".

[84] Clause 5.3.11 Notification of request to change normal voltage

Omit clause 5.3.11.

[85] Clause 5.3.12 Procedure to be followed for alterations to other connected plant

In clause 5.3.12, omit paragraphs (a) and (b), and substitute:

(a) This clause 5.3.12 applies where a *Schedule 5.3 Participant* specified in clause S5.3.11(a) or a *Schedule 5.3a Participant* 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 (as applicable) that is an *AEMO advisory matter*.

(b) A *Schedule 5.3 Participant* or *Schedule 5.3a Participant* 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 subject to *transmission service* regulation under Chapter 6A, the proposed *system strength remediation scheme* or an election for the *system strength charge* to be payable in relation to the alteration.

[86] Clause 5.3.12 Procedure to be followed for alterations to other connected plant

In clause 5.3.12(d), omit "*Network User* or *Market Network Service Provider*" and substitute "*Schedule 5.3 Participant* or *Schedule 5.3a Participant*".

[87] Clause 5.3.12 Procedure to be followed for alterations to other connected plant

Omit clause 5.3.12(h) and substitute:

(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 *Network Service Provider* and the *Schedule 5.3 Participant* or *Schedule 5.3a Participant* (as applicable) must immediately jointly advise *AEMO*, including the details of any *performance standards* amended pursuant to this clause 5.3.12.

[88] Clause 5.3.13 Acceptance of performance standards for other plant that is altered

Omit clause 5.3.13(a) and substitute:

(a) A *Schedule 5.3 Participant* or *Schedule 5.3a Participant* 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* (as applicable) that the provider and *AEMO* are satisfied in accordance with paragraph (b).

[89] Clause 5.3.13 Acceptance of performance standards for other plant that is altered

Omit clause 5.3.13(b) and substitute:

(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* (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* (as applicable) meets the relevant technical requirements of schedule 5.3 or schedule 5.3a (as applicable); and

(3) any *system strength remediation scheme* satisfies clause 5.3.4B.

[90] Clause 5.3A.1 Application of rule 5.3A

In clause 5.3A.1(b), omit "*generating system* or an *integrated resource system*" and substitute "*schedule 5.2 plant*, a *schedule 5.3a plant* or a *large inverter-based resource*".

[91] Clause 5.3A.1 Application of rule 5.3A

Omit clause 5.3A.1(c), and substitute:

(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).

[92] Clause 5.3A.3 Publication of Information

In clause 5.3A.3(b)(6), omit "*voltage*" wherever it appears and substitute "voltage".

[93] Clause 5.3AA Access arrangements relating to Distribution Networks

In clause 5.3AA(a)(2)(ii), omit "*Market Network Service Provider*" and substitute "*Schedule 5.3a Participant*".

[94] Clause 5.3AA Access arrangements relating to Distribution Networks

In clause 5.3AA, omit paragraphs (c) and (d) and substitute:

(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

(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.

[95] Clause 5.3AA Access arrangements relating to Distribution Networks

Omit clause 5.3AA(f)(2) and substitute:

(2) in the case of a *Schedule 5.3a Participant*, the service level standards to which the *Schedule 5.3a Participant* requires the *Distribution Network Service Provider* to adhere in providing its services;

[96] Clause 5.3AA Access arrangements relating to Distribution Networks

Omit clause 5.3AA(f)(3)(ii) and substitute:

(ii) where the *Connection Applicant* is a *Schedule 5.3a Participant*, to the *Schedule 5.3a Participant* 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

[97] Clause 5.7.2 Right of testing

In clause 5.7.2(a), after "may request testing", insert "or assessment"

[98] Clause 5.7.2 Right of testing

In clause 5.7.2(b), omit "the relevant test" and substitute "any test that requires, or may cause, an *outage* or change to normal operation of any *power system* equipment".

[99] Clause 5.7.2 Right of testing

In clause 5.7.2, omit paragraphs (c) to (e) and substitute:

(c) The *Registered 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* requesting them, unless the equipment is determined by the tests not to comply with the *Rules* or the relevant *connection agreement*, 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 procedures agreed between the relevant *Registered Participants*, which agreement is not to be unreasonably withheld or delayed.

[100] Clause 5.7.2 Right of testing

In clause 5.7.2(f), after "Tests", insert "or assessments".

[101] Clause 5.7.2 Right of testing

In clause 5.7.2, omit paragraphs (h) and (i) and substitute:

(h) The *Registered Participant* who requests a test under this clause 5.7.2 may appoint a *representative* to witness a test and the other *Registered Participant* must permit that appointed *representative* to be present while the test is being conducted.

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

[102] Clause 5.7.3 Tests to demonstrate compliance with connection requirements for Generators and Integrated Resource Providers

Omit clause 5.7.3(f)(2) and substitute:

(2) holds the reasonable opinion that the performance of the *plant*, or inadequacy of the applicable analytical model, is impeding or will impede *AEMO*'s ability to carry out its role in relation to *power system security*,

[103] Clause 5.7.4 Routine testing of protection equipment

In clause 5.7.4(a1)(3), omit "*voltage*" and substitute "voltage".

[104] Clause 5.13.1 Distribution annual planning review

In clause 5.13.1(d)(2)(v), omit "*voltage*" and substitute "voltage".

[105] Clause 5.18B.2 Register of completed distribution connection resource projects

In clause 5.18B.2(a)(7), omit "*voltage*" and substitute "voltage".

[106] Clause 5.20.4 Inertia requirements methodology

Omit clause 5.20.4(e) and substitute:

(e) The *inertia requirements methodology* determined by *AEMO* must provide for *AEMO* to take the following matters into account in determining the *secure inertia level*:

(1) the capabilities and expected response times provided by *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 *production 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.

[107] Clause 5.20.6 Publication of system strength requirements methodologies

Omit clause 5.20.6(e)(4) and substitute:

(4) the risk of *cascading outages* as a result of any *load shedding* or *schedule 5.2 plant* or *schedule 5.3a plant* tripping as a result of a *credible contingency event* or *protected event* in the *region*;

[108] Clause 5.20.6 Publication of system strength requirements methodologies

In clause 5.20.6(f)(4), omit "*voltage*" and substitute "voltage".

[109] Clause 5.20B.6 Inertia network services information and approvals

Omit clause 5.20B.6(b) and substitute:

(b) Where the *Inertia Service Provider* procures *inertia network services* from a *Generator* or *Integrated Resource Provider* provided by means of a *production unit* under an *inertia services agreement*, the *Inertia*

Service Provider must register the *production unit* with *AEMO* as an *inertia unit* and specify that the *production 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).

[110] Clause 5.20B.6 Inertia network services information and approvals

Omit clause 5.20B.6(b1) and substitute:

(b1) **[Deleted]**

[111] Clause 5.20C.1 Declaring system strength requirements

In clause 5.20C.1(c)(2), omit "*market network service facilities*" and substitute "*schedule 5.3a plant*".

[112] Clause 5.20C.4 System strength services information and approvals

In clause 5.20C.4(b), omit "*generating unit*" wherever it appears and substitute "*production unit*".

[113] Clause 5.20C.4 System strength services information and approvals

Omit clause 5.20C.4(b1) and substitute:

(b1) **[Deleted]**

[114] Clause 5.22.10 Preparation of ISP

In clause 5.22.10(a)(5)(viii), omit "*voltage*" and substitute "voltage".

[115] Clause S5.1a.3 System stability

In clause S5.1a.3(c), omit "*voltage*" and substitute "voltage".

[116] Clause S5.1a.4 Power frequency voltage

Omit clause S5.1a.4, and substitute:

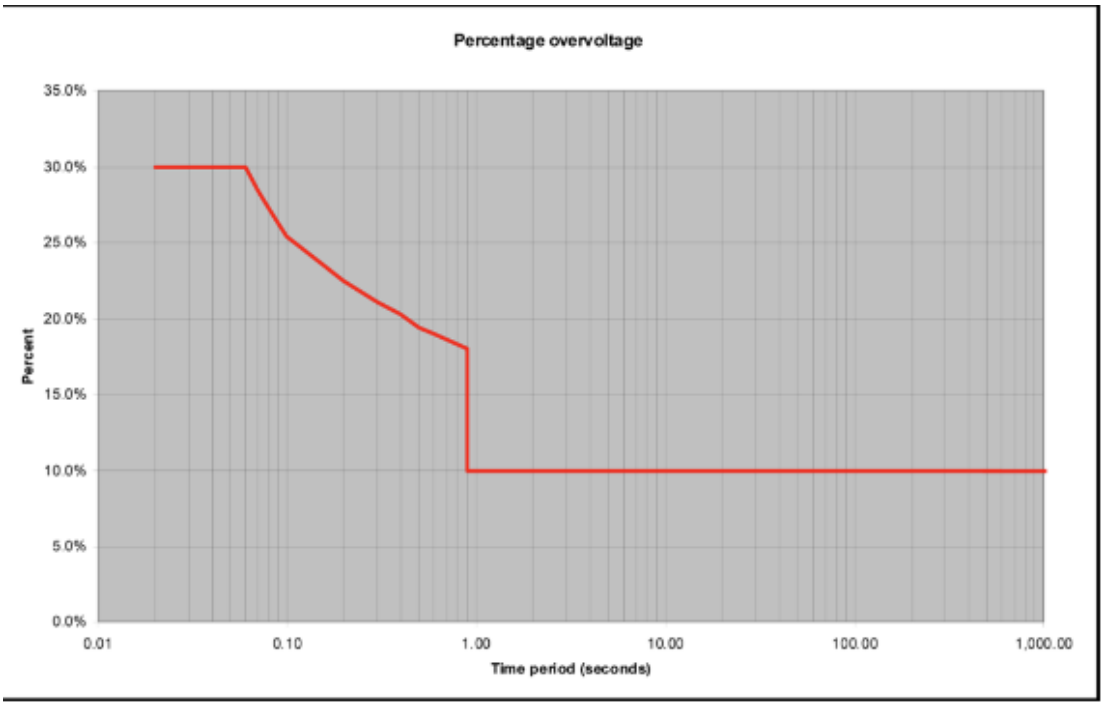
Except as a consequence of a *contingency event*, the voltage of *supply* at a *connection point* should not vary by more than 10 percent above or below its *nominal voltage*, provided that the *reactive power* flow and the *power factor* at the *connection point* is within the corresponding limits set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

As a consequence of a *credible contingency event*, the voltage of *supply* at a *connection point* should not rise above its *nominal voltage* by more than

a given percentage of *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 of *supply* at a *connection point* could fall to zero for any period.

Figure S5.1a.1



[117] Clause S5.1a.5 Voltage fluctuations

Omit clause S5.1a.5 and substitute:

The voltage fluctuation level of *supply* should be less than the "compatibility levels" set out in the International Electrotechnical Commission publication IEC/TR 61000.3.7. 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 following principles apply to the use of the shared network:

(a) the sharing between *Network Users* of the capability of *connection assets* to withstand voltage fluctuations is to be managed by *Network Service Providers* in accordance with the provisions of clause S5.1.5 of schedule 5.1; and

(b) to the extent practicable, the costs of managing or abating the impact of voltage fluctuations in excess of the costs which would result from the application of an *automatic access standard* are to be borne by those *Network Users* whose *facilities* cause the voltage fluctuations.

[118] Clause S5.1a.6 Voltage waveform distortion

Omit clause S5.1a.6 and substitute:

Harmonic voltage distortion level of *supply* should be less than the "compatibility levels" defined in the International Electrotechnical Commission publication IEC/TR 61000.3.6. To facilitate the application of this standard *Network Service Providers* must establish "planning levels" for their *networks* as provided for in IEC/TR 61000.3.6.

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 distortion is to be managed by *Network Service Providers* in accordance with the provisions of clause S5.1.6 of schedule 5.1; and

(b) to the extent practicable, the costs of managing or abating the impact of harmonic distortion in excess of the costs which would result from the application of an *automatic access standard* are to be borne by those *Network Users* whose *facilities* cause the harmonic voltage distortion.

[119] Clause S5.1a.7 Voltage unbalance

Omit clause S5.1a.7 and substitute:

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

As a consequence of a *credible contingency event* or *protected event*, the average voltage unbalance, measured at a *connection point*, should not vary by more than the amount set out in column 3 of Table S5.1a.1, when determined over a 30 minute averaging period.

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

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

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

[120] Clause S5.1a.9 Minimum three phase fault levels and stability for system strength nodes

Omit clause S5.1a.9(a) and substitute:

(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 *control systems* (such as reactive bank switching and dynamic voltage control) to be stable; and

(3) the *power system* to remain stable following any *credible contingency event* or *protected event*.

[121] Clause S5.1a.9 Minimum three phase fault levels and stability for system strength nodes

Omit clause S5.1a.9(b) and substitute:

(b) There should be stable 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 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*.

[122] Clause S5.1.1 Introduction

Omit clause S5.1.1 and substitute:

(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:

(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

(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 *Connection Applicant* to which any of schedules 5.2, 5.3 or 5.3a apply, the *Network Service Provider* must:

(1) set relevant *access standards* for the purposes of clause S5.1.9; and

(2) be satisfied that the application of any *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).

(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.

[123] Clause S5.1.2.1 Credible contingency events

Omit clause S5.1.2.1 and substitute:

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* with all *facilities* or equipment associated with the *power system* in service and may be required 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 above 66 kV which are not protected by an overhead earth wire and/or lines with tower footing resistances in excess of 10 ohms, the *Network Service Provider* may extend the criterion to include a single circuit three-phase solid fault to cover the increased risk of such a fault occurring. Such lines must be examined individually on their merits by the relevant *Network Service Provider*.

