



## **Draft National Electricity Amendment (Generator technical performance standards) Rule 2018 No. 8**

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 Electricity - National Scheme (Tasmania) Act 1999 of Tasmania;
- (e) the National Electricity (New South Wales) Act 1997 of New South Wales;
- (f) the National Electricity (Victoria) Act 2005 of Victoria;
- (g) the National Electricity (Northern Territory)(National Uniform Legislation) Act 2015; and
- (h) the Australian Energy Market Act 2004 of the Commonwealth.

The Australian Energy Market Commission makes the following Rule under the National Electricity Law.

John Pierce  
Chairman  
Australian Energy Market Commission

## **Draft National Electricity Amendment (Generator technical performance standards) Rule 2018 No. 8**

### **1 Title of Rule**

This Rule is the *Draft National Electricity Amendment (Generator technical performance standards) Rule 2018 No. 8*.

### **2 Commencement**

This Rule commences operation on 27 November 2018.

### **3 Amendment of the National Electricity Rules**

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

### **4 Amendment of the National Electricity Rules**

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

### **5 Savings and Transitional Amendments to the National Electricity Rules**

The National Electricity Rules are amended as set out in Schedule 3.

#### **Note**

Certain amendments in Schedule 1 of this Rule amend clauses that were either inserted or amended as part of the *Transmission connection and planning arrangements rule*, *Managing power system fault levels rule*, *Managing the rate of the change of power system frequency rule* and *Generating system model guidelines rule*. Those clauses will commence on 1 July 2018 and will be consolidated into the National Electricity Rules on that date.

## Schedule 1 Amendment to the National Electricity Rules

(Clause 3)

### [1] Clause 4.14 Acceptance of Performance Standards

In clause 4.14(n), after “clause 5.3.7(g)(1)” insert “, clause 5.3.9(h)”.

### [2] Clause 4.14 Acceptance of Performance Standards

After clause 4.14(n), insert:

- (n1) By 1 July each year, *AEMO* must provide to the *AER* an up-to-date copy of the register of *performance standards* required to be maintained under clause 4.14(n), including a copy of the corresponding *performance standards*.
- (n2) The *AER* may, at any time, request *AEMO* to provide:
  - (1) an up-to-date copy of the register of *performance standards* (current as at the date of the *AER*'s request) including a copy of the corresponding *performance standards*; or
  - (2) a copy of the *performance standards* relating to specified *plant*,  
if, in the reasonable opinion of the *AER*, it is required for the performance or exercise of the *AER*'s functions.
- (n3) Following a request under subparagraph (n2), *AEMO* must provide the information requested within:
  - (1) 10 *business days* for a request under subparagraph (n1); and
  - (2) five *business days* for a request under subparagraph (n2),  
unless the *AER* agrees otherwise.

### [3] Clause 5.1A.2 Principles

Omit clause 5.1A.2(d) and substitute “[Deleted]”.

### [4] Clause 5.2.6 Obligations of AEMO

In clause 5.2.6, delete “(a)”.

### [5] New Clause 5.2.6A AEMO review of technical requirements for connection

After clause 5.2.6, insert:

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

- (a) *AEMO* must conduct a review of some or all of the technical requirements set out in Schedule 5.2, Schedule 5.3 and Schedule 5.3a at least once in every five year period (and may conduct a review more frequently if *AEMO* considers necessary) to assess whether those requirements should be amended, having regard to:
  - (1) the *national electricity objective*;
  - (2) the need to achieve and maintain *power system security*;
  - (3) changes in *power system* conditions; and
  - (4) changes in technology and capabilities of *facilities* and *plant*.
- (b) When conducting a review under this clause 5.2.6A, *AEMO* must consult with, among other affected parties, the *Reliability Panel*.
- (c) *AEMO* must commence a review under this clause 5.2.6A with the publication of an approach paper on its website, which must:
  - (1) set out the scope of the review, including the nature and extent of the issues to be reviewed;
  - (2) describe the technical requirements to be consulted on; and
  - (3) state the date by which a draft report will be published.
- (d) *AEMO* must publish a draft report on its website that:
  - (1) sets out *AEMO*'s recommendations for any amendments to the technical requirements set out in Schedule 5.2, Schedule 5.3 and Schedule 5.3a and the reasons for those recommendations; and
  - (2) includes an invitation for written submissions to be made to *AEMO* within a period specified in the invitation (which must be at least 30 *business days*) on the technical requirements and recommendations in the draft report and must publish any submissions on its website, subject to obligations in respect of *confidential information*.
- (e) *AEMO* must publish a final report on its website within 12 months of the approach paper's publication under paragraph (c), setting out *AEMO*'s recommendations for any amendments to the technical requirements set out in Schedule 5.2, Schedule 5.3 and Schedule 5.3a, having regard to the matters set out in subparagraphs (a)(1) to (4) and any submissions made in response to its invitation under subparagraph (d)(2).

- (f) As soon as practicable following publication of a final report under paragraph (e), *AEMO* must provide written notification to the *AEMC* as to whether or not *AEMO* will be submitting a *Rule* change proposal that results from the review.

**[6] Clause 5.3.4A Negotiated access standards**

In clause 5.3.4A(a), omit “[Deleted]” and substitute “*AEMO* must advise on *AEMO* advisory matters.”.

**[7] Clause 5.3.4A Negotiated access standards**

In clause 5.3.4A(b)(1), at the beginning of the clause, insert “subject to subparagraph (1A).”.

**[8] Clause 5.3.4A Negotiated access standards**

In clause 5.3.4A(b)(1), omit “S5.4B(e)” and substitute “S5.4B(b)(2)”.

**[9] Clause 5.3.4A Negotiated access standards**

After clause 5.3.4A(b)(1), insert:

- (1A) with respect to a submission by a *Generator* under clause 5.3.9(b)(3), be no less onerous than the *performance standard* that corresponds to the technical requirement that is affected by the alteration to the *generating system*;

**[10] Clause 5.3.4A Negotiated access standards**

In clause 5.3.4A(b)(4), omit “clauses S5.2.5, S5.2.6, S5.2.7 and S5.2.8” and substitute “Schedule 5.2”.

**[11] Clause 5.3.4A Negotiated access standards**

After clause 5.3.4A(b), insert:

- (b1) When submitting a proposal for a *negotiated access standard* under clause 5.3.4(e), clause 5.3A.9(f), clause 5.3.9(b)(3) or subparagraph (h)(3), and where there is a corresponding *automatic access standard* for the relevant technical requirement, a *Connection Applicant* must propose a standard that is as close as practicable to the corresponding *automatic access standard*, having regard to:
- (1) the need to protect the *plant* from damage;
  - (2) *power system* conditions at the location of the proposed *connection*; and

- (3) the commercial and technical feasibility of complying with the *automatic access standard* with respect to the relevant technical requirement.

