# 4. Power System Security

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## 4.2 Definitions and Principles

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### 4.2.2 Satisfactory Operating State

The *power system* is defined as being in a *satisfactory operating state* when:

(a) the *frequency* at all energised *busbars* of the *power system* is within the *normal operating frequency band*, except for brief excursions outside the *normal operating frequency band* but within the *normal operating frequency excursion band*;

(b) the *voltage* magnitudes at all energised *busbars* at any *switchyard* or *substation* of the *power system* are within the relevant limits set by the relevant *Network Service Providers* in accordance with clause S5.1.4 of schedule 5.1;

(c) the current flows on all *transmission lines* of the *power system* are within the ratings (accounting for time dependency in the case of emergency ratings) as defined by the relevant *Network Service Providers* in accordance with schedule 5.1;

(d) all other *plant* forming part of or impacting on the *power system* is being operated within the relevant operating ratings (accounting for time dependency in the case of emergency ratings) as defined by the relevant *Network Service Providers* in accordance with schedule 5.1;

(e) the configuration of the *power system* is such that the severity of any potential fault is within the capability of circuit breakers to *disconnect* the faulted circuit or equipment; and

(f) the conditions of the *power system* are stable in accordance with requirements designated in or under clause S5.1.8 of schedule 5.1.

### 4.2.3 Credible and non-credible contingency events and protected events

(a) A *contingency event* means an event ~~affecting the power system which AEMO expects would be likely to involve the failure or removal from operational service of one or more generating units and/or transmission elements.~~ that *AEMO* expects would result in a sudden and unplanned change in the availability or operability of *plant* forming part of the *power system* or *scheduled load*.

(b) A *credible contingency event* means a *contingency event* the occurrence of which *AEMO* considers to be reasonably possible in the surrounding circumstances including the *technical envelope*.

(bl) In the absence of *abnormal conditions*, the following *contingency events* (without limitation) are not to be considered reasonably possible:

(1) three phase electrical faults on the *power system*;

(2) *busbar* faults; or

(3) simultaneous disruptive events such as:

(i) multiple *generating unit* failures, unless reasonably expected to follow from a single initiating event or set of circumstances; or

(ii) double circuit *transmission line* failure (such as may be caused by tower collapse).

~~Without limitation, examples of *credible contingency events* are likely to include:~~

~~(1) the unexpected automatic or manual *disconnection* of, or the unplanned reduction in capacity of, one operating *generating unit*; or~~

~~(2) the unexpected *disconnection* of one major item of *transmission plant* (e.g. *transmission line*, *transformer* or *reactive plant*) other than as a result of a three phase electrical fault anywhere on the *power system*.~~

(c) ~~**[Deleted]**~~ A *credible contingency event* may be further classified as:

(1) a [*distinct*] *credible contingency event* if the *power system plant* or *scheduled load* at risk is reasonably identifiable; or

(2) an [*indistinct*] *credible contingency event* if, in *abnormal conditions*, the *power system plant* or *scheduled load* at risk is not reasonably identifiable.

(d) **[Deleted]**

(e) A *non-credible contingency event* is a *contingency event* other than a *credible contingency event*. ~~Without limitation, examples of *non-credible contingency events* are likely to include:~~

~~(1) three phase electrical faults on the *power system*; or~~

~~(2) simultaneous disruptive events such as:~~

~~(i) multiple *generating unit* failures; or~~

~~(ii) double circuit *transmission line* failure (such as may be caused by tower collapse).~~

(f) A *protected event* means a *non-credible contingency event* that the *Reliability Panel* has declared to be a *protected event* under clause 8.8.4, where that declaration has come into effect and has not been revoked. *Protected events* are a category of *non-credible contingency event*.

### 4.2.3A ~~Re-classifying~~ Reclassifying contingency events

(a) *Abnormal conditions* are conditions posing added risks to the *power system* including, without limitation, severe weather conditions, lightning, storms and bush fires.