(c) For lines at any voltage above 66 kV a *Network Service Provider* must adopt operational practices to minimise the risk of slow fault clearance in case of inadvertent closing on to earths applied to equipment for maintenance purposes. These practices must include but not be limited to:

    (1) Not leaving lines equipped with intertrips alive from one end during maintenance; and

    (2) *Off-loading* a three terminal (tee connected) line prior to restoration, to ensure switch on to fault *facilities* are operative.

(d) The *Network Service Provider* must ensure that all *protection systems* for lines at a voltage above 66 kV, including associated intertripping, are well maintained so as to be available at all times other than for short periods (not greater than eight hours) while the maintenance of a *protection system* is being carried out.

[124] Clause S5.1.2.2 Network service within a region

Omit clause S5.1.2.2 and substitute:

The following paragraphs of this section set out minimum standards for certain *network services* to be provided to *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* 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* (e.g. 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.

[125] Clause S5.1.2.3 Network service between regions

In clause S5.1.2.3(a), omit “stated”, and substitute “described".

[126] Clause S5.1.4 Magnitude of power frequency voltage

Omit clause S5.1.4 and substitute:

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

(a) The *Network Service Provider* must determine the *automatic access standard* for the voltage of *supply* at the *connection point* such that the voltage may vary in accordance with clause S5.1a.4 of the *system standards*.

(b) The *Network Service Provider* must determine the *minimum access standard* for the voltage of *supply* at the *connection point* such that the voltage may vary:

(1) as a consequence of a *credible contingency event* or *protected event* in accordance with clause S5.1a.4; and

(2) otherwise, within a range of 5% of *nominal voltage* above and below the target voltage.

(c) For the purposes of clause S5.1.4(b) the target voltage must be determined as follows:

(1) if the *connection point* is connected to a *transmission line* (but not through a *transformer*), the *Network Service Provider* must determine the target voltage in consultation with *AEMO* taking into account the capability of existing *facilities* that are subject to that *supply* voltage; and

(2) otherwise, *Network Users* that share the same *supply* voltage must jointly determine the target voltage which may be specified to vary with aggregate *loading level*;

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

Where the independent control of voltage at the *connection point* is possible without adverse impact on voltage control at another

connection point, the *Network Service Provider* must make reasonable endeavours to meet the request. The target voltage and any agreement to a target range of voltage magnitude must be specified in the relevant *connection agreement*. The agreement may include a different target range in the *satisfactory operating state* and after a *credible contingency event* 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 magnitude occur due to faults external to the *facility*. The design of a *facility* should anticipate the likely time duration and magnitude of variations in the power-*frequency* phase voltages which may arise dependent on the nature and location of the fault.

[127] Clause S5.1.4A Slow front over-voltages

After clause S5.1.4, insert:

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*.

[128] Clause S5.1.5 Voltage fluctuations

Omit clause S5.1.5 and substitute:

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

In accordance with the International Electrotechnical Commission publication IEC/TR 61000.3.7 and guidelines published by *Standards Australia* and applying the assumption that *Schedule 5.3 Participants* will comply with their obligations under schedule 5.3, a *Network Service Provider* must determine "Planning Levels" for *connection points* on their *network* in order to maintain voltage fluctuation levels for all supply points to customers supplied from their network below the "Compatibility Levels" defined in Table 1 of IEC/TR 61000.3.7.

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.

(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.

(c) In respect of each new *connection* at a level of performance below the *automatic access standard* the *Network Service Provider* must include provisions in the relevant *connection agreement* requiring the *Network User* if necessary to meet the *system standards* or allow *connection* of other *Network Users* to either upgrade to the *automatic access standard* or fund the reasonable cost of the works necessary to mitigate their effect of connecting at a standard below the *automatic access standard*.

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

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

[129] Clause S5.1.6 Voltage harmonic or voltage notching distortion

Omit clause S5.1.6, and substitute:

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

In accordance with the International Electrotechnical Commission publication IEC/TR 61000.3.6 and guidelines published by *Standards Australia* and applying the assumption that *Schedule 5.3 Participants* will comply with their obligations under schedule 5.3 *Network Service Providers* must determine "Planning Levels" for *connection points* on their *network* in order to maintain harmonic voltage distortion for all supply points to customers supplied from their *network* below the "Compatibility Levels" defined in Table 1 of IEC/TR 61000.3.6.

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.

(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.

(c) In respect of each new *connection* at a level of performance below the *automatic access standard* the *Network Service Provider* must include provisions in the relevant *connection agreement* requiring the *Network User* if necessary to meet the *system standards* or allow *connection* of other *Network Users* to either upgrade to the *automatic access standard* or fund the reasonable cost of the works necessary to mitigate their effect of connecting at a standard below the *automatic access standard*.

(d) If for existing customer *connections* the level of harmonic voltage distortion is, or may be, exceeded as a result of a proposed new *connection*, the *Network Service Provider* must, if the cause of that excessive level cannot be remedied by enforcing the provisions of existing *connection agreements*, undertake all works necessary to meet the technical standards in this schedule or to permit a proposed new *connection* within the *automatic access standard* defined in clause S5.3.8 and the requirements stated in this clause.

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

[130] Clause S5.1.7 Voltage unbalance

Omit clause S5.1.7 and substitute:

(a) A *Transmission Network Service Provider* must balance the effective impedance of the phases of its *network*, and a *Distribution Network Service Provider* must balance the current drawn in each phase at each of its *connection points*, so as to achieve average levels of negative sequence voltage at all *connection points* that are equal to or less than the values set out in Table S5.1a.1 as determined in accordance with the accompanying provisions of clause S5.1a.7 of the *system standards*.

(b) A *Network Service Provider* must include conditions in *connection agreements* to ensure that a *Connection Applicant* will balance the current drawn in each phase at each of its *connection points* so as to achieve:

(1) for *Schedule 5.3 Participants*: the levels permitted in accordance with clause S5.3.6 of schedule 5.3;

(2) for *Schedule 5.3a Participants*: the levels permitted in accordance with clause S5.3a.9 of schedule 5.3a;

(3) otherwise: the average levels of negative sequence voltage at each of its *connection points* that are equal to or less than the values set out in Table S5.1a.1 and the accompanying provisions of clause S5.1a.7 of the *system standards*.

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

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

(1) the 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 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 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.

[131] Clause S5.1.8 Stability

Omit clause S5.1.8 and substitute:

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

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

(a) the *power system* will remain in synchronism;

(b) damping of *power system* oscillations will be adequate; and

(c) voltage stability criteria will be satisfied.

Damping of *power system* oscillations must be assessed for planning purposes according to the design criteria which states that *power system damping* is considered adequate if after the most critical *credible contingency event* 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 control criterion is that stable 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 stability limit as determined from the voltage/reactive *load* characteristic at that *connection point*. Selection of the appropriate margin at each *connection point* is at the discretion of the relevant *Network Service Provider*, subject only to the requirement that the margin (expressed as a capacitive *reactive power* (in MVAr)) must not be less than one percent of the maximum fault level (in MVA) at the *connection point*.

In planning a *network* a *Network Service Provider* must consider *non-credible contingency events* such as *busbar* faults which result in tripping of several circuits, uncleared faults, double circuit faults and multiple contingencies which could potentially endanger the stability of the *power system*. In those cases where the consequences to any *network* or to any *Registered Participant* of such events are likely to be severe disruption a *Network Service Provider* and/or a *Registered Participant* must 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.

[132] Clause S5.1.13 Information to be provided

In the heading, omit "Information to be provided" and substitute "**[Deleted]**".

[133] Clause S5.1.13 Information to be provided

Omit clause S5.1.13.

[134] Clause S5.1.14 Minimum three phase fault levels and stability for system strength nodes

In clause S5.1.14(a)(ii), omit "*market network service facilities*", and substitute "*schedule 5.3a plant*".

[135] Clause S5.1.14 Minimum three phase fault levels and stability for system strength nodes

Omit clause S5.1.14(b)(2) and substitute:

(2) achieve stable voltage waveforms for the level and type of *inverter based resources* and *schedule 5.3a plant* 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*.

[136] Clause S5.1.14 Minimum three phase fault levels and stability for system strength nodes

Omit clause S5.1.14(c), and substitute:

(c) For paragraph (b)(2), voltage waveforms must be sufficiently stable such that:

(1) in steady state conditions, *inverter based resources* and *schedule 5.3a plant* do not create, amplify or reflect instabilities;

(2) avoiding 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 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 waveforms in the *system strength requirements methodology* is satisfied.

[137] Schedule 5.2 Conditions for Connection of Generators and Integrated Resource Providers

In the heading, omit "Conditions for Connection of Generators and Integrated Resource Providers", and substitute "Technical connection requirements for generating systems, integrated resource systems and synchronous condensers".

[138] Clause S5.2.1 Outline of requirements

In the heading, omit "Outline of requirements", and substitute "Application of the schedule".

[139] Clause S5.2.1 Outline of requirements

Omit clause S5.2.1(a), and substitute:

(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*").

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.

[140] Clause S5.2.1 Outline of requirements

Omit clause S5.2.1(b) and substitute:

(b) 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 subparagraph (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*;

(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*.

[141] Clause S5.2.1 Outline of requirements

After clause S5.2.1(b), insert:

(b1) This schedule applies to a *Schedule 5.2 Participant* described in subparagraph (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 S5.2.6 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.

[142] Clause S5.2.1 Outline of requirements

Omit clause S5.2.1(c), and substitute:

(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*:

(1) to co-operate with the relevant *Network Service Provider* on technical matters relating to *schedule 5.2 plant*; and

(2) to provide information to the *Network Service Provider* or *AEMO*.

[143] Clause S5.2.1 Outline of requirements

In clause S5.2.1(d), omit "*generating system* or *integrated resource system*", and substitute "*schedule 5.2 plant*".

[144] Clause S5.2.1 Outline of requirements

In clause S5.2.1(e), omit "*Generators* and *Integrated Resource Providers*", and substitute "*Schedule 5.2 Participants*".

[145] Clause S5.2.1 Outline of requirements

Omit clause S5.2.1(f) and substitute:

(f) **[Deleted]**

[146] Clause S5.2.1 Outline of requirements

Omit clause S5.2.1(g) and substitute:

(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):

(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.

[147] Clause S5.2.2 Application of Settings

Omit clause S5.2.2 and substitute:

A *Schedule 5.2 Participant* 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*, also by *AEMO*. A *Schedule 5.2 Participant* must not allow its *schedule 5.2 plant* to supply electricity to, or take electricity from, the *power system* without such prior approval.

If a *Schedule 5.2 Participant* 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* 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*, *AEMO*, reasonably determines that the changed setting would cause the *schedule 5.2 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 an *AEMO advisory matter*, *AEMO*, reasonably determines that a setting of a *schedule 5.2 plant*'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*, 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* to apply a setting or to conduct a test, if it relates to an *AEMO advisory matter*.

A *Schedule 5.2 Participant* 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* must, on request, provide 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* 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* to change a setting within 18 months of a previous request, the *Network Service Provider* must pay the *Schedule 5.2 Participant* its reasonable costs of changing the setting and conducting the tests as requested.

[148] Clause S5.2.3 Technical matters to be coordinated

Omit clause S5.2.3(a) and substitute:

(a) A *Schedule 5.2 Participant* 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* 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*.

[149] Clause S5.2.3 Technical matters to be coordinated

Omit clause S5.2.3(b) and substitute:

(b) A *Schedule 5.2 Participant* must ensure that in designing the *schedule 5.2 plant*, including any substation for its *connection* 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 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* 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* is located, as notified by the *Network Service Provider*.

[150] Clause S5.2.3 Technical matters to be coordinated

Omit clause S5.2.3(c) and substitute:

(c) If no relevant *Australian Standard* exists for the purposes of paragraph (b)(1), the *Schedule 5.2 Participant* must agree with the *Network Service Provider* for the *schedule 5.2 plant* to comply with another relevant standard.

[151] Clause S5.2.4 Provision of information

Omit clause S5.2.4(a) and substitute:

(a) A *Schedule 5.2 Participant* must promptly on request by *AEMO* or the *Network Service Provider* provide all data in relation to its *schedule 5.2 plant* specified in schedule 5.5.

[152] Clause S5.2.4 Provision of information

Omit clause S5.2.4(b) and substitute:

(b) A *Schedule 5.2 Participant* in respect of a:

(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 the *schedule 5.2 plant* or planned alteration to a *schedule 5.2 plant*; or

(4) 5 *business days* before commissioning of an alteration to the *schedule 5.2 plant* 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 systems* of the *schedule 5.2 plant*;

(ii) information about the *control systems* of the *schedule 5.2 plant* 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*.

[153] Clause S5.2.4 Provision of information

Omit clause S5.2.4(c) and substitute:

(c) The information provided under paragraph (b) must:

(1) encompass all *control systems* that respond to voltage or *frequency* disturbances on the *power system*, and which are either integral to the *production units* or otherwise part of the *schedule 5.2 plant*, including those applying to *reactive power* equipment that forms part of the *schedule 5.2 plant*;

(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*.

[154] Clause S5.2.4 Provision of information

Omit clause S5.2.4(d) and substitute:

(d) The *Schedule 5.2 Participant* 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* becomes aware that the information is incomplete, inaccurate or out of date; or

(3) on request by *AEMO* or the relevant *Network Service Provider*, where *AEMO* or the relevant *Network Service Provider* considers that the information is incomplete, inaccurate or out of date.