### **[12] Clause 5.3.4A Negotiated access standards**

After clause 5.3.4A(b1), insert:

- (b2) When proposing a *negotiated access standard* under paragraph (b1), the *Connection Applicant* must provide reasons and evidence to the *Network Service Provider* and *AEMO* as to why, in the reasonable opinion of the *Connection Applicant*, the proposed *negotiated access standard* is appropriate, including:
  - (1) how the *Connection Applicant* has taken into account the matters outlined in subparagraphs (b1)(1) to (3); and
  - (2) how the proposed *negotiated access standard* meets the requirements of paragraph (b).

### **[13] Clause 5.3.4A Negotiated access standards**

Omit clause 5.3.4A(c) and substitute:

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

#### **Note**

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

### **[14] Clause 5.3.4A Negotiated access standards**

Omit clause 5.3.4A(d) and substitute:

- (d) Within 20 *business days* following the later of:
  - (1) receipt of a proposed *negotiated access standard* under clause 5.3.4(e), clause 5.3A.9(f), clause 5.3.9(b)(3) or subparagraph (h)(3); and
  - (2) receipt of all information required to be provided by the *Connection Applicant* under clause S5.2.4, clause S5.5.6, clause S5.3.1(a1) or clause S5.3a.1(a1),

*AEMO* must advise the *Network Service Provider* in writing, in respect of *AEMO advisory matters*, whether the proposed *negotiated access standard* should be accepted or rejected.

### **[15] Clause 5.3.4A Negotiated access standards**

After clause 5.3.4A(d), insert:

- (d1) When advising the *Network Service Provider* under paragraph (d) to reject a proposed *negotiated access standard*, and subject to obligations in respect of *confidential information*, *AEMO* must:
  - (1) provide detailed reasons for the rejection to the *Network Service Provider*, including:
    - (i) where the basis of *AEMO*'s advice is lack of evidence from the *Connection Applicant*, details of the additional evidence of the type referred to in paragraph (b2) *AEMO* requires to continue assessing the proposed *negotiated access standard*; and
    - (ii) the extent to which each of the matters identified at subparagraphs (b)(1), (b)(1A), (b)(2) and (b)(4) contributed to *AEMO*'s decision to reject the proposed *negotiated access standard*; and
  - (2) recommend a *negotiated access standard* that *AEMO* considers meets the requirements of subparagraphs (b)(1), (b)(1A), (b)(2) and (b)(4).

### **[16] Clause 5.3.4A Negotiated access standards**

Omit clause 5.3.4A(e) and substitute:

- (e) Within 30 *business days* following the later of:
  - (1) receipt of a proposed *negotiated access standard* in accordance with clause 5.3.4(e), clause 5.3A.9(f), clause 5.3.9(b)(3) or paragraph (h)(3); and
  - (2) receipt of all information required to be provided by the *Connection Applicant* under clause S5.2.4, clause S5.5.6, clause S5.3.1(a1) or clause S5.3a.1(a1),

the *Network Service Provider* must accept or reject a proposed *negotiated access standard*.

#### **Note**

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

### **[17] Clause 5.3.4A Negotiated access standards**

Omit clause 5.3.4A(f) and substitute:

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

**Note**

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

**[18] Clause 5.3.4A Negotiated access standards**

Omit clause 5.3.4A(g) and substitute:

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

**Note**

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



**[19] Clause 5.3.4A Negotiated access standards**

In clause 5.3.4A(h), omit “paragraph (g)” and substitute “subparagraph (g)(2)”.

**[20] Clause 5.3.9 Procedure to be followed by a Generator proposing to alter a generating system**

In clause 5.3.9(a), omit “accepted by *AEMO*” and substitute “accepted by the *Network Service Provider* and *AEMO* (in relation to *AEMO* advisory matters)”.

**[21] Clause 5.3.9 Procedure to be followed by a Generator proposing to alter a generating system**

Omit clause 5.3.9(b)(3) and substitute:

- (3) in relation to each relevant technical requirement for which the proposed alteration to the equipment will affect the performance of the *generating system*, the proposed amendments to the *plant’s* existing corresponding *performance standard* for that technical requirement; and

**[22] Clause 5.3.9 Procedure to be followed by a Generator proposing to alter a generating system**

In clause 5.3.9(c), omit “paragraph (b)(3)(ii)” and substitute “subparagraph (b)(3)”.

**[23] Clause 5.3.9 Procedure to be followed by a Generator proposing to alter a generating system**

Omit clause 5.3.9(d) and substitute:

- (d) Without limiting paragraph (a), a proposed alteration to the equipment specified in column 1 of the table set out below is deemed to affect the performance of the *generating system* 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.

<b>Column 1 (altered equipment)</b>	<b>Column 2 (clause)</b>
machine windings	S5.2.5.1, S5.2.5.2, S5.2.8
power converter	S5.2.5.1, S5.2.5.2, S5.2.5.5, S5.2.5.12, S5.2.5.13, S5.2.8
reactive compensation plant	S5.2.5.1, S5.2.5.2, S5.2.5.5, S5.2.5.12, S5.2.5.13
<i>excitation control system</i>	S5.2.5.5, S5.2.5.7, S5.2.5.12,

Column 1 (altered equipment)	Column 2 (clause)
	S5.2.5.13
<i>voltage control system</i>	S5.2.5.5, S5.2.5.7, S5.2.5.12, S5.2.5.13
<i>governor control system</i>	S5.2.5.7, S5.2.5.11, S5.2.5.14
<i>power control system</i>	S5.2.5.11, S5.2.5.14
<i>protection system</i>	S5.2.5.3, S5.2.5.4, S5.2.5.5, S5.2.5.7, S5.2.5.8, S5.2.5.9, S5.2.5.10
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

**[24] Clause 5.3.9 Procedure to be followed by a Generator proposing to alter a generating system**

In clause 5.3.9(h), after “jointly advise *AEMO*” insert “, including the details of any *performance standards* amended pursuant to this clause 5.3.9”.

**[25] Clause S5.1.9 Protection systems and fault clearance times**

Omit clause S5.1.9(b) and substitute “[Deleted]”.

**[26] Clause S5.2.1 Outline of requirements**

In clause S5.2.1(g), omit “derived from *minimum access standards*”.

**[27] Clause S5.2.5.1 Reactive power capability**

Omit clause S5.2.5.1(b) and substitute:

- (b) The *minimum access standard* is a *generating system* operating at any *voltage* at the *connection point* within the limits established under clause S5.1a.4 without a *contingency event*, must be capable of supplying and absorbing continuously at its *connection point* an amount of *reactive power* of at least the amount equal to zero.

**[28] Clause S5.2.5.1 Reactive power capability**

Omit the opening paragraph of clause S5.2.5.1(c) and substitute:

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

**[29] Clause S5.2.5.1 Reactive power capability**

In clause S5.2.5.1(c)(1), after “must” insert “,”.

**[30] Clause S5.2.5.1 Reactive power capability**

In clause S5.2.5.1(c)(1), omit “paragraph (d)(4)” and substitute “subparagraph (d)(4)”.