(b) *AEMO* must take all reasonable steps to ensure that it is promptly informed of *abnormal conditions*, and when *abnormal conditions* are known to exist *AEMO* must:

(1) on a regular basis, make reasonable attempts to obtain all information relating to how the *abnormal conditions* may affect the *power system* ~~a *contingency event*~~; and

(2) identify whether ~~any~~ *non-credible contingency event* ~~which~~ is more likely to occur because of the existence of the *abnormal conditions*.

(c) As soon as practicable after *AEMO* identifies that a *non-credible contingency event* ~~which~~ is more likely to occur because of the existence of *abnormal conditions*, *AEMO* must provide *Market Participants* with a notification specifying:

(1) the *abnormal conditions*;

(2) the ~~relevant~~ *non-credible contingency event*;

(3) whether *AEMO* has reclassified ~~this~~ the *non-credible contingency event* as a *credible contingency event* under clause 4.2.3A(g) and, if so, any additional measures implemented to maintain *power system security*;

(4) information (other than *confidential information*) in its possession that is relevant to its consideration under clause 4.2.3A(e), the source of that information and the time that information was received or confirmed by *AEMO*;

(5) the time at which the notification has been issued; and

(6) the time at which an updated notification is expected to be issued, where this might be necessary.

(d) *AEMO* must update a notification issued in accordance with clause 4.2.3A(c) as it becomes aware of new information that is material to its consideration under clause 4.2.3A(e), and in any event no later than the time indicated in the original notification under clause 4.2.3A(c)(6), until such time as it issues a notification specifying that the *abnormal conditions* have ceased to increase the likelihood of a ~~have a material effect on the likely occurrence of the~~ *non-credible contingency event* occurring.

(e) If *AEMO* identifies under paragraph (b) that a *non-credible contingency event* ~~which~~ is more likely to occur ~~because of the existence of *abnormal conditions*~~ it must, on a regular basis while the *abnormal conditions* exist, consider whether they make the occurrence of a ~~that~~ *non-credible contingency event* ~~is~~ reasonably possible, having regard to all the facts and circumstances identified in accordance with clause 4.2.3A(b).

(f) In undertaking its consideration in accordance with clause 4.2.3A(e), *AEMO* must have regard to the criteria referred to in clause 4.2.3B.

~~**Note:**~~

~~Clause 4.2.3A(f) will not come into effect until *NEMMCO* has established the criteria referred to in clause 4.2.3B.~~

(g) If, after undertaking a consideration in accordance with clause 4.2.3A(e), *AEMO* decides that the existence of the *abnormal conditions* make the occurrence of a *non-credible contingency event* reasonably possible, it must:

(1) reclassify that event to be a *credible contingency event*;

(2) determine, having regard to the criteria referred to in clause 4.2.3B, any additional measures it will implement to maintain *power system security*; and ~~must~~

(3) provide *Market Participants* with a notification consistent with the

requirements in paragraph (c)~~notify *Market Participants* as soon as practicable~~.

(h) If, after reclassifying a *non-credible contingency event* to be a *credible contingency event* in accordance with clause 4.2.3A(g), *AEMO* considers that the relevant facts and circumstances have changed so that the occurrence of that *credible contingency event* is no longer reasonably possible, *AEMO* must ~~may~~ reclassify that *credible contingency event* to be a *non-credible contingency event* and ~~. If *AEMO* does so, it must~~ notify *Market Participants* as soon as practicable.

(i) Every six months, *AEMO* must issue a report setting out its reasons for all decisions to ~~re-classify~~ reclassify *non-credible contingency events* to be *credible contingency events* under clause 4.2.3A(g) during the relevant period. The report must include:

(1) ~~must include~~ an explanation of how *AEMO* applied the criteria established in accordance with clause 4.2.3B for each reclassification decision ~~of those decisions~~;

(2) *AEMO's* appraisal of the appropriateness and effectiveness of the reclassification criteria and the measures applied to maintain *power system security* as a result of reclassification decisions; and

(~~2~~3) ~~may also include~~ if sufficient data is available to discern trends, *AEMO's* analysis of ~~re-classification~~ reclassification trends during the relevant period ~~and its appraisal of the appropriateness and effectiveness of the relevant criteria that were applied in the case of each reclassification decision~~.