[155] Clause S5.2.4 Provision of information

In clause S5.2.4(d1), omit "*Generator* or *Integrated Resource Provider*" and substitute "*Schedule 5.2 Participant*".

[156] Clause S5.2.4 Provision of information

Omit clause S5.2.4(e) and substitute:

(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.

[157] Clause S5.2.4 Provision of information

Omit clause S5.2.4(e1) and substitute:

(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* 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 5.2 plant* 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 fluctuation, harmonic voltage distortion and voltage unbalance at the *connection point* with the *schedule 5.2 plant* not electrically *connected*;

(4) technical information relevant to the *connection point* with the *schedule 5.2 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;

(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* following the *connection* of the *schedule 5.2 plant*.

[158] Clause S5.2.4 Provision of information

In clause S5.2.4(f), after "*confidential information*.", insert "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*.".

[159] Clause S5.2.5.1 Reactive power capability

Omit clause S5.2.5.1 and substitute:

(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 s*chedule 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.

Automatic access standard

(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^{o}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

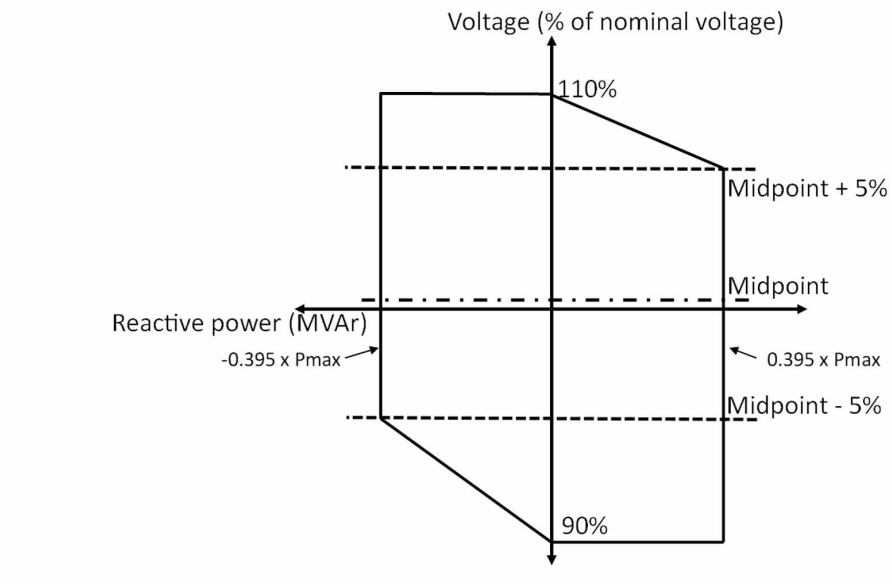
(3) for a voltage range from the lower limit of the voltage range in paragraph (1) to the lower limit established under clause S5.1a.4 without a *contingency event*:

(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 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:

(1) subject to paragraph (d), must be established at or above a level that is consistent with achieving all relevant *system standards* before and after *credible contingency events* under normal and planned *outage* operating conditions of the *power system*;

(2) may include 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 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* is not capable of the level of performance specified in paragraph (c)(1), the *Schedule 5.2 Participant*, 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 *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*;

(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 *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]**

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) The *performance standards* must record the agreed values, 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.

(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.

[160] Clause S5.2.5.2 Quality of electricity generated

Omit clause S5.2.5.2, and substitute:

(a) For the purpose of this clause S5.2.5.2 in respect of a *synchronous production unit*, International Electrotechnical Commission standard IEC 60034-1 is a *plant standard* for harmonic voltage distortion.

Automatic access standard

(b) The *automatic access standard* is a *schedule 5.2 plant* at all times when *connected* must not produce at its *connection point*:

(1) voltage fluctuation greater than the limits allocated by the *Network Service Provider* under clause S5.1.5(a);

(2) harmonic voltage distortion greater than the emission limits specified by a *plant standard* under paragraph (a) or allocated by the *Network Service Provider* under clause S5.1.6(a); and

(3) voltage unbalance greater than the limits allocated by the *Network Service Provider* in accordance with clause S5.1.7(c).

Minimum access standard

(c) The *minimum access standard* is a *schedule 5.2 plant* at all times when connected must not produce at its *connection point*:

(1) voltage fluctuations greater than limits determined under clause S5.1.5(b);

(2) harmonic voltage distortion more than the lesser of the emission limits determined by the relevant *Network Service Provider* under clause S5.1.6(b) and specified by a *plant standard* under paragraph (a); and

(3) voltage unbalance more than limits determined under clause S5.1.7(c).

Negotiated access standard

(d) **[Deleted]**

[161] Clause S5.2.5.3 Response to frequency disturbances

Omit clause S5.2.5.3 and substitute:

(a) In this clause S5.2.5.3:

(1) 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* is located.

(1) 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* is located; and

(1) 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* 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;

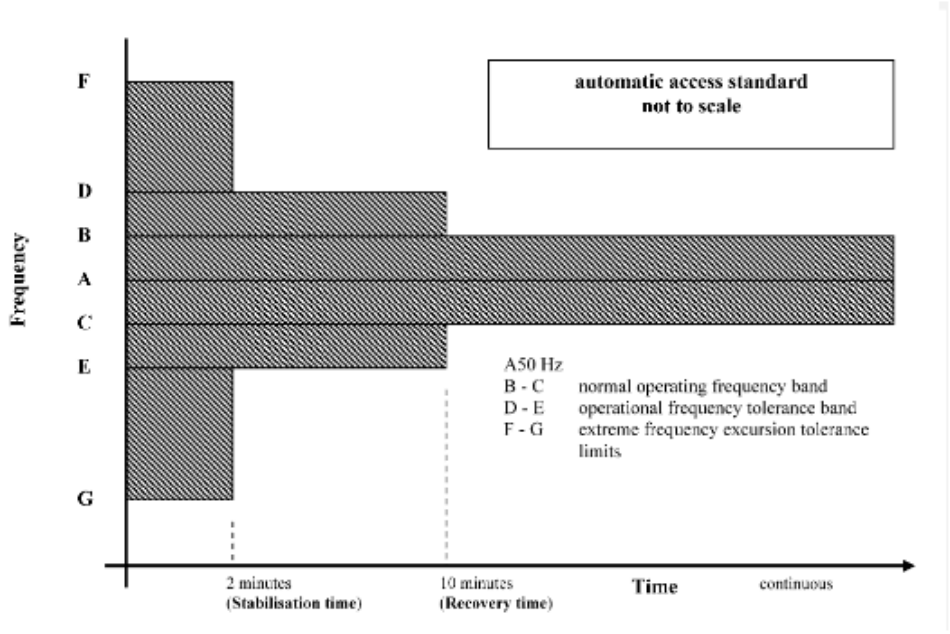
(4) the upper bound of the normal operating frequency band to the upper bound of the operational frequency tolerance band, for at least the recovery time including any time spent in the range under subparagraph (5); and

(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* 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* has a *protection system* to trip *generation* from a *production unit* if the *frequency* exceeds a level agreed with *AEMO*; and

(6) in respect of a *production system*:

(i) having *production units* with a combined *nameplate rating* equal to or more than the lower of:

(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]**

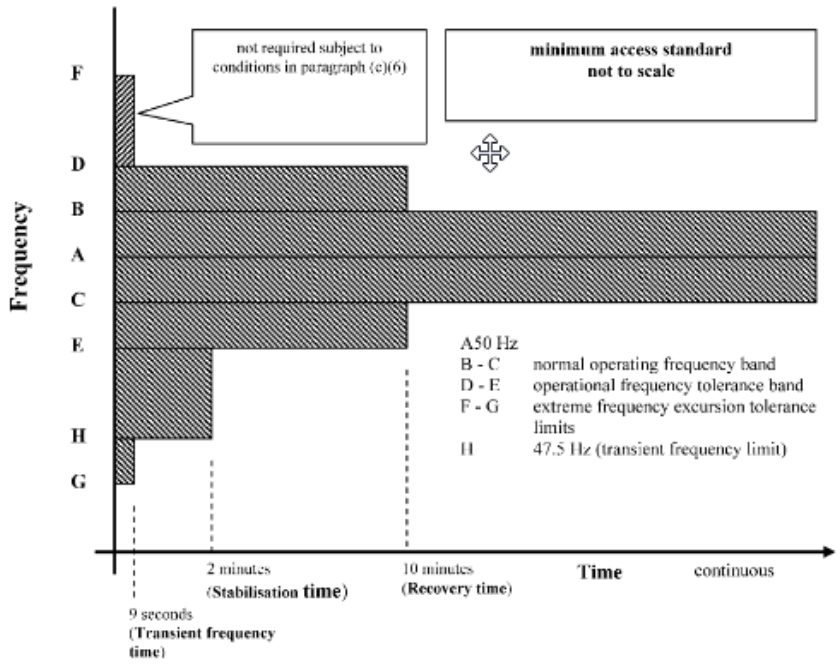
(ii) that does not have a *protection system* to trip *production units* if the *frequency* exceeds a level agreed with *AEMO* under subparagraph (5),

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 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.

[162] Clause S5.2.5.4 Response to voltage disturbances

Omit S5.2.5.4, and substitute:

(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;

(4) references to *continuous uninterrupted operation* apply subject to paragraph (e1); and

(5) requirements referring to *active power* do not apply to *synchronous condensers*.

Automatic access standard

(a) The *automatic access standard* is a *schedule 5.2 plant* and each of its operating *production units* and *synchronous condensers* must remain in *continuous uninterrupted operation* where a *power system* disturbance causes the voltage at the *connection point* to vary within the following ranges:

(1) at least marginally exceeding 130% of *nominal voltage* for a period of at least 0.02 seconds after T(ov);

(2) over 125% up to and including 130% of *nominal voltage* for a period of at least 0.2 seconds after T(ov);

(3) over 120% up to and including 125% of *nominal voltage* for a period of at least 2 seconds after T(ov);

(4) over 115% up to and including 120% of *nominal voltage* for a period of at least 20 seconds after T(ov);

(5) over 110% up to and including 115% of *nominal voltage* for a period of at least 20 minutes after T(ov);

(6) subject to paragraphs (e1) and (e3), 90% to 110% of *nominal voltage* continuously;

(7) below 90% down to and including 80% of *nominal voltage* for a period of at least 10 seconds after T(uv); and

(8) below 80% down to and including 70% of *nominal voltage* for a period of at least 2 seconds after T(uv).

Minimum access standard

(b) The *minimum access standard* is a *schedule 5.2 plant* and each of its operating *production units* and *synchronous condensers* must remain in *continuous uninterrupted operation* where a *power system* disturbance causes the voltage at the *connection point* to vary within the following ranges:

(1) 115% to 120% of *nominal voltage* for a period of at least 0.1 seconds after T(ov);

(2) 110% to 115% of *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 *nominal voltage* continuously, provided that the ratio of voltage to *frequency* (as measured at the *connection point* and expressed

as a percentage of *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 *nominal voltage* for a period of at least 5 seconds after T(uv); and

(5) 70% to 80% of *nominal voltage* for a period of at least 2 seconds after T(uv).

Negotiated access standard

(c) **[Deleted]**

(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]**

(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 *performance standards* must record any operational arrangements necessary to ensure the *schedule 5.2 plant* will meet its agreed performance levels under abnormal *network* or *plant* conditions.

[163] Clause S5.2.5.5 Response to disturbances following contingency events

In the heading, omit "Response to disturbances following contingency events", and substitute "Disturbance ride-through capability".

[164] Clause S5.2.5.5 Response to disturbances following contingency events

Omit clause S5.2.5.5, and substitute:

(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.

Automatic access standard

(b) The *automatic access standard* is the requirements of paragraphs (c) and (d).

(c) A *schedule 5.2 plant* 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*;

(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,

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

(d) A *schedule 5.2 plant* 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 at the *connection point* to drop below 50% of *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 at the *connection point* drops below 50% of *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 at the *connection point* to vary within the ranges under clause S5.2.5.4(a)(7) and (a)(8);

(5) the time difference 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* or cause a material reduction in *power transfer capability* by removing *network elements* from service;

(8) the cumulative time that voltage at the *connection point* is lower than 90% of *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 *nominal voltage* and the voltage at the *connection point* when the voltage at the *connection point* is lower than 90% of *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).

(k) A *schedule 5.2 plant* 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*; 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* from the *power system* by removing *network elements* from service.

(l) A *schedule 5.2 plant* 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 at the *connection point* to drop below 50% of *nominal voltage*;

(2) up to one disturbance causes the 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 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* or cause a material reduction in *power transfer capability* by removing *network elements* from service;

(7) the cumulative time that voltage at the *connection point* is lower than 90% of *nominal voltage* exceeding 1,000 milliseconds within any five minute period;

(8) the time integral, within any five minute period, of the difference between 90% of *nominal voltage* and the voltage at the *connection point* when the voltage at the *connection point* is lower than 90% of *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) **[Deleted]**

(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 assessing proposed *negotiated access standards* under this clause S5.2.5.5 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 *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 (l).

General requirements

(s) The *performance standard* must include any operational arrangements to ensure the *schedule 5.2 plant* will meet its agreed performance levels under abnormal *network* or *plant network* 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.

(u) **[Deleted]**

(v) **[Deleted]**

(w) **[Deleted]**

[165] Clause S5.2.5.5A Responses to disturbances following contingency events

After clause S5.2.5.5, insert the following new clause S5.2.5.5A:

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

(c) The *automatic access standard* is:

(1) for a *schedule 5.2 plant* to the extent it comprises *synchronous production units* and *synchronous condensers*, the requirements of paragraphs (ed) and (e); and

(2) for a *production system* to the extent it comprises *asynchronous production units*, the requirements of paragraphs (f) to (i).