**[31] Clause S5.2.5.1 Reactive power capability**

In clause S5.2.5.1(c)(1), after “under subparagraph (d)(4),” insert “be consistent with maintaining *power system security* and”.

**[32] Clause S5.2.5.3 Generating unit response to frequency disturbances**

In the heading to clause S5.2.5.3, omit “unit” and substitute “system”.

**[33] Clause S5.2.5.3 Generating system response to frequency disturbances**

In clause S5.2.5.3(a), in the definition of **stabilisation time** and **recovery time**, omit “system *frequency*” and substitute “the *frequency* of the *power system*”.

**[34] Clause S5.2.5.3 Generating system response to frequency disturbances**

In clause S5.2.5.3(b), after “for more than 0.25 seconds” insert “, -3 Hz to 3 Hz per second for more than one second,”.

**[35] Clause S5.2.5.3 Generating system response to frequency disturbances**

In clause S5.2.5.3(c), after “outside the range of” insert “-2 Hz to 2 Hz per second for more than 0.25 seconds,”.

**[36] Clause S5.2.5.3 Generating system response to frequency disturbances**

Omit clause S5.2.5.3(d) and substitute:

- (d) A *negotiated access standard* must require that the *frequency* would be unlikely to fall below the lower bound of the operational frequency tolerance band as a result of over-frequency tripping of *generating units*.

### **[37] Clause S5.2.5.3 Generating system response to frequency disturbances**

Omit clause S5.2.5.3(e).

### **[38] Clause S5.2.5.4 Generating system response to voltage disturbances**

Omit clause S5.2.5.4(a) and substitute:

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

where T(ov) means the point in time when the *voltage* at the *connection point* first varied above 110% of *normal voltage* and T(uv) means the point in time when the *voltage* at the *connection point* first varied below 90% of *normal voltage*.

### **[39] Clause S5.2.5.4 Generating system response to voltage disturbances**

Omit clause S5.2.5.4(b) and substitute:

- (b) The *minimum access standard* is a *generating system* including all operating *generating units* must be capable of *continuous uninterrupted operation* where a *power system* disturbance causes

the *voltage* at the *connection point* to vary within the following ranges:

- (1) 115% to 120% of *normal voltage* for a period of at least 0.1 seconds after T(ov);
- (2) 110% to 115% of *normal voltage* for a period of at least 0.9 seconds after T(ov);
- (3) 90% to 110% of *normal voltage* continuously, provided that the ratio of *voltage* to *frequency* (as measured at the *connection point* and expressed as a percentage of *normal voltage* and a percentage of 50 Hz) does not exceed:
  - (A) a value of 1.15 for more than two minutes; or
  - (B) a value of 1.10 for more than 10 minutes;
- (4) 80% to 90% of *normal voltage* for a period of at least 5 seconds after T(uv); and
- (5) 70% to 80% of *normal voltage* for a period of at least 2 seconds after T(uv),

where T(ov) means the point in time when the *voltage* at the *connection point* first varied above 110% of *normal voltage* and T(uv) means the point in time when the *voltage* at the *connection point* first varied below 90% of *normal voltage*.

#### **[40] Clause S5.2.5.4 Generating system response to voltage disturbances**

Omit clause S5.2.5.4(c) and substitute:

- (c) In negotiating a *negotiated access standard*, a *generating system* and each of its operating *generating units* must be capable of *continuous uninterrupted operation* for the range of *voltages* specified in the *automatic access standard*, except where AEMO and the *Network Service Provider* agree that the total reduction of *generation* in the *power system* as a result of any *voltage* excursion within levels specified by the *automatic access standard* would not exceed 100 MW, or a greater limit based on what AEMO and the *Network Service Provider* both consider to be reasonable in the circumstances.

#### **[41] Clause S5.2.5.4 Generating system response to voltage disturbances**

Omit clause S5.2.5.4(d) and substitute:

- (d) In carrying out assessments of proposed *negotiated access standards* under this clause S5.2.5.4, AEMO and the *Network Service Provider* must at a minimum, in addition to the requirements of clauses 5.3.4A(d1) and 5.3.4A(g) respectively, take into account:
- (1) the expected performance of existing *networks* and *considered projects*; and
  - (2) the expected performance of existing *generating plant* and other relevant projects.

**[42] Clause S5.2.5.4 Generating system response to voltage disturbances**

Omit clause S5.2.5.4(e) and substitute “[Deleted]”.

**[43] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

Omit clause S5.2.5.5(a) and substitute:

- (a) In this clause S5.2.5.5 a fault includes a fault of the relevant type having a metallic conducting path.

**[44] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

In clause S5.2.5.5(b)(1), omit “an event that is”.

**[45] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

After clause S5.2.5.5(b)(1), insert:

- (1A) a *generating system* and each of its *generating units* 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 subparagraph (b)(1) where:
- (i) up to six of the disturbances cause the *voltage* at the *connection point* to drop below 50% of *normal voltage*;
  - (ii) 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 *normal voltage*;
  - (iii) up to one disturbance is cleared by a *breaker fail protection system* or similar back-up *protection system*;

- (iv) 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 subparagraphs (a)(7) and (a)(8) of clause S5.2.5.4;
- (v) the minimum clearance from the end of one disturbance and commencement of the next disturbance may be zero milliseconds; and
- (vi) all remaining disturbances are caused by faults other than three phase faults,

provided that none of the events would result in:

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

#### **[46] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

Omit clause S5.2.5.5(b)(2) and substitute:

- (2) subject to any changed *power system* conditions or energy source availability beyond the *Generator's* reasonable control, a *generating system* comprised solely of *synchronous generating units*, and each *synchronous generating unit* within a *generating system*, in respect of the types of fault described in subparagraphs (1)(ii) to (iv), must supply to or absorb from the *network*:
  - (i) to assist the maintenance of *power system voltages* during the application of the fault, capacitive reactive current of at least the greater of its pre-disturbance reactive current and 4% of the maximum continuous current of the *generating system* including all operating *synchronous generating units* (in the absence of a disturbance) for each 1% reduction (from the level existing just prior to the fault) of *connection point voltage* during the fault;

- (ii) after clearance of the fault, *reactive power* sufficient to ensure that the *connection point voltage* is within the range for *continuous uninterrupted operation* under clause S5.2.5.4; and
- (iii) from 100 milliseconds after clearance of the fault, *active power* of at least 95% of the level existing just prior to the fault;

#### **[47] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

After clause S5.2.5.5(b)(2), insert:

- (3) subject to any changed *power system* conditions or energy source availability beyond the *Generator's* reasonable control, a *generating system* comprised solely of *asynchronous generating units*, and each *asynchronous generating unit* within a *generating system*, in respect of the types of fault described in subparagraphs (1)(ii) to (iv), must have *facilities* capable of supplying to or absorbing from the *network*:

- (i) to assist the maintenance of *power system voltages* during the application of the fault:

- (A) capacitive reactive current in addition to its pre-disturbance level of 4% of the maximum continuous current of the *generating system* including all operating *asynchronous generating units* (in the absence of a disturbance) for each 1% reduction of *voltage* at the terminals of a *generating unit* below the relevant threshold identified in clause S5.2.5.5(i)(4), except where *voltage* at the terminals of a *generating unit* is 5% or lower of *nominal voltage*; and

- (B) inductive reactive current in addition to its pre-disturbance reactive current and 6% of the maximum continuous current of the *generating system* including all operating *asynchronous generating units* (in the absence of a disturbance) for each 1% increase of *voltage* at the terminals of a *generating unit* above the relevant threshold identified in clause S5.2.5.5(i)(4),

during the disturbance and maintained until *connection point voltage* recovers to between 90% and 110% of *normal voltage*; and



- (ii) from 100 milliseconds after clearance of the fault, *active power* of at least 95% of the level existing just prior to the fault,

provided that any active current consumption immediately upon the occurrence of a fault does not exceed 5% of the maximum continuous current of the *generating system* and is limited to 20 milliseconds.

- (4) For the purpose of subparagraph (b)(3)(i), the reactive current response must have a *rise time* of no greater than 40 milliseconds and a *settling time* of no greater than 70 milliseconds and must be *adequately damped*.
- (5) For the purposes of subparagraphs (b)(2) and (b)(3), the *performance standards* must record the capacitive reactive current response and inductive reactive current response (where applicable) agreed with *AEMO* and the *Network Service Provider*.

#### **[48] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

Omit clause S5.2.5.5(c)(1) and substitute:

- (1) a *generating system* and each of its *generating units* must remain in *continuous uninterrupted operation* for a disturbance caused by:
  - (i) a *credible contingency event*; or
  - (ii) 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:
    - (A) *AEMO* and the *Network Service Provider* agree that the total reduction of *generation* in 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; and
    - (B) the event is not one that would *disconnect* the *generating unit* from the *power system* by removing *network elements* from service;

#### **[49] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

After clause S5.2.5.5(c)(1), insert:

(1A) a *generating system* and each of its *generating units* 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 subparagraph (1) where:

- (i) up to three of the disturbances cause the *voltage* at the *connection point* to drop below 50% of *normal voltage*;
- (ii) up to one disturbance is cleared by a *breaker fail protection system* or similar back-up *protection system*;
- (iii) 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 subparagraphs (a)(7), (a)(8), (b)(4) or (b)(5) (as appropriate) of clause S5.2.5.4;
- (iv) the time difference between the clearance of one disturbance and commencement of the next disturbance exceeds 200 milliseconds; and
- (v) all disturbances are caused by faults other than three phase faults,

provided that none of the events would result in:

- (vi) the islanding of the *generation system* or cause a material reduction in *power transfer capability* by removing *network elements* from service;
- (vii) the cumulative time that *voltage* at the *connection point* is lower than 90% of *normal voltage* exceeding 1,000 milliseconds within any five minute period; or
- (viii) the time integral, within any five minute period, of the difference between 90% of *normal voltage* and the *voltage* at the *connection point* when the *voltage* at the *connection point* is lower than 90% of *normal voltage* exceeding 0.5 pu second,

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

**[50] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

Omit clause S5.2.5.5(c)(2) and substitute:

- (2) subject to any changed *power system* conditions or energy source availability beyond the *Generator's* reasonable control after clearance of the fault, a *generating system* comprised solely of *synchronous generating units*, and each *synchronous generating unit* within a *generating system*, in respect of the types of fault described in subparagraph (1)(ii), 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;

### **[51] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

After clause S5.2.5.5(c)(2), insert:

- (3) subject to any changed *power system* conditions or energy source availability beyond the *Generator's* reasonable control, a *generating system* comprised solely of *asynchronous generating units*, and each *asynchronous generating unit* within a *generating system*, must:
  - (i) in respect of the types of fault described in subparagraph (1)(ii), and to assist the maintenance of *power system voltages* during the application of the fault, have *facilities* capable of supplying to or absorbing from the *network*:
    - (A) capacitive reactive current in addition to its pre-disturbance level of 2% of the maximum continuous current of the *generating system* including all operating *asynchronous generating units* (in the absence of a disturbance) for each 1% reduction of *voltage* at the terminals of a *generating unit* below the relevant threshold identified in clause S5.2.5.5(i)(4), except where *voltage* at the terminals of a *generating unit* is 20% or lower of *nominal voltage*; and
    - (B) inductive reactive current in addition to its pre-disturbance reactive current and 2% of the maximum continuous current of the *generating system* including all operating *asynchronous generating units* (in the absence of a disturbance) for each 1% increase of *voltage* at the terminals of a *generating unit* above the relevant threshold identified in clause S5.2.5.5(i)(4),

during the disturbance and maintained until *connection point voltage* recovers to between 90% and 110% of *normal voltage*, except for *voltages* below the relevant

threshold identified in clause S5.2.5.5(i)(4), the reactive current response may be limited to two seconds duration; and

- (ii) return to at least 95% of the pre-fault *active power* output, after clearance of the fault, within a period of time agreed by the *Connection Applicant*, *AEMO* and the *Network Service Provider*,

provided that any active current consumption immediately upon the occurrence of a fault does not exceed 10% of the maximum continuous current of the *generating system* and is limited to 60 milliseconds;

- (4) for the purpose of subparagraph (c)(3), the reactive current response must have a *rise time* of no greater than 40 milliseconds and a *settling time* of no greater than 70 milliseconds and must be *adequately damped*, except that where a duration of greater than two seconds is required, the reactive current *rise time* must be as soon as practicable, and in any event, no longer than 180 milliseconds; and
- (5) for the purposes of subparagraphs (c)(3) and (c)(4), the *performance standards* must record the capacitive reactive current response and inductive reactive current response (where applicable) agreed with *AEMO* and the *Network Service Provider*.

### **[52] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

In clause S5.2.5.5(e), omit “generating” and substitute “*generating*”.

### **[53] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

Omit clause S5.2.5.5(f) and substitute “[Deleted]”.