Synchronous plant only

(d) Subject to paragraph (e), a *schedule 5.2 plant* for disturbances caused by a type of fault described in clause S5.2.5.5(c)(2) to (4), must:

(1) to assist the maintenance of *power system* voltages during the disturbance, supply or absorb capacitive reactive current at the *connection point*, in addition to its pre-disturbance reactive current, of 4% of the *maximum continuous current* of 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) of *connection point* voltage during the disturbance;

(2) after clearance of the fault, supply or absorb *reactive power* at the *connection point*, sufficient to ensure that the *connection point* voltage is within the range for *continuous uninterrupted operation* under clause S5.2.5.4; and

(3) within 100 milliseconds after 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

(f) Subject to paragraph (h), a *schedule 5.2 plant*, for disturbances caused by a type of fault described in clause S5.2.5.5(c)(2) to (4), must:

(1) to assist the maintenance of *power system* voltages during the 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* (in the absence of a disturbance) for each 1% reduction of positive sequence voltage at the *connection point* below the voltage at which the reactive current response commences;

(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* (in the absence of a disturbance) for each 1% increase of positive sequence voltage at the *connection point* above the relevant percentage of *nominal voltage* at which the reactive current response commences; and

(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) until the end of the disturbance, or until another point agreed with the *Network Service Provider* and *AEMO*; and

(3) within 100 milliseconds after 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).

(g) For the purpose of paragraph (f):

(1) the *schedule 5.2 plant* must commence the required response when or before the voltage reaches:

(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.

(h) 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:

(i) the *plant* is directly *connected* to the *power system* with no step-up or *connection transformer*; and

(ii) voltage at the *connection point* is 5% or lower of *nominal voltage*.

(i) Subject to paragraph (h), despite the amount of reactive current injected or absorbed during voltage disturbances, a *schedule 5.2 plant* must make available at all times:

(1) sufficient current to maintain rated apparent power of all operating *asynchronous production units* (in the absence of a disturbance), for all *connection point* voltages above 115% of *nominal voltage*; and

(2) the *maximum continuous current* of all operating *asynchronous production units* (in the absence of a disturbance) for all *connection point* voltages below 85% of *nominal voltage*,

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:

(1) for a *schedule 5.2 plant* to the extent it comprises *synchronous production units* or *synchronous condensers*, the requirements of paragraph (k) and (l); and

(2) for a *production system* to the extent it comprises *asynchronous production units*, the requirements of paragraphs (m) to (o).

Synchronous plant only

(k) Subject to paragraph (l), a *schedule 5.2 plant*, for disturbances caused by a type of fault described in 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 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 (consistent with *good electricity industry practice*), to conditions that may accompany a voltage disturbance, such as a *frequency* deviation or phase angle change), 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).

(l) 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

(m) Subject to paragraph (o), a *schedule 5.2 plant*, for disturbances caused by a type of fault described in clause S5.2.5.5(k)(2), must:

(1) to assist the maintenance of *power system* 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 a percentage greater than 0% of the *maximum continuous current* of all operating *asynchronous production units* (in the absence of a disturbance) for each 1% reduction of voltage at the *connection point* below the relevant point at which a reactive current response must commence, as identified in or agreed under paragraph (n)(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 all operating *asynchronous production units* (in the absence of a disturbance) for each 1% increase of voltage at the *connection point* above the relevant point at which a reactive current response must commence, as identified in or agreed under paragraph (n)(1),

with the required responses (within the range of capabilities expressed in this paragraph (m)(1)) to be agreed with the *Network Service Provider* and *AEMO* at levels consistent with achieving the control objective, and without contributing excessively to voltage rise on unfaulted phases during unbalanced faults;

(2) substantially maintain a response required under sub-paragraph (1) until the end of the disturbance, or until another point agreed with the *Network Service Provider* and *AEMO*; and

(3) 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), 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).

(n) For the purpose of paragraph (m):

(1) the *schedule 5.2 plant* must commence a response when or before the voltage reaches:

(i) for under-voltage, 80% of *nominal voltage* or another percentage agreed with *AEMO* and the *Network Service Provider*; or

(ii) for over-voltage, 120% of *nominal voltage* or another percentage agreed with *AEMO* and the *Network Service Provider*,

with the specific response initiating conditions being agreed with the Network Service Provider and AEMO, consistent with achieving the control objective;

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

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

(4) 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*.

(o) A *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) is not required to provide a capacitive reactive current response in accordance with subparagraph (m)(1)(i) where:

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

(ii) the *schedule 5.2 plant* is directly *connected* to the *power system* with no step-up or *connection transformer*, and voltage at the *connection point* is 20% or lower of *nominal voltage*.

Provision of minimum access standard

(p) 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) or other longer times it may be prepared to agree.

(q) 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* may propose

the times in paragraphs (n)(2) and (n)(4) or other longer times it is seeking to agree.

General requirements

(r) The *performance standard* must include any operational arrangements to ensure the *schedule 5.2 plant* will meet its agreed performance levels under abnormal *network* or *plant* conditions.

(s) 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 its operating *asynchronous production units*; and

(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 deviation may be measured at a location other than the *connection point* (including within the *schedule 5.2 plant*) where agreed with *AEMO* and the *Network Service Provider*, in which case the required injection and absorption will be calculated for 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*.

(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

(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.

[166] Clause S5.2.5.6 Quality of electricity generated and continuous uninterrupted operation

In the heading, omit "Quality of electricity generated and continuous uninterrupted operation" and substitute "Response to abnormal voltage quality".

[167] Clause S5.2.5.6 Quality of electricity generated and continuous uninterrupted operation

Omit clause S5.2.5.6 and substitute:

Minimum access standard

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

[168] Clause S5.2.5.7 Partial load rejection

In the heading, after "rejection", insert "for synchronous generation".

[169] Clause S5.2.5.7 Partial load rejection

Omit clause S5.2.5.7 and substitute:

(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 this clause S5.2.5.7, 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 must remain in *continuous uninterrupted operation* during and following a *power system load* reduction of 30% or equivalent impact from separation of part of the *power system* in less than 10 seconds, provided that the combined *loading level* of the operating *synchronous production units* remains above their combined *minimum operating level*.

Minimum access standard

(d) The *minimum access standard* is a relevant system must 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 combined *loading level* of the operating *synchronous production units* remains above their combined *minimum operating level*.

(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.

[170] Clause S5.2.5.8 Protection from power system disturbances

Omit clause S5.2.5.8 and substitute:

(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:

(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 s*ynchronous 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*.

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 limits*, 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* include a requirement for the *schedule 5.2 plant* 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 conditions for which the *schedule 5.2 plant*:

(1) must trip, where it would otherwise be required to remain in *continuous uninterrupted operation*; or

(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* 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* and *AEMO* or a *Network Service Provider*;

(2) where a *load* that is not part of the *schedule 5.2 plant* has the same *connection point* as the *schedule 5.2 plant* 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* is automatically *disconnected* under its performance standard for this clause S5.2.5.8, clause S5.2.5.9 or clause S5.2.5.10;

(4) where the *schedule 5.2 plant* is automatically *disconnected* by an *emergency frequency control scheme*;

(5) in accordance with an agreement between the *Schedule 5.2 Participant* 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 run-back scheme established by a *Network Service Provider*, with the agreement of *AEMO*.

(f) **[Deleted]**

[171] Clause S5.2.5.9 Protection systems that impact on power system security

In clause S5.2.5.9(a)(1), omit "*generating system* or *integrated resource system*" and substitute "*schedule 5.2 plant*".

[172] Clause S5.2.5.9 Protection systems that impact on power system security

In clause S5.2.5.9(b), omit "*Generator* or *Integrated Resource Provider*" and substitute "*Schedule 5.2 Participant*".

[173] Clause S5.2.5.9 Protection systems that impact on power system security

In clause S5.2.5.9(c)(1), omit "*generating system* or *integrated resource system*" and substitute "*schedule 5.2 plant*".

[174] Clause S5.2.5.9 Protection systems that impact on power system security

In clause S5.2.5.9(e), omit "*Generator* or *Integrated Resource Provider*" and substitute "*Schedule 5.2 Participant*".

[175] Clause S5.2.5.9 Protection systems that impact on power system security

In clause S5.2.5.9(e)(1), omit "*voltage*" and substitute "voltage".

[176] Clause S5.2.5.10 Protection to trip plant for unstable operation

In the heading, omit "Protection to trip plant for" and substitute "Detection and response to".

[177] Clause S5.2.5.10 Protection to trip plant for unstable operation

Omit clause S5.2.5.10 and substitute:

Automatic access standard

(a) The *automatic access standard* is a *schedule 5.2 plant* must:

(1) for its *synchronous production units* and *synchronous condensers*, have a *protection system* to *disconnect* units promptly when a condition that would lead to pole slipping is detected, to prevent pole slipping or other conditions where a unit causes *active power*, *reactive power* or voltage at the *connection point* to become unstable as assessed in accordance with the *power system* stability guidelines established under clause 4.3.4(h);

(2) for its *asynchronous production units*:

(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:

(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*.

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*.

[178] Clause S5.2.5.11 Frequency control

Omit clause S5.2.5.11 and substitute:

(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*, expressed as a percentage of its *active power capability*. 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*.

Automatic access control

(b) The *automatic access standard* is:

(1) *power transfer* to the *power system* from a *schedule 5.2 plant*, 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

(2) a *schedule 5.2 plant* 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* 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).

(3) **[Deleted]**

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 bidirectional 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*, under relatively stable input energy, 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*; or

(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* 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 provide:

(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*; and

(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*.

(3) [**Deleted**]

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 bidirectional 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 subparagraph (b)(2), 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* 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* 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 ± 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) is taken to require a *production unit* 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

(4) **[Deleted]**

(5) the *performance standards* must record:

(i) agreed values for the *minimum operating level* of the *production units* where applicable, and where relevant the method of determining the values; and

(ii) for the purpose of subparagraph (b)(2), or a *negotiated access standard* offering measurable 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.

[179] Clause S5.2.5.12 Impact on network capability

Omit clause S5.2.5.12 and substitute:

(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* 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* were not electrically *connected*.

Minimum access standard

(b) The *minimum access standard* is a *schedule 5.2 plant* 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]**

(d) A *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* 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* conditions, so that *power system security* can be maintained.

(e) A *negotiated access standard* must detail the *plant* capabilities, *control systems* and operational arrangements that will be maintained by the *Schedule 5.2 Participant*, notwithstanding that changes 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]**

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* (such as a power system stabiliser), the *Network Service Provider* and the *Schedule 5.2 Participant* may negotiate for the provision of such additional *control system facilities* as a commercial arrangement.

[180] Clause S5.2.5.13 Voltage and reactive power control

Omit clause S5.2.5.13 and substitute:

(a) 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:

(1) 30 MW or 30 MVA (as applicable); or

(2) 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*.

Automatic access standard

(b) The *automatic access standard* is:

(1) subject to paragraph (o), a *schedule 5.2 plant* must have *plant* capabilities and *control systems* sufficient to ensure that:

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

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

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

(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* must have a *control system* with the ability to:

(i) 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 the *Network Service Provider* and *AEMO*;

(2B) a *schedule 5.2 plant* must have a 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 at the *connection point* or another agreed location in the *power system* (including within the *schedule 5.2 plant*) to within 0.5% of the setpoint, where that setpoint may be adjusted to incorporate any voltage droop or reactive current compensation agreed with *AEMO* and the *Network Service Provider*;

(ii) regulates voltage in a manner that helps to support *network* voltages during faults and does not prevent the *Network Service Provider* from achieving the requirements of clauses S5.1a.3 and S5.1a.4;

(iii) allows the voltage setpoint to be configurable in the range of at least 5% of *nominal voltage* above and below the target voltage (as determined by the *Network Service Provider* in accordance with clause S5.1.4(c));

(iiiA) does not rely on a *tap-changing transformer* as the means of voltage regulation; and

(iv) has limiting devices 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 disturbance does not cause the *plant* to trip at the limits of its operating capability;

(3) 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* 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 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 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 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);

(viii) can increase field voltage from rated field voltage to the excitation ceiling voltage in less than:

(A) 0.05 second for a *static excitation system*; or

(B) 0.5 second for other *excitation control systems*; and

(ix) has a 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* 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 connected* to the *power system*, has *settling times* and *rise 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);

(vi) **[Deleted]**

(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,* 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;

(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 *plant*;

(4) an output limiter, which for a *synchronous production unit* is continually adjustable over the range of –10% to +10% of stator voltage;

(5) monitoring and recording *facilities* for key variables including inputs, output and the inputs to the lead-lag transfer function blocks; and

(6) *facilities* to permit testing of the *power system* stabiliser in isolation from the *power system* by injection of test signals, sufficient to establish the transfer function of the *power system* stabiliser.

(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*), to within:

(i) for a *schedule 5.2 plant* operating in *reactive power* mode, 2% of the rating (in MVA) of the *schedule 5.2 plant* (expressed in MVAr); or

(ii) for a *schedule 5.2 plant* operating in *power factor* mode, a *power factor* equivalent to 2% of the rating (in MVA) of the *schedule 5.2 plant* (expressed in MVAr);

(2) 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; and

(3) 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).