### **[54] Clause S5.2.5.5 Generating system response to disturbances following contingency events**

After clause S5.2.5.5(g), insert:

- (h) When assessing multiple disturbances, a failure by the *automatic reclose equipment* to clear the relevant fault shall be counted as a separate disturbance.
- (i) For the purpose of subparagraphs (b)(3) and (c)(3):

- (1) the reactive current contribution may be limited to the maximum continuous current of a *generating system*, including its operating *asynchronous generating units*;
  - (2) the reactive current contribution and *voltage* deviation described may be measured at the *connection point* where agreed with *AEMO* and the *Network Service Provider*;
  - (3) the reactive current contribution required may be calculated using phase to phase, phase to ground or sequence components of *voltages*. The ratio of the negative sequence to positive sequence components of the reactive current contribution must be agreed with *AEMO* and the *Network Service Provider* for the types of disturbances listed in this clause S5.2.5.5;
  - (4) for the purpose of subparagraphs (b)(3)(i) and (c)(3)(i), separate thresholds for activation of the reactive current contribution must be set within the ranges of 85% to 90% and 110% to 112% of the *nominal voltage* at the terminals of the *generating unit*, with the actual thresholds to be agreed between *AEMO* and the *Network Service Provider* and recorded as the *performance standards*;
  - (5) any reactive current consumption immediately upon the occurrence of a fault must not exceed 5% of the maximum continuous current of the *generating system* and is limited to the duration of *rise time*; and
  - (6) notwithstanding the amount of reactive current injected or absorbed during *voltage* disturbances, the maximum continuous current of the *generating system* including all operating *generating units* (in the absence of a disturbance) must be available at all times, except that *AEMO* and the *Network Service Provider* may agree limits on active current injection where required to maintain *power system security* and the quality of supply to other *Network Users*.
- (j) For a *generating system* comprised solely of *synchronous generating units*, the reactive current contribution may be limited to 250% of the maximum continuous current of the *generating system*.
  - (k) For a *synchronous generating unit* within a *generating system* (other than a *generating system* described in paragraph (j)), the reactive current contribution may be limited to 250% of the maximum continuous current of that *synchronous generating unit*.

### [55] Clause S5.2.5.7 Partial load rejection

In clause S5.2.5.7(a), omit “**minimum load**” and substitute “**minimum generation**”.

**[56] Clause S5.2.5.7 Partial load rejection**

Omit clause S5.2.5.7(b) and substitute “[Deleted]”.

**[57] Clause S5.2.5.7 Partial load rejection**

In clause S5.2.5.7(c), omit “*generating unit*” and substitute “*generating system*”.

**[58] Clause S5.2.5.7 Partial load rejection**

In clause S5.2.5.7(c), omit “predisturbance” and substitute “pre-disturbance”.

**[59] Clause S5.2.5.7 Partial load rejection**

In clause S5.2.5.7(c), omit “minimum load” and substitute “minimum generation”.

**[60] Clause S5.2.5.7 Partial load rejection**

In clause S5.2.5.7(d), omit “*generating unit*” and substitute “*generating system*”.

**[61] Clause S5.2.5.7 Partial load rejection**

In clause S5.2.5.7(d), omit “minimum load” and substitute “minimum generation”.

**[62] Clause S5.2.5.7 Partial load rejection**

In clause S5.2.5.7, omit the heading “**Negotiated access standard**” and substitute “[Deleted]”.

**[63] Clause S5.2.5.7 Partial load rejection**

Omit clause S5.2.5.7(e) and substitute “[Deleted]”.

**[64] Clause S5.2.5.7 Partial load rejection**

Omit clause S5.2.5.7(f) and substitute “[Deleted]”.

**[65] Clause S5.2.5.7 Partial load rejection**

In clause S5.2.5.7(g), omit “*access standards*” and substitute “*performance standards*”.

**[66] Clause S5.2.5.8 Protection of generating systems from power system disturbances**

In clause S5.2.5.8, omit the heading “**Negotiated access standard**” and substitute “[Deleted]”.

**[67] Clause S5.2.5.8 Protection of generating systems from power system disturbances**

Omit clause S5.2.5.8(b) and substitute “[Deleted]”.

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

In clause S5.2.5.9, omit the heading “Negotiated access standard” and substitute “[Deleted]”.

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

Omit clause S5.2.5.9(d) and substitute “[Deleted]”.

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

In the opening paragraph of clause S5.2.5.10(a), after “*automatic access standard* is”, insert “a *generating system* must have”.

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

In clause S5.2.5.10(a)(1), omit “a *synchronous generating unit* must have” and substitute “for its *synchronous generating units*”.

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

In clause S5.2.5.10(a)(2), omit “an *asynchronous generating unit* must have” and substitute “for its *asynchronous generating units*”.

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

In clause S5.2.5.10(b), omit “*generating unit*” and substitute “*generating system*”.

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

Omit clause S5.2.5.10(e).

**[75] Clause S5.2.5.11 Frequency control**

In clause S5.2.5.11(a), insert the following definition in alphabetical order:

**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 *generating system* expressed as a percentage of the maximum operating level of the

*generating system*. Droop must be measured at *frequencies* that are outside the deadband and within the limits of *power transfer*.

### **[76] Clause S5.2.5.11 Frequency control**

In clause S5.2.5.11(a), omit the definition of **maximum operating level** and substitute:

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

- (1) a *non-scheduled generating unit*, the maximum *sent out generation* consistent with its *nameplate rating*;
- (2) a *scheduled generating unit* or *semi-scheduled generating unit*, the maximum *generation* to which it may be *dispatched* and as provided to AEMO in the most recent *bid and offer validation data*;
- (3) a *non-scheduled generating system*, the combined maximum *sent out generation* consistent with the *nameplate ratings* of its *in-service generating units*; and
- (4) a *scheduled generating system* or *semi-scheduled generating system*, the combined maximum *generation* to which its *in-service generating units* may be *dispatched* and as provided to AEMO in the most recent *bid and offer validation data*.

### **[77] Clause S5.2.5.11 Frequency control**

In clause S5.2.5.11(a), omit the definitions of **pre-disturbance level** and **system frequency**.

### **[78] Clause S5.2.5.11 Frequency control**

Omit clause S5.2.5.11(b) and substitute:

- (b) The *automatic access standard* is:
  - (1) a *generating system's power transfer* to the *power system* 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*; and
  - (2) a *generating system* must be capable of operating in *frequency response mode* such that it automatically provides a proportional:



- (i) decrease in *power transfer* to the *power system* in response to a rise in the *frequency* of the *power system* as measured at the *connection point*; and
- (ii) increase in *power transfer* to the *power system* in response to a fall in the *frequency* of the *power system* as measured at the *connection point*,

sufficiently rapidly and sustained for a sufficient period for the *Generator* to be in a position to offer measurable amounts of all *market ancillary services* for the provision of *power system frequency control*.

### **[79] Clause S5.2.5.11 Frequency control**

Omit clause S5.2.5.11(c) and substitute:

- (c) The *minimum access standard* is:
  - (1) for a *generating system* under relatively stable input energy, *power transfer* to the *power system* must not:
    - (i) increase in response to a rise in the *frequency* of the *power system* as measured at the *connection point*; and
    - (ii) decrease 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 *generating system* must be capable of operating in *frequency response mode* such that, subject to energy source availability, it automatically provides:
    - (i) a decrease in *power transfer* to the *power system* in response to a rise in the *frequency* of the *power system* as measured at the *connection point*; or
    - (ii) an increase in *power transfer* to the *power system* in response to a fall in the *frequency* of the *power system* as measured at the *connection point*,

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

### **[80] Clause S5.2.5.11 Frequency control**

In clause S5.2.5.11, omit the heading “**Negotiated access standard**” and substitute “[Deleted]”.

### **[81] Clause S5.2.5.11 Frequency control**

Omit clause S5.2.5.11(d) and substitute “[Deleted]”.

### **[82] Clause S5.2.5.11 Frequency control**

Omit clause S5.2.5.11(e) and substitute “[Deleted]”.

### **[83] Clause S5.2.5.11 Frequency control**

Omit clause S5.2.5.11(f) and substitute “[Deleted]”.

### **[84] Clause S5.2.5.11 Frequency control**

After clause S5.2.5.11(h), insert:

- (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* to the *power system* must occur with no delay beyond that required for stable operation, or inherent in the *plant* controls, once the *frequency* of the *power system* as measured at the *connection point* leaves a deadband around 50 Hz;
  - (2) a *generating system* must be capable of setting the deadband and droop within the following ranges:
    - (i) the deadband referred to in subparagraph (1) must be set within the range of 0 to  $\pm 1.0$  Hz. Different deadband settings may be applied for a rise or fall in the *frequency* of the *power system* as measured at the *connection point*; and
    - (ii) the droop must be set within the range of 2% to 10%;
  - (3) nothing in paragraph (b)(2) is taken to require a *generating system* to operate below its minimum operating level in response to a rise in the *frequency* of the *power system* as measured at the *connection point*, or above its maximum operating level in response to a fall in the *frequency* of the *power system* as measured at the *connection point*;
  - (4) a *generating system* is required to operate in *frequency response mode* only when it is enabled for the provision of a relevant *market ancillary service*; and
  - (5) the *performance standards* must record:
    - (i) the agreed values for maximum operating level and minimum operating level, and where relevant the method of determining the values, and the values for a

*generating system* must take into account its in-service *generating units*; and

- (ii) for the purpose of subparagraph (b)(2), the *market ancillary services*, including the performance parameters and requirements that apply to each such *market ancillary service*.

### **[85] Clause S5.2.5.12 Impact on network capability**

Omit clause S5.2.5.12(f) and substitute “[Deleted]”.

### **[86] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(a), omit the definitions of **rise time** and **settling time**.

### **[87] Clause S5.2.5.13 Voltage and reactive power control**

After clause S5.2.5.13(b)(2), insert:

(2A) a *generating system* must have *facilities* with a *control system* to regulate *voltage, reactive power* or *power factor*, with the ability to:

- (i) operate in any control mode; and
- (ii) switch between control modes,

in accordance with a procedure agreed with *AEMO* and the *Network Service Provider*. *Remote control equipment* to change the setpoint and control mode must be provided;

### **[88] Clause S5.2.5.13 Voltage and reactive power control**

After clause S5.2.5.13(b)(2A), insert:

(2B) a *generating system* must have a *voltage control system* that:

- (i) regulates *voltage* at the *connection point* or another agreed location in the *power system* (including within the *generating system*) to within 0.5% of the setpoint, where that setpoint may be droop-adjusted to incorporate any *voltage* droop 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 continuously controllable in the range of at least 95% to 105% of

*normal voltage* at the *connection point* or agreed location on the *power system*, without reliance on a *tap-changing transformer*;

- (iv) has limiting devices to ensure that a *voltage* disturbance does not cause the *generating unit* to trip at the limits of its operating capability; and
- (v) has a *power system* stabiliser with sufficient flexibility to enable damping performance to be maximised, with characteristics as described in paragraph (c);

**[89] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(3)(i) and substitute “[Deleted]”.

**[90] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(3)(iii) and substitute “[Deleted]”.

**[91] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(3)(iv) and substitute “[Deleted]”.

**[92] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(3)(v) and substitute “[Deleted]”.

**[93] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(b)(3)(vii), omit “subparagraph (i)” and substitute “subparagraph (2B)(i)”.

**[94] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(b)(3)(vii)(C), after “operate;” insert “and”.

**[95] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(b)(3)(viii)(B), after “*excitation control systems*;” insert “and”.

**[96] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(3)(ix).

**[97] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(3)(x).

**[98] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(4)(i) and substitute “[Deleted]”.

**[99] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(4)(ii) and substitute “[Deleted]”.

**[100] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(4)(iii) and substitute “[Deleted]”.

**[101] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(4)(iv) and substitute “[Deleted]”.

**[102] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(b)(4)(vi), after “2 seconds;” insert “and”.

**[103] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(b)(4)(v), omit “subparagraph (i)” and substitute “subparagraph (2B)(i)”.

**[104] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(b)(4)(v)(B), after “operate;” insert “and”.

**[105] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(b)(4)(vi), after “2 seconds”, omit “;” and substitute “.”.

**[106] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(4)(vii).

**[107] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(b)(4)(viii).

**[108] Clause S5.2.5.13 Voltage and reactive power control**

After clause S5.2.5.13(c), insert:

- (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*, an agreed location in the *power system* or within the *generating system*, to within 0.5% of its setpoint;
  - (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;
  - (3) with the *generating system connected* to the *power system*, and for a step change in setpoint, or a 5% *voltage* disturbance at the location agreed under subparagraph (1):
    - (i) have *settling times* for *active power, reactive power* and *voltage* of less than 5.0 seconds from an operating point where the *voltage* disturbance would not cause any limiting device to operate;
    - (ii) have *settling times* for *active power, reactive power* and *voltage* of less than 7.5 seconds when operating into any limiting device from an operating point where a *voltage* disturbance of 2.5% would just cause the limiting device to operate; and
    - (iii) have *reactive power rise time* of less than two seconds, where the change in *reactive power* setpoint or *power factor* setpoint is sufficient to induce a 5% change in *voltage* at the location agreed under subparagraph (1).

**[109] Clause S5.2.5.13 Voltage and reactive power control**

After clause S5.2.5.13(d)(2), insert:

- (2A) a *generating system* must have *facilities* with 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*;

**[110] Clause S5.2.5.13 Voltage and reactive power control**

After clause S5.2.5.13(d)(2A), insert:

(2B) a *voltage control system* for a *generating system* must:

- (i) regulate *voltage* at the *connection point*, an agreed location in the *power system* or within the *generating system*, to within 2% of the setpoint, where that setpoint may be droop-adjusted to incorporate any *voltage* droop 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 *normal voltage* at the *connection point* or the agreed location;

**[111] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(d)(3) and substitute:

- (3) a *generating system's reactive power or power factor control system* must:
  - (i) regulate *reactive power or power factor* (as applicable) at the *connection point*, an agreed location in the *power system* or within the *generating system*, to within 2% of its setpoint; 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;

**[112] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(d)(4)(i) and substitute “[Deleted]”.

**[113] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(d)(4)(iii), omit “5.0” and substitute “7.5”.

**[114] Clause S5.2.5.13 Voltage and reactive power control**

Omit the opening paragraph of clause S5.2.5.13(d)(5) and substitute:

- (5) a *generating system* comprised solely of *asynchronous generating units* with a combined *nameplate rating* of 30 MW or more, must have a *control system* that:

**[115] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(d)(5)(i) and substitute “[Deleted]”.

**[116] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(d)(5)(ii) omit “subparagraph (i)” and substitute “paragraph (i)”.