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
Voltage as primary – not *synchronised*[1]	No requirement	*Synchronous production units* and *synchronous condensers* only: < 2.5 seconds for: • voltage • 5% voltage disturbance typical to highest impedance.	No requirement
Voltage as primary	*Asynchronous production units* only: < 3 seconds without limiting	< 5 seconds without limiting device condition < 7.5 seconds with limiting device	< 5 seconds without limiting device condition < 7.5 seconds with limiting device

Control mode	Maximum rise time	Maximum settling time - setpoint change	Maximum settling time – voltage disturbance
	device condition for: • *reactive power* • 2-5% voltage disturbance • typical to highest impedance.	condition In both cases, for: • voltage, *reactive power* and *active power* • 5% setpoint change • typical to highest impedance • setpoint input ramp rate limit, if applicable, may be disabled for test purposes.	condition In both cases, for: • voltage, *reactive power* and *active power* • voltage disturbance between 2% and 5% • typical to highest impedance.
Voltage as secondary	No requirement	No requirement	< 5 seconds without limiting device condition < 7.5 seconds with limiting device condition In both cases, for: • voltage, *reactive power* and *active power* • 5% voltage disturbance • typical impedance.
Power factor as primary	No requirement	Without limiting device condition:	< 5 seconds without limiting device condition

Control mode	Maximum rise time	Maximum settling time - setpoint change	Maximum settling time – voltage disturbance
		• < 5 seconds in conditions where response overshoots the sustained change or response is oscillatory • < 30 seconds otherwise for: - *reactive power* and *active power* - a setpoint change equivalent to at least half of the *reactive power* range (absorbing to injecting) established under clause S5.2.5.1 - typical to highest	< 7.5 seconds with limiting device condition In both cases, for: • *reactive power* and *active power* • voltage disturbance between 2% and 5% • typical to highest impedance.

Control mode	Maximum rise time	Maximum settling time - setpoint change	Maximum settling time – voltage disturbance
		impedance.	
Power factor as secondary	No requirement	No requirement	< 5 seconds without limiting device condition < 7.5 seconds with limiting device condition In both cases, for: • *reactive power* and *active power* • 5% voltage disturbance • typical impedance.
Reactive power as primary	No requirement	If limiting device does not operate: • < 5 seconds in conditions where response overshoots the sustained change or response is oscillatory • < 30 seconds otherwise for: • *reactive power* • a setpoint change equivalent to at least half of the *reactive power* range	< 5 seconds without limiting device condition < 7.5 seconds with limiting device condition In both cases, for: • *reactive power* • voltage disturbance between 2% and 5% • typical to highest impedance.

Control mode	Maximum rise time	Maximum settling time - setpoint change	Maximum settling time – voltage disturbance
		(absorbing to injecting) established under clause S5.2.5.1 • typical to highest impedance.	
Reactive power as secondary	No requirement	No requirement	< 5 seconds without limiting device condition < 7.5 seconds with limiting device condition In both cases, for: • *reactive power* • 5% voltage disturbance • typical impedance.

Minimum access standard

(d) The *minimum access standard* is:

(1) subject to paragraph (o), a *schedule 5.2 plant* must have *plant* capabilities and *control systems*, including, if appropriate, a 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* against any other *production unit* or *synchronous condenser*, are *adequately damped*;

(ii) operation of the *schedule 5.2 plant* 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* does not cause instability (including hunting of *tap-changing transformer control systems*) that would adversely impact other *Network Users*;

(1A) **[Deleted]**

(2) a relevant system must have *facilities* for testing its *control systems* sufficient to establish their dynamic operational characteristics;

(2A) a *schedule 5.2 plant* must have a *control system* to regulate:

(i) voltage; or

(ii) either of *reactive power* or *power factor* with the agreement of *AEMO* and the *Network Service Provider*;

(2B) a voltage *control system* for a *schedule 5.2 plant* must, within the *reactive power* response range agreed in a *performance standard* under clause S5.2.5.1:

(i) regulate voltage at the *connection point* or another agreed location in the *power system* (including within the *schedule 5.2 plant*), to within 2% of the setpoint, where that setpoint may be adjusted to incorporate any voltage droop or reactive current compensation agreed with *AEMO* and the *Network Service Provider*; and

(ii) allow the voltage setpoint to be controllable in the range of at least 98% to 102% of the target voltage (as determined by the *Network Service Provider* in accordance with clause S5.1.4(c) and recorded in the *performance standards*) at the *connection point* or the agreed location;

(3) a *schedule 5.2 plant'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*), to within:

(A) for a *schedule 5.2 plant* operating in reactive power mode, 5% of the rating (in MVA) of the *schedule 5.2 plant* (expressed in MVAr); or

(B) for a *schedule 5.2 plant* operating in *power factor* mode, a *power factor* equivalent to 5% of the rating (in MVA) of the *schedule 5.2 plant* (expressed in MVAr); 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) with an *excitation control system* required to regulate voltage under subparagraph (d)(2A)(i) must:

(i) **[Deleted]**

(ii) have excitation ceiling voltage of at least 1.5 times the excitation required to achieve 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]**

(iv) **[Deleted]**

(5) any relevant system with an *excitation control system* required to regulate 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

(iii) have limiting devices to ensure that a voltage disturbance would not cause the *generating unit* to trip at the limits of its operating capability.

(6) **[Deleted]**

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: • voltage • 5% voltage disturbance • typical to highest impedance.
Power factor as primary	< 7.5 seconds or longer time agreed with the *Network Service Provider*, for: • *reactive power* and *active power* • 5% voltage disturbance • typical to highest impedance.
Reactive power as primary	< 7.5 seconds or longer time agreed with the *Network Service Provider*, for: • *reactive power* • 5% voltage disturbance • typical to highest impedance.

Negotiated access standard

(e) **[Deleted]**

(f) 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 requirement

(g1) Where a *schedule 5.2 plant* has been commissioned for more than one control mode, the *Schedule 5.2 Participant* (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.*

(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*.

(i) The *Network Service Provider* may require that the design and operation of the *control systems* of a *schedule 5.2 plant* be coordinated with the existing voltage *control systems* of the *Network Service Provider* and of other *Network Users*, in order to avoid or manage interactions that would adversely impact on the *Network Service Provider* and other *Network Users*.

(j) Any requirements imposed by the *Network Service Provider* under paragraph (i) must be recorded in the *performance standard*.

(k) The impact of the *schedule 5.2 plant* on *power system* stability and damping of *power system* oscillations 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*, ±0.5 MW or ±2% of the maximum active power (Pmax) recorded in the *performance standard* for clause S5.2.5.1;

(ii) for *reactive power*, ±0.5 MVAr or ±2% of the *reactive power capability* recorded in the *performance standard* for clause S5.2.5.1; or

(iii) for voltage, ±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.

[181] Clause S5.2.5.14 Active power control

Omit clause S5.2.5.14 and substitute:

(a0) This clause S5.2.5.14 does not apply to *synchronous condensers*.

(a) The *automatic access standard* is a *schedule 5.2 plant* must have an *active power control system* capable of:

(1) for any *scheduled generating units* or *scheduled bidirectional units*:

(i) maintaining and changing the *active power* level in accordance with *dispatch instructions*;

(ii) ramping 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*

(i) automatically reducing or increasing 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 the *active power* level, to below the level specified in subparagraph (i); and

(iii) not changing 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 *semi-scheduled generating units*:

(i) automatically reducing or increasing 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 the *active power* level, to or below the level specified in subparagraph (i);

(iii) not changing 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 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* must have an *active power control system* capable of:

(1) for any *scheduled generating units* or *scheduled bidirectional units*:

(i) maintaining and changing 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*:

(i) reducing 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 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 *semi-scheduled generating units*:

(i) maintaining and changing the *active power* level in accordance with its *dispatch instructions*;

(ii) not changing 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* to upgrade its *facilities* to receive electronic instructions and fully implement them within 5 minutes.

(d) A *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* 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*.

[182] Clause S5.2.5.15 Short circuit ratio

Omit clause S5.2.5.15, and substitute:

(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).

Minimum access standard

(b) The *minimum access standard* is a *production system* 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* must accord:

(1) the agreed value of the *short circuit ratio* which must be the minimum of 3.0 and the value at which the *production system* has, subject to paragraph (e), *plant* capability sufficient to operate stably and remain *connected*;

(2) the *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 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 system* is not otherwise capable of meeting the *minimum access standard*, the *Schedule 5.2 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 5.2 Participant* may:

(1) reach agreement with the *Network Service Provider* for the *Schedule 5.2 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 *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.

[183] Clause S5.2.5.16 Voltage phase angle shift

In the heading, omit "Voltage phase angle shift" and substitute "**[Deleted]**".

[184] Clause S5.2.5.16 Voltage phase angle shift

Omit clause S5.2.5.16.

[185] Clause S5.2.6.1 Remote Monitoring

Omit S5.2.6.1 and substitute:

(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* 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*:

(i) the status of all switching devices that carry *generation* or *load*;

(ii) *tap-changing transformer* tap position(s) and 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*; and

(vi) 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;

(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, *active power* and *reactive power* in respect of *production unit* or *synchronous condenser* 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*, *active power* and *reactive power*;

(4) in respect of *reactive power* equipment that is part of a *schedule 5.2 plant* but not part of a particular *production unit* or *synchronous condenser*, its *reactive power*;

(5) in respect of *semi-scheduled generating units*, all data specified as mandatory in the relevant *energy conversion model* applicable to the corresponding type of *semi-scheduled generating unit*;

(6) in respect of a *schedule 5.2 plant* to the extent that it is a *scheduled resource*:

(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* 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* 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*:

(i) voltage *control* setpoint; and

(ii) voltage *control* mode (where applicable);

(2) in respect of a *schedule 5.2 plant* to the extent that it is a *scheduled resource*, the *AGC* signal; and

(3) in respect of a *schedule 5.2 plant* that is non-scheduled, 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* 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*;

(2) if *connected* to a *transmission system*, the *reactive power* level of the *schedule 5.2 plant*; and

(3) in respect of *semi-scheduled generating units*, all data specified as mandatory in the relevant *energy conversion model* applicable to the corresponding type of *semi-scheduled generating unit*.

(4) **[Deleted]**

(5) **[Deleted]**

[186] Clause S5.2.6.2 Communications equipment

Omit clause S5.2.6.2 and substitute:

Automatic access standard

(a) The *automatic access standard* is a *Schedule 5.2 Participant* 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 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* 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*.

Minimum access standard

(b) The *minimum access standard* is a *Schedule 5.2 Participant* must:

(1) provide and maintain a telephone facility for the purposes of *operational communications* between the *Schedule 5.2 Participant'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* 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*.

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* must provide communications paths (with appropriate redundancy) from the *remote monitoring equipment* or *remote control equipment* installed for its *schedule 5.2 plant* to an interface for communication purposes in a location reasonably acceptable to the *Network Service Provider* at the relevant *schedule 5.2 plant*.

(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* and the *Network Service Provider*.

(f) A *negotiated access standard* must include a requirement that the *Schedule 5.2 Participant* provide accommodation and secure power supplies for communications *facilities* provided by the *Network Service Provider* under this clause S5.2.6.2.

[187] Clause S5.2.7 Power station auxiliary supplies

In the heading, omit "Power station" and substitute "Generation".

[188] Clause S5.2.7 Power station auxiliary supplies

Omit clause S5.2.7 and substitute:

In cases where a *production 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* (as the case may be) were a *Schedule 5.3 Participant.*

[189] Clause S5.2.8 Fault current

Omit clause S5.2.8 and substitute:

Automatic access standard

(a) The *automatic access standard* is:

(1) the contribution of the *schedule 5.2 plant* 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* 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* 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*, as specified in the *connection agreement*.

Minimum access standard

(b) The *minimum access standard* is:

(1) the *schedule 5.2 plant* does not need to limit fault current contribution;

(2) a *schedule 5.2 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* 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*, 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*, impose the least obligation on the *Schedule 5.2 Participant*.

(d) **[Deleted]**

[190] Schedule 5.3 Conditions for Connection of Customers

In the heading, omit "Conditions for Connection of Customers" and substitute "Technical connection requirements for loads".

[191] Clause S5.3.1a Introduction to the schedule

In the heading, omit "Introduction to the schedule" and substitute "Application of the schedule".

[192] Clause S5.3.1a Introduction to the schedule

Omit clause S5.3.1a(a) and substitute:

(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*").

[193] Clause S5.3.1a Introduction to the schedule

After clause S5.3.1a(a), insert:

(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*.

[194] Clause S5.3.1a Introduction to the schedule

Omit clause S5.3.1a(b) and substitute:

(b) For the purposes of this schedule 5.3 the term **Network Service Provider** means the *Network Service Provider* with whom the *Connection Applicant* has sought, or is seeking, a *connection*.

[195] Clause S5.3.1a Introduction to the schedule

Omit clause S5.3.1a(c) and substitute:

(c) **[Deleted]**

[196] Clause S5.3.1a Introduction to the schedule

Omit clause S5.3.1a(d) and substitute:

(d) 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 of this schedule expressed as obligations on a *Schedule 5.3 Participant*; and

(2) the relevant agreed *performance standards* with which the *Schedule 5.3 Participant* must comply.

[197] Clause S5.3.1a Introduction to the schedule

Omit clause S5.3.1a(e) and substitute:

(e) **[Deleted]**

[198] Clause S5.3.1 Information

In clause S5.3.1, omit "*Network User*" wherever it appears in paragraphs (a), (a1) and (a3), and substitute "*Schedule 5.3 Participant"*.

[199] Clause S5.3.1 Information

In clause S5.3.1(a4), after "must be treated as *confidential information* by those recipients.", insert "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*".