**[117] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(d)(5)(ii) omit “settling time” and substitute “*settling time*”.

**[118] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(e) and substitute “[Deleted]”.

**[119] Clause S5.2.5.13 Voltage and reactive power control**

In clause S5.2.5.13(f), omit “paragraph (e)” and substitute “clause 5.3.4A(b1)”.

**[120] Clause S5.2.5.13 Voltage and reactive power control**

Omit clause S5.2.5.13(g) and substitute “[Deleted]”.

**[121] Clause S5.2.5.13 Voltage and reactive power control**

After clause S5.2.5.13(k), insert:

- (l) The performance characteristics of any *reactive power control* capability agreed with *AEMO* and the *Network Service Provider* under this clause S5.2.5.13 must be consistent with the *reactive power capability* agreed with *AEMO* and the *Network Service Provider* under clause S5.2.5.1.

**[122] Clause S5.2.5.14 Active power control**

In the first paragraph of clause S5.2.5.14(a), omit “comprised of *generating units* with a combined *nameplate rating* of 30 MW or more”.

**[123] Clause S5.2.5.14 Active power control**

Omit clause S5.2.5.14(a)(1) and substitute:



- (1) for a *scheduled generating unit* or a *scheduled generating system*:
  - (i) maintaining and changing its *active power* output in accordance with its *dispatch instructions*;
  - (ii) ramping its *active power* output linearly from one level of *dispatch* to another; and
  - (iii) receiving and automatically responding to signals delivered from the *automatic generation control system*, as updated at a rate of once every four seconds (or such other period specified by *AEMO* as required);

**[124] Clause S5.2.5.14 Active power control**

In clause S5.2.5.14(a)(3)(iii), after “*control centre*,” omit “and”.

**[125] Clause S5.2.5.14 Active power control**

In clause S5.2.5.14(a)(3)(iv), after “another”, omit “.” and substitute “; and”.

**[126] Clause S5.2.5.14 Active power control**

After clause S5.2.5.14(a)(3)(iv), insert:

- (v) receiving and automatically responding to signals delivered from the *automatic generation control system*, as updated at a rate of once every four seconds (or such other period specified by *AEMO* as required).

**[127] Clause S5.2.5.14 Active power control**

In the first paragraph of clause S5.2.5.14(b), omit “comprised of *generating units* with a combined *nameplate rating* of 30 MW or more”.

**[128] Clause S5.2.5.14 Active power control**

Omit clause S5.2.5.14(b)(1) and substitute:

- (1) for a *scheduled generating unit* or a *scheduled generating system*:
  - (i) maintaining and changing its *active power* output in accordance with its *dispatch instructions*; and
  - (ii) receiving and automatically responding to signals delivered from the *automatic generation control system*, as updated at a rate of once every four seconds (or such other period specified by *AEMO* as required);

**[129] Clause S5.2.5.14 Active power control**

Omit clause S5.2.5.14(b)(2) and substitute:

- (2) for a *non-scheduled generating system*:
  - (i) reducing its *active power* output, within 5 minutes, to or below the level required to manage *network* flows that is specified in a verbal instruction issued by the *control centre*;
  - (ii) limiting its *active power* output, to or below the level specified in subparagraph (i); and
  - (iii) subject to energy source availability, ensuring that the change of *active power* output in a 5 minute period does not exceed a value agreed with *AEMO* and the *Network Service Provider*; and

**[130] Clause S5.2.5.14 Active power control**

Omit clause S5.2.5.14(b)(3) and substitute:

- (3) subject to energy source availability, for a *semi-scheduled generating unit* or a *semi-scheduled generating system*:
  - (i) maintaining and changing its *active power* output in accordance with its *dispatch instructions*;
  - (ii) not changing its *active power* output 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 *automatic generation control system*, as updated at a rate of once every four seconds (or such other period specified by *AEMO* as required).

**[131] Clause S5.2.5.14 Active power control**

Omit clause S5.2.5.14(e) and substitute “[Deleted]”.

**[132] Clause S5.2.6.1 Remote monitoring**

In clause S5.2.6.1(a)(3), omit “with a *nameplate rating* of 30 MW or more”.

**[133] Clause S5.2.6.1 Remote monitoring**

In clause S5.2.6.1(a)(4), omit “with a combined *nameplate rating* of 30 MW or more”.

**[134] Clause S5.2.6.1 Remote monitoring**

In the last paragraph of clause S5.2.6.1(a), omit “*remote monitoring equipment to transmit to*” and substitute “*remote monitoring equipment and remote control equipment to transmit to, and receive from,*”.

**[135] Clause S5.2.6.1 Remote monitoring**

Omit clause S5.2.6.1(b) and substitute:

- (b) The quantities referred to under paragraph (a) that *AEMO* may request include:
  - (1) in respect of a *generating system* of a type referred to in subparagraphs (a)(1) to (6):
    - (i) the status of all switching devices that carry the *generation*;
    - (ii) *tap-changing transformer* tap position(s) and *voltages*;
    - (iii) *active power* and *reactive power* aggregated for groups of identical *generating units*;
    - (iv) either the number of identical *generating units* operating or the operating status of each non-identical *generating unit*;
    - (v) *active power* and *reactive power* for the *generating system*; and
    - (vi) *voltage control system* setpoint and mode (as applicable);
  - (2) in respect of a *generating unit* with a *nameplate rating* of 30 MW or more, current, *voltage*, *active power* and *reactive power* in respect of *generating unit* stators or power conversion systems (as applicable);
  - (3) in respect of an auxiliary supply system with a capacity of 30 MW or more associated with a *generating unit* or *generating system*, *active power* and *reactive power*;
  - (4) in respect of *reactive power* equipment that is part of a *generating system* but not part of a particular *generating unit*, its *reactive power*;
  - (5) in respect of a *semi-scheduled generating system*, all data specified as mandatory in the relevant *energy conversion model* applicable to that type of *semi-scheduled generating system*;

- (6) in respect of a *scheduled generating system* or *semi-scheduled generating system*:
  - (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 the *generating unit*, turbine control limits, or other information required to reasonably predict the *active power* response of the *generating system* to a change in *power system frequency* at the *connection point*; and
- (9) any other quantity that *AEMO* reasonably requires to discharge its *market* and *power system security* functions as set out in Chapters 3 and 4.

**[136] Clause S5.2.6.1 Remote monitoring**

After clause S5.2.6.1(b), insert:

- (b1) The remote control quantities referred to under paragraph (a) that *AEMO* may request include:
  - (1) in respect of a *generating system*:
    - (i) *voltage control* setpoint; and
    - (ii) *voltage control* mode (where applicable);
  - (2) in respect of a *scheduled generating system* or *semi-scheduled generating system*, the *automatic generation control system* signal; and
  - (3) in respect of a *non-scheduled generating system*, to the extent required to manage *network* flows:
    - (i) *active power* limit; and
    - (ii) *active power* ramp limit.

**[137] Clause S5.2.6.1 Remote monitoring**

Omit clause S5.2.6.1(c) and substitute:

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

- (1) *scheduled generating unit*;
- (2) *scheduled generating system*;
- (3) *non-scheduled generating system*;
- (4) *semi-scheduled generating unit*; or
- (5) *semi-scheduled generating system*,

must have *remote monitoring equipment* to transmit to *AEMO's control centres* in real time 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* output of the *generating unit* or *generating system* (as applicable);
- (2) if *connected* to a *transmission system*, the *reactive power* output of the *generating unit* or *generating system* (as applicable); and
- (3) if a *semi-scheduled generating system*, all data specified as mandatory in the relevant *energy conversion model* applicable to that type of *semi-scheduled generating system*.

**[138] Clause S5.2.6.1 Remote monitoring**

Omit the heading “**Negotiated access standard**”.

**[139] Clause S5.2.6.1 Remote monitoring**

Omit clause S5.2.6.1(d).

**[140] Clause S5.2.6.2 Communications  
equipment**

Omit clause S5.2.6.2(g).

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

In clause S5.3a.1a, omit “derived from *minimum access standards*”.

**[142] Clause S5.3a.4.1 Remote monitoring**

Omit clause S5.3a.4.1(c).

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

Omit clause S5.3a.14(d) and substitute “[Deleted]”.

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## Schedule 2            Amendment to the National Electricity Rules

(Clause 4)

### [1] Chapter 10            Substituted definitions

In chapter 10, substitute the following definitions:

#### *AEMO advisory matter*

A matter that relates to *AEMO*'s functions under the *National Electricity Law* 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 S5.2.5.14, S5.2.6.1, S5.2.6.2, S5.3a.4.1 and 5.3a.14.

#### *continuous uninterrupted operation*

In respect of a *generating system* or *generating unit* operating immediately prior to a *power system* disturbance:

- (a) not *disconnecting* from the *power system* except under its *performance standards* established under clauses S5.2.5.8 and S5.2.5.9;
- (b) during the disturbance contributing active and reactive current as required by its *performance standards* established under clause S5.2.5.5;
- (c) after clearance of any electrical fault that caused the disturbance, only substantially varying its *active power* and *reactive power* as required or permitted by its *performance standards* established under clauses S5.2.5.5, S5.2.5.11, S5.2.5.13 and S5.2.5.14; and
- (d) so as to not exacerbate or prolong the disturbance or cause 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.

### [2] Chapter 10            New definitions

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

#### *rise time*

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

***settling time***

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:

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

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## Schedule 3 Savings and Transitional Amendments to the National Electricity Rules

(Clause 5)

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

In Chapter 11, after Part ZZZH, insert:

#### Part ZZZI Generator technical performance standards

##### 11.107 Rules consequential on the making of the National Electricity Amendment (Generator technical performance standards) Rule 2018

###### 11.107.1 Definitions

For the purposes of this rule 11.107:

**agreed access standard** means an *access standard* 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 (Generator technical performance standards) rule 2018 No. 8.

**commencement date** means the date of commencement of the Amending Rule.

**conditional access standards** has the meaning given in clause 11.107.3(e)(1)(B).

**existing application to connect** has the meaning given in clause 11.107.3.

**existing connection enquiry** has the meaning given in clause 11.107.2.

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

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

**new Chapter 5** means Chapter 5 of the *Rules* as it will be in force on and from the commencement date, as amended from time to time.

### 11.107.2 Application of the Amending Rule to existing *connection* enquiries

- (a) This clause 11.107.2 applies where, before the commencement date, a *Connection Applicant* has, in respect of *plant* that the *Connection Applicant* proposes to *connect*:
- (1) made a *connection* enquiry in accordance with clause 5.3.2 (**existing connection enquiry**); and
  - (2) not made an *application to connect* to a *Network Service Provider* under clause 5.3.4.
- (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 a *Connection Applicant* to which this clause 11.107.2 applies 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 clause 5.3.3 of 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*,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 such 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 11.107.3(c) does not preclude a *Network Service Provider* recovering an application fee from the *Connection Applicant* under clause 5.3.4(b).

### **11.107.3 Application of the Amending Rule to existing *applications to connect***

- (a) This clause 11.107.3 applies where, before the commencement date, a *Connection Applicant* has, in respect of *plant* that the *Connection Applicant* proposes to *connect*:
  - (1) made an *application to connect* to a *Network Service Provider* in accordance with clause 5.3.4 (**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) Except in the circumstances set out in paragraph (f), 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 a *Connection Applicant* to which this clause 11.107.3 applies 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 copy to be provided to *AEMO*) with:

- (A) any further information required under clause 5.3.3 of the new Chapter 5 relevant to the proposed *plant*, including for each technical requirement, written details of the *automatic access standards*, *minimum access standards* and *negotiated access standards* that are *AEMO advisory matters*; and
- (B) written notice of any further information to be provided by the *Connection Applicant* (which may include information required to be provided under clauses 5.2.5(d) and (e) and Schedule 5.5),

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 former Chapter 5 and the new Chapter 5.
- (e) Subject to paragraph (f), where, in the reasonable opinion of the *Network Service Provider* and *AEMO*, as at the commencement date all *access standards* relevant to the *plant* were agreed *access standards*, 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* as at the commencement date; 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 standards**); and

(2) otherwise, use its reasonable endeavours to provide, within 10 *business days* after the commencement date, the written confirmation at subparagraphs (e)(1)(A) and (e)(1)(B) 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).

[AEMC drafting note: the application of conditional access standards are still being considered in the context of these transitional arrangements]

(g) Notwithstanding this clause 11.107.3, and subject to paragraph (f), if the *Network Service Provider* provides written confirmation to a *Connection Applicant* under subparagraphs (e)(1) or (e)(2), the former 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 *application to connect*.

#### **11.107.4 Application of the Amending Rule to existing *offers to connect***

- (a) This clause 11.107.4 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 former 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*.

#### **11.107.5 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 of the Amending Rule, a *Generator* under an Existing Connection Agreement is required, in accordance with the *Rules*, to amend the *performance standards* set out in the Existing Connection Agreement, then the new Chapter 5 applies for the purposes of amending such *performance standards*.
- (c) The former Chapter 5 applies to a *Generator* who, as at the commencement date, has proposed to alter its *generating system* and has advised *AEMO* in accordance with clause 5.3.9, unless:
  - (1) *AEMO*, the *Generator* 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 former Chapter 5.

- (d) The Amending Rule is neither intended to have, nor is it to be read or construed as having, the effect of changing the application of clause 11.6.11 (if applicable) in relation to *connection services* provided under an Existing Connection Agreement.
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