[200] Clause S5.3.1 Information

Omit clause S5.3.1(b) and substitute:

(b) 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 the proposed *connection* includes:

(1) the highest expected single phase and three phase fault levels at the *connection point* without the proposed *connection*;

(2) the clearing times of the existing *protection systems* that would clear a fault at the location at which the new *connection* would be connected into the existing *transmission system* or *distribution system*;

(3) the expected limits of voltage fluctuation, harmonic voltage distortion and voltage unbalance at the *connection point* without the proposed *connection*;

(4) technical information relevant to the *connection point* without the proposed *connection* including equivalent source impedance information, sufficient to estimate fault levels, voltage fluctuations, harmonic voltage distortion and voltage unbalance; and

(5) any other information or data not being *confidential information* relating to the performance of the Network Service Provider's *facilities* that is reasonably necessary for the *Connection Applicant* to prepare an *application to connect*;

except where the *Schedule 5.3 Participant* agrees the Network Service Provider may provide alternative or less detailed technical information in satisfaction of this clause S5.3.1(b).

[201] Clause S5.3.2 Design standards

In clause S5.3.2, omit the first instance of "*Network User*", and substitute "*Schedule 5.3 Participant*".

[202] Clause S5.3.2 Design standards

Omit clause S5.3.2(a) and substitute:

(a) the electrical *plant* within the *schedule 5.3 plant* complies with the relevant *Australian Standards* as applicable at the time of first installation;

[203] Clause S5.3.2 Design standards

In clause S5.3.2(b), omit "*Network User's facilities*" and substitute "*schedule 5.3 plant*".

[204] Clause S5.3.2 Design standards

Omit clause S5.3.2(c) and substitute:

(c) new equipment including circuit breakers provided to isolate the *schedule 5.3 plant* from the Network Service Provider's *facilities* is capable of withstanding, without damage, power *frequency* voltages and impulse levels nominated by the Network Service Provider to apply at the *connection point* in accordance with the relevant provisions of the *system standards* and recorded in the relevant *connection agreement*.

[205] Clause S5.3.3 Protection systems and settings

Omit clause S5.3.3 and substitute:

A *Schedule 5.3. Participant* 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* must cooperate in the design and implementation of *protection systems* to comply with this clause, including cooperation with regard to:

(1) the use of *current transformer* and *voltage transformer* secondary circuits (or equivalent) of one party by the *protection system* of the other;

(2) tripping of one party's circuit breakers by a *protection system* of the other party; and

(3) co-ordination of *protection system* settings to ensure inter-operation.

Before the *schedule 5.3 plant* is *connected* to the *Network Service Provider's transmission system* or *distribution system* its *protection system* must be tested and the *Schedule 5.3 Participant* 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.

[206] Clause S5.3.4 Settings of protection and control systems

In clause S5.3.4, omit "*Network User*" wherever it appears and substitute "*Schedule 5.3 Participant*".

[207] Clause S5.3.5 Power factor requirements

Omit clause S5.3.5 and substitute:

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

A *Schedule 5.3 Participant* who installs *shunt capacitors* to comply with *power factor* requirements must comply with the *Network Service Provider's* reasonable requirements to ensure that the design does not severely attenuate audio *frequency* signals used for *load* control or operations, or adversely impact on harmonic voltage levels at the *connection point*.

[208] Clause S5.3.6 Balancing of load currents

Omit clause S5.3.6, and substitute:

A Network Service Provider may require a *schedule 5.3 plant's load* to be balanced across all phases in order to maintain the negative sequence voltage at each *connection point* at less than or equal to the limits set out in Table S5.1a.1 of the *system standards* for the applicable nominal *supply* voltage level.

Automatic access standard: A *Schedule 5.3 Participant* must ensure that:

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

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

Minimum access standard: Where agreed with the relevant Network Service Provider and subject to any specific conditions imposed, a *schedule 5.3 plant* may cause current unbalance greater than that specified in the *automatic access standard* provided the *schedule 5.3 plant* 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* 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*.

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

[209] Clause S5.3.7 Voltage fluctuations

Omit clause S5.3.7 and substitute:

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

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

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

[210] Clause S5.3.8 Harmonics and voltage notching

Omit clause S5.3.8 and substitute:

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

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

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

[211] Clause S5.3.9 Design requirements for Network Users' substations

In clause S5.3.9, omit the first instance of "*Network User*", and substitute "*Schedule 5.3 Participant*".

[212] Clause S5.3.9 Design requirements for Network Users' substations

Omit clause S5.3.9(c) and substitute:

(c) a *substation* must be capable of continuous uninterrupted operation with the levels of voltage, harmonics, unbalance and voltage fluctuation specified in the *system standards* as modified in accordance with the relevant provisions of schedule 5.1;

[213] Clause S5.3.10 Load shedding facilities

In clause S5.3.10, omit "*Network Users* who are *Market Customers* and", and substitute "*Schedule 5.3 Participants*".

[214] Clause S5.3.11 Short circuit ratio (customers)

In the heading of clause S5.3.11, omit "(customers)".

[215] Clause S5.3.11 Short circuit ratio (customers)

In clause S5.3.11(a), omit "a *Network User* where the *plant* to be *connected*", and substitute "*schedule 5.3 plant* that".

[216] Clause S5.3.11 Short circuit ratio (customers)

In clause S5.3.11(c), omit "in the *connection agreement*".

[217] Schedule 5.3a Conditions for connection of Market Network Services

In the heading, omit "Conditions for connection of Market Network Services" and substitute "Technical requirements for high voltage direct current networks".

[218] Clause S5.3a.1a Introduction to the schedule

In the heading, omit "Introduction to the schedule" and substitute "Application of the schedule".

[219] Clause S5.3a.1a Introduction to the schedule

Omit clause S5.3a.1a and substitute:

(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.

[220] Clause S5.3a.1 Provision of Information

In clause S5.3a.1(a), omit "*Market Network Service Provider*" wherever it appears and substitute "*Schedule 5.3a Participant*".

[221] Clause S5.3a.1 Provision of Information

In clause S5.3a.1(a1), omit "*Market Network Service Provider*" wherever it appears and substitute "*Schedule 5.3a Participant*".

[222] Clause S5.3a.1 Provision of Information

Omit clause S5.3a.1(a3) and substitute:

(a3) **[Deleted]**

[223] Clause S5.3a.1 Provision of Information

Omit clause S5.3a.1(b) and substitute:

(b) 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 the proposed *connection* of a *schedule 5.3a plant* 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;

(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*.

[224] Clause S5.3a.1 Provision of Information

After clause S5.3a.1(b), insert:

(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*.

[225] Clause S5.3a.2 Application of settings

Omit clause S5.3a.2 and substitute:

A *Schedule 5.3a Participant* 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*, also by *AEMO*. A *Schedule 5.3a Participant* must not allow its *schedule 5.3a plant* to supply electricity to, or take electricity from, the *power system* without such prior approval.

If a *Schedule 5.3a Participant* 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*, *AEMO*, reasonably determines that the changed setting would cause the *schedule 5.3a 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 an *AEMO advisory matter*, *AEMO*, reasonably determines that a setting of a *schedule 5.3a plant'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*, 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* to apply a setting or to conduct a test.

A *Schedule 5.3a Participant* 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* 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* 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* to change a setting within 18 months of a previous request, the *Network Service Provider* must pay the *Schedule 5.3a Participant* its reasonable costs of changing the setting and conducting the tests as requested.

[226] Clause S5.3a.3 Technical matters to be coordinated

Omit clause S5.3a.3 and substitute:

A *Schedule 5.3a Participant* 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* 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*.

[227] Clause S5.3a.4.1 Remote Monitoring

Omit clause S5.3a.4.1 and substitute:

Automatic access standard

(a) The *automatic access standard* is:

(1) a *schedule 5.3a plant* 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 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*.

(2) **[Deleted]**

Minimum access standard

(b) The *minimum access standard* is

a *schedule 5.3a plant* 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):

(i) *connection point active power* flow, *reactive power* flow and voltage;

(ii) *active power*, *reactive power* and voltage for AC power lines, *transformers* and *busbars*;

(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]**

[228] Clause S5.3a.4.2 [Deleted]

In the heading, omit "[Deleted]", and substitute "Detection and response to unstable operation".

[229] Clause S5.3a.4.2 [Deleted]

In clause S5.3a.4.2, insert:

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).

[230] Clause S5.3a.4.3 Communications equipment

Omit clause S5.3a.4.3 and substitute:

A *Schedule 5.3a Participant* must provide electricity supplies for remote monitoring equipment and *remote control equipment* installed in relation to its *schedule 5.3a plant* 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*.

A *Schedule 5.3a Participant* must provide communications paths (with appropriate redundancy) from the *remote monitoring equipment* or *remote control equipment* installed at its *schedule 5.3a plant* 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* and the *Network Service Provider.*

Telecommunications between *Network Service Providers* and *Schedule 5.3a Participants* 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* 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 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.

[231] Clause S5.3a.5 Design standards

Omit clause S5.3a.5, and substitute:

A *Schedule 5.3a Participant* must ensure that:

(a) The electronic *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* 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* from the *Network Service Provider's facilities* is capable of withstanding, without damage, power *frequency* voltages and impulse levels nominated by the *Network Service Provider* in accordance with the relevant provisions of the *system standards* and recorded in the *performance standards.*

[232] Clause S5.3a.6 Protection systems and settings

Omit clause S5.3a.6 and substitute:

(a0) A *Schedule 5.3a Participant* 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.

Automatic access standard

(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; 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).

Minimum access standard

(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); 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).

General requirements

(c) The *Network Service Provider* and the *Schedule 5.3a Participant* 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* 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* must provide details of the protection scheme implemented for the *schedule 5.3a plant* 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* is connected to the *Network Service Provider's transmission system* or *distribution system* the *protection system* must be tested and the *Schedule 5.3a Participant* must submit the appropriate test certificate to the *Network Service Provider*.

[233] Clause S5.3a.7 Short circuit radio

Omit S5.3a.7(a) and substitute:

(a) **[Deleted]**

[234] Clause S5.3a.7 Short circuit radio

In clause S5.3a.7(c)(2), omit "rated".

[235] Clause S5.3a.8 Reactive power capability

Omit clause S5.3a.8 and substitute:

(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* 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.

[236] Clause S5.3a.9 Balancing of load currents

Omit clause S5.3a.9, and substitute:

(a) A *Network Service Provider* may require a *schedule 5.3a plant's power transfer* to be balanced at a *connection point* in order to maintain the negative sequence voltage at each *connection point* at less than or equal to the limits set out in Table S5.1a.1 of the *system standards* for the applicable nominal *supply* voltage level.

Automatic access standard

(b) The *automatic access standard* is a *Schedule 5.3a Participant* must ensure that for *connections* at 11kV or higher voltage, the current in any phase drawn by its equipment from the *Network Service Provider's network* is not greater than 102 percent or less than 98 percent of the average of the currents in the three phases.

Minimum access standard

(c) 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* may cause current unbalance greater than that specified in the *automatic access standard* provided the *schedule 5.3a plant* 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) 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.*

General requirement

(e) The *performance standards* must record the limit to *power transfer* current unbalance, which is subject to verification of compliance by the *Network Service Provider*.

[237] Clause S5.3a.10 Voltage fluctuations

Omit clause S5.3a.10 and substitute:

Automatic access standard

(a) 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) 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

(c) The *performance standards* must record the voltage fluctuation emission limits and any specified conditions, which are subject to verification of compliance by the *Network Service Provider*.

[238] Clause S5.3a.11 Harmonics and voltage notching

Omit clause S5.3a.11 and substitute:

Automatic access standard

(a) The *automatic access standard* is the harmonic 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 harmonic 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* must ensure that its *schedule 5.3a plant* 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 distortion emission limits and any special conditions, which are subject to verification of compliance by the *Network Service Provider*.

[239] Clause S5.3a.12 Design requirements for Market Network Service Providers' substations

In the heading, omit "*Market Network Service Providers*".

[240] Clause S5.3a.12 Design requirements for Market Network Service Providers' substations

In clause S5.3a.12, omit the first instance of "*Market Network Service Provider*" and substitute "*Schedule 5.3a Participant*".

[241] Clause S5.3a.12 Design requirements for Market Network Service Providers' substations

Omit clause S5.3a.12(c) and substitute:

(c) a *substation* must be capable of continuous uninterrupted operation with the levels of voltage, harmonics, unbalance and voltage fluctuation specified in the *system standards* as modified in accordance with the relevant provisions of schedule 5.1;

[242] Clause S5.3a.13 Response to disturbances in the power system

In the heading, omit "*Market network service response*" and substitute "Response".

[243] Clause S5.3a.13 Response to disturbances in the power system

Omit clause S5.3a.13 and substitute:

Automatic access standard

(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

(b) 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

(c) 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.

(d) 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*.

(e) The equipment associated with each *schedule 5.3a plant* must be designed to withstand without damage or reduction in life expectancy the harmonic distortion and voltage unbalance conditions determined to apply in accordance with the provisions of schedule 5.1, clauses S5.1.6 and S5.1.7, respectively, at each *connection point*.

[244] Clause S5.3a.14 Protection of market network services from power system disturbances

In the heading of clause S5.3a.14, omit "Protection of market network services from power system disturbances", and substitute "Disturbance ride through and response capability".

[245] Clause S5.3a.14 Protection of market network services from power system disturbances

Omit clause S5.3a.14 and substitute:

(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 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.

[246] Clause S5.3a.15 Voltage and reactive power control

After clause S5.3a.14, insert new clause S5.3a.15:

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.

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.

[247] Clause S5.3a.16Active power control

After clause S5.3a.15, insert new clause S5.3a.16:

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;

(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*.

[248] Schedule 5.4A Preliminary Response

Omit schedule 5.4A(c) and substitute:

(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*;

(4) **[Deleted]**

[249] Schedule 5.4B Detailed Response to Enquiry

Omit schedule 5.4B(b) and substitute:

(b) written details of each technical requirement relevant to the proposed *plant* as relevant to:

(1) the *automatic access standards*;

(2) the *minimum access standards*; and

(3) any applicable *plant* standards;

(4) **[Deleted]**

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;

[250] Clause S5.5.4 Data Requirements

Omit clause S5.5.4 and substitute:

(a) Schedules 5.5.3 to 5.5.5 cover the following data areas:

(1) schedule 5.5.3 - Network Plant Technical Data. This comprises fixed electrical parameters.

(2) 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*.

(3) schedule 5.5.5 - *Load* Characteristics. This comprises the estimated design parameters of *loads*.

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

(1) *Generators*: the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*;

(2) *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*;

(3) *Customers*: schedule 5.5.5 and the *Power System Model Guidelines*, *Power System Design Data Sheet* and *Power System Setting Data Sheet*; and

(4) *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*.

[251] Clause S5.5.5 Asynchronous production unit data

Omit clause S5.5.5 and substitute:

A *Schedule 5.2 Participant* that connects a *schedule 5.2 plant* that includes any *asynchronous production 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*, 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*, as determined by the *Network Service Provider*.

[252] Clause S5.5.6 Generating units smaller than 30MW data

In clause S5.5.6, omit "*Generator* or an *Integrated Resource Provider*" and substitute "*Schedule 5.2 Participant*".

[253] Clause S5.5.7 Power System Design Data Sheet, Power System Setting Data Sheet and Power System Model Guidelines

In clause S5.5.7(a), omit "5.3.9(b)(2A)," wherever it appears.

[254] Clause S5.5.7 Power System Design Data Sheet, Power System Setting Data Sheet and Power System Model Guidelines

Omit clause 5.5.7(b1) and substitute:

(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), and clause S5.5.6 (as applicable);

(ii) *Schedule 5.2 Participants* must provide under clause 5.3.9(b)(2) and clause S5.2.4;

(iii) *Network Service Providers* must provide under clause 4.3.4(o), clause 5.2.3(j) and clause 5.2.3(k);

(iv) *Customer* must provide under clause 5.2.4(c) and clause 5.2.4(d);

(v) *Market Network Service Providers* must provide under clause 5.2.3A(a) and clause 5.2.3A(b);

(vi) *Schedule 5.3 Participant* or *Schedule 5.3a Participant* must provide under clause 5.3.12(b)(2), clause S5.3.1(a1) and clause S5.3a.1(a1) (as applicable);

(vii) prospective *NSCAS* tenderers must provide under clause 3.11.5(b)(5); and

(viii) prospective *SRAS Providers* must provide under clause 3.11.9(g);

[255] Clause S5.5.7 Power System Design Data Sheet, Power System Setting Data Sheet and Power System Model Guidelines

Omit clause 5.5.7(b1)(4) and substitute:

(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), 5.2.5(e), 5.2.5A(d), 5.2.5A(e), 5.3.9(b)(2), 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*;

[256] Schedule 5.5.3 Network and plant technical data of equipment at or near connection point

Omit Schedule 5.3.3 and substitute:

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

Data Description	Units	Data Category
Controls		
Remote control and data transmission arrangements	Text	D
Metering Provided by Customer		
Measurement *transformer* ratios:		D
Current transformers	A/A	D
Voltage transformers	V/kV	D
Measurement *Transformer* Test Certification details	Text	R1
Network Configuration		
Operation Diagrams showing the electrical circuits of the existing and proposed main *facilities* within the *Registered Participant's* ownership including *busbar* arrangements, phasing arrangements, earthing arrangements, switching *facilities* and operating voltages.	Single line Diagrams	S, D, R1
Network Impedance		
For each item of *plant*: 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
Short Circuit Infeed to the Network		
Maximum generator 3-phase short circuit infeed including infeeds from *production units connected* to the *Registered Participant's*	kA symmetrical	S, D, R1

Data Description	Units	Data Category
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 *Registered Participant's network* at *connection point*.	% on 100 MVA base	D, R1
Minimum negative sequence impedance of *Registered Participant's network* at *connection point*.	% on 100 MVA base	D, R1
Load Transfer Capability:		
Where a *load*, or group of *loads*, may be fed from alternative *connection points*:		
Load normally taken from *connection point* X	MW	D, R1
Load normally taken from *connection point* Y	MW	D, R1
Arrangements for transfer under planned or fault *outage* conditions	Text	D
Circuits Connecting Distribution Connected Units to the Network:		
For all *production 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*		

Data Description	Units	Data Category
System Design Data Sheet, *Power System Setting Data Sheet* and the *Power System Model Guidelines* where such details are not *confidential information*		
***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 *Reactor*	MVAr	D,R
Location and Rating of DC Filter	MVAr	D,R

[257] Schedule 5.6 Terms and Conditions of Connection agreements and network operating agreements

Omit Part A and substitute:

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* 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;

(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* facilities for 60 percent of the *load* at any time;

(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.

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.

[258] Schedule 5.8 Distribution Annual Planning Report

In schedule 5.8(b)(5)(ii), omit "*voltage*" and substitute "voltage".

[259] Schedule 5.13 SAPS Performance Requirements to be defined by Distribution Network Service Providers

In schedule 5.13, omit paragraph (b) (including Table S5.13.1) and substitute:

(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

Parameter	Minimum content of standards
Frequency	*Frequency* band in normal operation *Frequency* band following a contingency and the maximum permitted time for excursions outside this band
System stability	Transient, oscillatory or voltage stability requirements to ensure stable *supply* in a *regulated SAPS*
Power frequency voltage	*Nominal voltage* of *supply* at *connection points* Acceptable limits of supply voltage variation from *nominal voltage* in normal operation and following a contingency Maximum time for which voltage may vary from *nominal voltage* for any given variation from *nominal voltage* These are to be set to achieve distortion free voltage supply for the efficient and safe operation of equipment in customer installations
Voltage fluctuations (flicker)	Maximum voltage fluctuation level of *supply*
	Permitted voltage distortion (harmonics)

Parameter	Minimum content of standards
Voltage waveform distortion	
Voltage unbalance (if applicable)	Voltage unbalance is to be measured as negative sequence voltage Maximum average voltage unbalance in normal operation, measured at a *connection point*, over a specified averaging period Maximum average voltage unbalance following a contingency
Fault clearance times	Maximum allowed fault clearance times at *nominal voltage* levels Fault ride through requirements as necessary to meet stability requirements These must be reasonable and sufficiently fast that they ensure stability and safety with respect to a *regulated SAPS*
Reliability	Performance targets for frequency and duration of *supply* interruptions in a *regulated SAPS* Performance targets for expected *load* not served in a *regulated SAPS*

[260] Clause 5A.D.1A Register of completed non-registered DER

In clause 5A.D.1A(b)(7), omit "*voltage*" and substitute "voltage".

[261] Clause 5A.E.3 Connection charge guidelines

In clause 5A.E.3(d)(1), omit "*voltage*" and substitute "voltage".

[262] Clause 6A.1.4 National regulatory requirements

In clause 6A.1.4(b), omit "*voltage*" and substitute "voltage".

[263] Clause 6A.17.2 Information Guidelines

In clause 6A.17.2(h)(iv), omit "*voltage*" wherever it appears and substitute "voltage".

[264] Clause 6A23.5 System strength charge

In clause 6A23.5(j)(2), omit “*rated active power*, rated”, and substitute “*active power capability*,”

[265] Clause 6A.23.5 System strength charge

In clause 6A23.5(k), omit "*rated active power*, rated", and substitute "*active power capability*,".

[266] Clause S7.1.2 Metering register information

In clause S7.1.2(d)(3), omit "*voltage*" and substitute "voltage".

[267] Clause S7.4.6.1 Design requirements

In clause S7.4.6.1(c), omit "*voltage*" and substitute "voltage".

[268] Clause S7.4.6.2 Design guidelines

In clause S7.4.6.2(b), omit "*voltage*" and substitute "voltage".

[269] Clause S7.5.1 Minimum services specification

In clause S7.5.1, omit "*voltage*" wherever it appears in Table 7.5.1.1 and substitute "voltage".

[270] Clause 9.32.1Design requirements

In clause 9.32.1(b), omit "*voltage*" and substitute "voltage".

[271] Clause 9.37.10 Reactive power capability (clause S5.2.5.1 of schedule 5.2)

In clause 9.37.10(a)(1), omit "voltage" and substitute "*voltage*".

[272] Clause 9.37.12 Voltage fluctuations (clause S5.1.5 of schedule 5.1)

In clause 9.37.12, omit "*voltage*" wherever it appears and substitute "voltage".

[273] Clause 9.37.21Excitation control system (clause S5.2.5.13 of schedule 5.2)

In clause 9.37.21, omit "*voltage*" wherever it appears and substitute "voltage".

[274] Chapter 10 Glossary

In Chapter 10, in the definition of "*active energy*", omit "*voltage*" and substitute "voltage".

[275] Chapter 10 Glossary

In Chapter 10, in the definition of "*access standard*", omit "as recorded in a *connection agreement*".

[276] Chapter 10 Glossary

In Chapter 10, omit the definition of "*active power capability*" and substitute:

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 system* or *integrated resource system* as specified or proposed to be specified in a *performance standard* or *connection agreement*.

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.

[277] Chapter 10 Glossary

In Chapter 10, in the definition of "*adverse system strength impact*", omit "a *generating system*, *integrated resource system*, *market network service facility* or *inverter based load* forming part of the *power system*", and substitute "*plant*".

[278] Chapter 10 Glossary

In Chapter 10, omit the definition of "*AEMO advisory matter*" and substitute:

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, S5.2.6.1, S5.2.6.2, S5.3.5, S5.3.11, S5.3a.4.1, S5.3a.4.2, S5.3a.7, S5.3a.8 and S5.3a.13 to S5.3a.16.

[279] Chapter 10 Glossary

In Chapter 10, in the definition of "*black system*", omit "*voltage*" and substitute "voltage".

[280] Chapter 10 Glossary

In Chapter 10, in the definition of "*capacitor bank*", omit "*voltage*" and substitute "voltage".

[281] Chapter 10 Glossary

In Chapter 10, omit the definition of "*continuous uninterrupted operation*" and substitute:

continuous uninterrupted operation

In respect of a *schedule 5.2 plant* or a *schedule 5.3a plant* 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*;

(b) during the disturbance contributing active and reactive current or *active power* and *reactive power* as required or permitted by its *performance standards*;

(c) after clearance of any electrical fault that caused the disturbance, not substantially varying its *active power* and *reactive power* except as required or permitted by its *performance standards*; 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).

[282] Chapter 10 Glossary

In Chapter 10, in the definition of "*disconnect*", omit "at a *connection point*", and substitute "to or from *connected* equipment".

[283] Chapter 10 Glossary

In Chapter 10, in the definition of "*distribution use of system, distribution use of system service*", omit "*voltage*" and substitute "voltage".

[284] Chapter 10Glossary

In Chapter 10, in the definition of "*energise*", omit "*voltage*" and substitute "voltage".

[285] Chapter 10 Glossary

In Chapter 10, in the definition of "*high voltage (HV)*", omit "*voltage*" and substitute "voltage".

[286] Chapter 10 Glossary

In Chapter 10, in the definition of "*major supply disruption*", omit "*voltage*" and substitute "voltage".

[287] Chapter 10 Glossary

In Chapter 10, omit the definition of "*maximum continuous current*" and substitute:

maximum continuous current

In respect of a *schedule 5.2 plant*:

(a) where measured at the *connection point*, the current at the *connection point* corresponding to the largest amount of *apparent power* required by the *generating system's* or *integrated resource system's performance standard* for clause S5.2.5.1, at the *nominal voltage*; and

(b) where 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*.

[288] Chapter 10 Glossary

In Chapter 10, omit the definition of "*nameplate rating*" and substitute:

nameplate rating

In relation to an item of equipment, its maximum continuous output or consumption in MW, or *apparent power* in MVA for *synchronous condensers*, 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).

[289] Chapter 10 Glossary

In Chapter 10, omit the definition of "*negotiated access standard*" and substitute:

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.

[290] Chapter 10 Glossary

In Chapter 10, omit the definition of "*nominal voltage*" and substitute:

nominal voltage

The design 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.

[291] Chapter 10 Glossary

In Chapter 10, omit the definition of "*normal voltage*".

[292] Chapter 10 Glossary

In Chapter 10, omit the definition of "*performance standard*" and substitute:

performance standard

A standard of performance for a particular *plant* that, as applicable:

(a) is taken to be an applicable performance standard in accordance with clause 5.3.4A(i);

(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 S*chedule 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).

[293] Chapter 10 Glossary

In Chapter 10, in the definition of "*plant*", omit "*generating*, consuming or transmitting electrical *energy*.", and substitute ", or supporting, the *generation*, consumption or conveyance of electricity."

[294] Chapter 10 Glossary

In Chapter 10, omit the definition of "*power transfer*" and substitute:

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.

[295] Chapter 10 Glossary

In Chapter 10, omit the definition of "*rated active power*".

[296] Chapter 10 Glossary

In Chapter 10, omit the definition of "*rated maximum demand*".

[297] Chapter 10 Glossary

In Chapter 10, in the definition of "*reactive energy*", omit "*voltage*" and substitute "voltage".

[298] Chapter 10 Glossary

In Chapter 10, omit the definition of "*reactive power capability*" and substitute:

reactive power capability

The amount of *reactive power* that a *plant* is capable of supplying to or absorbing from the *network* at its rate *connection point*.

[299] Chapter 10 Glossary

In Chapter 10, in the definition of "*reactor*", omit "*voltage*" and substitute "voltage".

[300] Chapter 10 Glossary

In Chapter 10, omit the definition of "*rise time*" and substitute:

rise time

In relation to a *control system*, the time taken for an output quantity to rise from 10% to 90% of the mean sustained change induced in that quantity by a step change of an input quantity, disregarding longer-term dynamics and influences external to the *generating system* following the step change.

[301] Chapter 10 Glossary

In Chapter 10, omit the definition of "*RMS phase voltage*"

[302] Chapter 10 Glossary

In Chapter 10, in the definition of "*scheduled integrated resource system*", omit ", to the extent it is comprised of *production units*,".

[303] Chapter 10 Glossary

In Chapter 10, omit the definition of "*settling time*" and substitute:

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.

[304] Chapter 10 Glossary

In Chapter 10, omit the definition of "*short circuit ratio*", and substitute:

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 *active power capability* (expressed in MW);

(b) in the case of a *schedule 5.3a plant*, its *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),

(d) **[Deleted]**

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*.

[305] Chapter 10Glossary

In Chapter 10, in the definition of "*static VAR compensator*", omit "*voltage*" wherever it appears and substitute "voltage".

[306] Chapter 10 Glossary

In Chapter 10, omit the definition of "*synchronous condensers*" and substitute:

synchronous condenser

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*.

[307] Chapter 10 Glossary

In Chapter 10, in the definition of "*synchronous generator voltage control*", omit "*voltage*" wherever it appears and substitute "voltage".

[308] Chapter 10 Glossary

In Chapter 10, in the definition of "*top-changing transformer*", omit "*voltages*" and substitute "voltages".

[309] Chapter 10 Glossary

In Chapter 10, in the definition of "*top-changing transformer*", omit "*voltage*" and substitute "voltage".

[310] Chapter 10 Glossary

In Chapter 10, in the definition of "*transformer*", omit "*voltage*" and substitute "voltage".

[311] Chapter 10 Glossary

In Chapter 10, in the definition of "*transformer tap position*", omit "*voltage*" wherever it appears and substitute "voltage".

[312] Chapter 10 Glossary

In Chapter 10, omit the definition of "*voltage*".

[313] Chapter 10 Glossary

In Chapter 10, in the definition of "*voltage transformer (VT)*", omit "*voltage*" wherever it appears and substitute "voltage".

[314] Chapter 10 Glossary

In Chapter 10, insert the following new definitions in alphabetical order:

minimum operating level

In relation to a *generating unit*, the minimum *generation* required for its continuous stable operation.

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.

Schedule 5 Participant

A *Schedule 5.2 Participant*, *Schedule 5.3 Participant* or *Schedule 5.3a Participant*.

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*.

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*.

Schedule 2 Savings and Transitional Amendment to the National Electricity Rules

(Clause 4)

[1] Chapter 11 Savings and Transitional Amendments to the National Electricity Rules

In Part ZZ, after rule 11.[XXX], insert a new rule as follows:

11.[XXX] Rules consequential on making of the National Electricity Amendment (Improving NEM Access Standards) Rule 2024

11.[XXX].1 Definitions

For the purposes of this rule 11.XXX:

Agreed Access Standard means an access standard assessed in accordance with the old Chapter 5 that has been agreed by the *Network Service Provider* and is capable of forming part of the terms and conditions of a connection agreement as the *performance standard* applicable to the *plant* for the relevant technical requirement.

Amending Rule means the National Electricity Amendment (Improving NEM Access Standards - Package 1) Rule 2025.

commencement date means [10 April 2025], being the date on which the Amending Rule commences operation.

Conditional Access Standard has the meaning given in clause 11.[XXX].4(e)(1)(ii).

Existing Application To Connect has the meaning given in clause 11.[XXX].4(a)(1).

Existing Connection Enquiry has the meaning given in clause 11.[XXX].3(a)(1).

Existing Connection Agreement means a connection agreement entered into before the commencement date.

new Chapter 5 means Chapter 5 of the *Rules* in force immediately after the commencement date.

old Chapter 5 means Chapter 5 of the *Rules* in force immediately prior to the commencement date.

transitional date means [30 October 2025].

11.[XXX].2 Provision of information by network service providers for existing plant

(a) This clause applies to a *Network Service Provider* that is required under clause 5.2.3(c1) of the Amending Rule to determine and

document *performance standards* for *plant* forming part of its *network*, and advise *AEMO* of those *performance standards*.

(b) For *plant* in existence as at the commencement date, the *Network Service Provider* must advise *AEMO* of the relevant *performance standards* within [12 months] of the commencement date.

11.[XXX].3 Application of the Amending Rule to existing connection enquiries

(a) This clause 11.[XXX].3 applies where, before the commencement date, a *Connection Applicant* has, in respect of *plant* that the *Connection Applicant* proposes to *connect*:

(1) made a valid *connection* enquiry in accordance with clause 5.3.2 or 5.3A.5 (Existing Connection Enquiry); and

(2) not made an *application to connect* to a *Network Service Provider* under clause 5.3.4 or 5.3A.9.

(b) On and from the commencement date:

(1) the new Chapter 5 applies for the purposes of determining the *access standards* that apply to the *plant* that the *Connection Applicant* proposes to *connect*;

(2) the Existing Connection Enquiry will be taken to be a valid connection enquiry under the new Chapter 5 with respect to the proposed *plant*; and

(3) the *Network Service Provider* must:

(i) within 10 *business days* after the commencement date, use its reasonable endeavours to provide written notification to the *Connection Applicant* that the Existing Connection Enquiry will be treated as a *connection* enquiry under the new Chapter 5; and

(ii) within 20 *business days* after providing the written notification in subparagraph (3)(i), in consultation with *AEMO* and where necessary, provide each *Connection Applicant* notified under subparagraph (3)(i) with:

(A) any further information required under the new Chapter 5 relevant to the Existing Connection Enquiry; and

(B) written notice of any further information or data to be provided by the *Connection Applicant* to the *Network Service Provider*,

to enable the *Connection Applicant* to submit an *application to connect* in accordance with the new Chapter 5 with respect to the proposed *plant*.

(c) Where the *Network Service Provider* has charged the *Connection Applicant* any fees or charges with respect to the Existing Connection Enquiry, the *Network Service Provider* must not charge the *Connection Applicant* any additional fees or charges on or from the commencement date with respect to the Existing Connection Enquiry, except to the extent necessary to cover the reasonable costs of work required to notify the *Connection Applicant* and provide any relevant information under subparagraph (3)(ii). For the avoidance of doubt, this clause 11.[XXX].3(c) does not preclude a *Network Service Provider* recovering an application fee from the *Connection Applicant* under clause 5.3.4(b) or 5.3A.9(b).

11.[XXX].4 Application of the Amending Rule to existing applications to connect

(a) This clause 11.[XXX].4 applies where, before the commencement date, a *Connection Applicant* has, in respect of *plant* that the *Connection Applicant* proposes to *connect*:

(1) made a valid *application to connect* to a *Network Service Provider* in accordance with clause 5.3.4 or 5.3A.9 (Existing Application To Connect); and

(2) not received an offer to *connect* from the relevant *Network Service Provider* in respect of the Existing Application To Connect.

(b) Subject to paragraph (e), on and from the commencement date:

(1) the new Chapter 5 applies for the purposes of determining the *access standards* that apply to the *plant* that the *Connection Applicant* proposes to *connect*;

(2) the Existing Application To Connect will be taken to be a valid *application to connect* under the new Chapter 5 with respect to the proposed *plant*; and

(3) the *Network Service Provider* must:

(i) within 10 *business days* after the commencement date, use its reasonable endeavours to provide written notification to the *Connection Applicant* that the Existing Application to Connect will be treated as an *application to connect* under the new Chapter 5; and

(ii) within 20 *business days* after providing the written notification in subparagraph (3)(i), in consultation with

AEMO and where necessary, provide each *Connection Applicant* notified under subparagraph (3)(i) with:

(A) any further information required under the new Chapter 5 relevant to the proposed *plant*; and

(B) written notice of any further information or data to be provided by the *Connection Applicant* to the *Network Service Provider*,

necessary for the *Network Service Provider* to prepare an offer to *connect* in accordance with the new Chapter 5 with respect to the proposed *plant*.

(c) Where the *Network Service Provider* has charged the *Connection Applicant* any fees or charges with respect to the Existing Application To Connect, the *Network Service Provider* must not charge the *Connection Applicant* any additional fees or charges on or from the commencement date with respect to such Existing Application To Connect, except to the extent necessary to cover the reasonable costs of work required for the *Network Service Provider* to prepare an offer to *connect* in accordance with the new Chapter 5, including the requirements to notify the *Connection Applicant* and provide any relevant information under subparagraph (b)(3).

(d) A *Network Service Provider* to which this clause applies may extend the time period referred to in clause 5.3.6(a) to reasonably allow for any additional time taken in excess of the period allowed in the *preliminary program* that is necessary to take account of the differences in *access standards* between the old Chapter 5 and the new Chapter 5.

(e) Despite the application of paragraph (b), a *Connection Applicant* may, until the transitional date, continue to negotiate *access standards* in accordance with the old Chapter 5. Where, subject to paragraph (f), on or before the transitional date, all *access standards* relevant to the plant are Agreed Access Standards in the reasonable opinion of the *Network Service Provider* and *AEMO*, then the *Network Service Provider* must:

(1) within 10 *business days* from receipt of a written request by the *Connection Applicant*, provide written confirmation to the *Connection Applicant*:

(i) that all *access standards* relevant to the *plant* are Agreed Access Standards; and

(ii) identifying any *access standards* that are agreed subject to certain conditions being satisfied, including where relevant, the date for satisfaction of those conditions (Conditional Access Standard); and

(2) otherwise, use its reasonable endeavours to provide, within 10 *business days* after the transitional date, the written confirmation at subparagraphs (e)(1)(i) and (e)(1)(ii) to the relevant *Connection Applicant.*

(f) Where:

(1) the *Network Service Provider* has provided written confirmation under paragraph (e)(1) or (e)(2); and

(2) a condition under the Conditional Access Standards was not satisfied,

then on and from the date on which such condition was not satisfied:

(3) the relevant Conditional Access Standards will be taken to have not been agreed for the purposes of paragraph (e);

(4) the new Chapter 5 applies for the purposes of determining all *access standards* that apply to the *plant* that the *Connection Applicant* proposes to *connect*;

(5) the Existing Application To Connect will be taken to be a valid *application to connect* under the new Chapter 5 with respect to the proposed *plant*;

(6) the *Network Service Provider* must, in consultation with *AEMO*, within a further 10 *business days* from the date on which the condition was not satisfied:

(i) notify the *Connection Applicant* that the relevant Conditional Access Standards are no longer Agreed Access Standards and that the Existing Application To Connect will be treated as an *application to connect* under the new Chapter 5; and

(ii) provide the *Connection Applicant* notified under subparagraph (i) with the further information and notice specified in subparagraph (b)(3)(ii); and

(7) the *Network Service Provider* must comply with the requirements of paragraphs (c) and (d).

(g) Notwithstanding this clause 11.[XXX].4, and subject to paragraph (f), if the *Network Service Provider* provides written confirmation to a *Connection Applicant* under subparagraphs (e)(1) or (e)(2) (as applicable), the old Chapter 5 applies for the purposes of determining the *access standards* that apply to the plant that the *Connection Applicant* proposes to *connect* under that Existing Application To Connect.

11.[XXX].5 Application of the Amending Rule to existing offers to connect

(a) This clause 11.[XXX].5 applies where, before the commencement date, a *Connection Applicant*:

(1) has received a valid offer to *connect* from the relevant *Network Service Provider* in respect of an *application to connect*; and

(2) has not entered into a *connection agreement* with the relevant *Network Service Provider* in respect of that *application to connect*.

(b) On and from the commencement date, the old Chapter 5 applies for the purposes of determining the *access standards* that apply to the *plant* that the *Connection Applicant* proposes to *connect* under that offer to *connect*.

11.[XXX].6 Application of the Amending Rule to Existing Connection Agreements

(a) The Amending Rule is neither intended to, nor to be read or construed as having, the effect of:

(1) altering the terms of an Existing Connection Agreement;

(2) altering the contractual rights or obligations of any of the parties under an Existing Connection Agreement; or

(3) relieving the parties under any such Existing Connection Agreement of their contractual obligations under such an agreement.

(b) Subject to paragraph (c), if, after the commencement date, a *Schedule 5 Participant* who has entered into an Existing Connection Agreement is required, in accordance with the *Rules*, to amend any of the *performance standards* set out in that Existing Connection Agreement, then the new Chapter 5 applies for the purposes of amending such *performance standards*.

(c) The old Chapter 5 applies to a *Schedule 5.2 Participant* who, as at the commencement date, has proposed to alter *schedule 5.2 plant* and has advised *AEMO* in accordance with clause 5.3.9, unless:

(1) *AEMO*, the *Schedule 5.2 Participant* and the relevant *Network Service Provider* agree otherwise; or

(2) in *AEMO*'s reasonable opinion (in respect of an *AEMO advisory matter*), there will be an adverse impact on *power system security* as a result of the application of old Chapter 5.