### 4.2.3B Criteria for ~~re-classifying~~ reclassifying contingency events

(a) *AEMO* must develop and *publish*, and may amend, the ~~Within six months of the commencement of this clause, *NEMMCO* must establish~~ criteria (**reclassification criteria**) that it must use when considering whether the existence of *abnormal conditions* make the occurrence of a *non-credible contingency event* reasonably possible under clause 4.2.3A(e).

(b) *AEMO* must review the reclassification criteria ~~established under clause 4.2.3B(a)~~ not less frequently than once every two years ~~after the date of establishment~~.

~~(c) *AEMO* may amend the criteria established under clause 4.2.3B(a).~~

(c~~d~~) In ~~establishing~~ developing, reviewing or amending the reclassification criteria ~~under this clause~~, *AEMO* must~~: (1)~~ first consult with relevant stakeholders including *Market Participants*, *Transmission Network Service Providers*, *Jurisdictional System Security Coordinators* and relevant emergency services agencies.

(d) The reclassification criteria must:

(1) describe criteria to be used when assessing different types of *abnormal conditions* and their potential impact on *plant*, having ~~(2) ensure that the criteria include a requirement to have~~ regard to the particulars of any risk(s) to the *power system* associated with the relevant type of ~~various types of~~ *abnormal conditions* ~~that might arise~~;

(2) describe the type of measures that *AEMO* may implement to maintain *power system security* for a *contingency event* reclassified as an [*indistinct*] *credible contingency event*. ~~and~~

~~(3) *publish* the criteria on its website as soon as practicable after the criteria have been established or amended.~~

### 4.2.4 Secure operating state and power system security

(a) The *power system* is defined to be in a *secure operating state* if, in *AEMO's* reasonable opinion, taking into consideration the appropriate *power system security* principles described in clause 4.2.6:

(1) the *power system* is in a *satisfactory operating state*; ~~and~~

(2) the *power system* will return to a *satisfactory operating state* following the occurrence of the ~~any~~ [*distinct*] *credible contingency event* with the largest expected impact on the *power system* at any given time; and

(3) the *power system* can be restored to a *satisfactory operating state* following the occurrence of a significant [*indistinct*] *credible contingency event* or a *protected event*,

in accordance with the *power system security standards*.

(b) Without limitation, in forming the opinions described in clause 4.2.4(a), *AEMO* must:

(1) consider the impact of each of the potentially *constrained interconnectors*; and

(2) use the *technical envelope* as the basis of determining events considered to be *credible contingency events* at that time.

### 4.2.5 Technical envelope

(a) The *technical envelope* means the technical boundary limits of the *power system* for achieving and maintaining the *secure operating state* of the *power system* for a given demand and *power system* scenario.

(b) *AEMO* must determine and revise the *technical envelope* (as may be necessary from time to time) by taking into account the prevailing *power system* and *plant* conditions as described in clause 4.2.5(c).

(c) In determining and revising the *technical envelope AEMO* must take into account matters such as:

(1) *AEMO's* forecast of total *power system load*;

(2) the provision of the applicable *contingency capacity reserves*;

(3) operation within all *plant* capabilities of *plant* on the *power system*;

(4) *contingency capacity reserves* available to ~~handle any~~ respond to a *credible contingency event* in accordance with the *power system security principles*;

(5) advised *generation* minimum *load constraints*;

(6) *constraints* on *transmission networks*, including short term limitations;

(7) *ancillary service* requirements and *inertia network service* and *system strength service* availability;

(8) **[Deleted]**

(9) the existence of proposals for any major equipment or *plant* testing, including the checking of, or possible changes in, *transmission plant* availability; and

(10) applicable *performance standards*.

(d) *AEMO* must, when determining the secure operating limits of the *power system*, assume that the applicable *performance standards* are being met, subject to:

(1) a *Registered Participant* notifying *AEMO*, in accordance with rule 4.15(f), that a *performance standard* is not being met; or

(2) *AEMO* otherwise becoming aware that a *performance standard* is not being met.

### 4.2.6 General principles for maintaining power system security

The *power system security* principles are as follows:

(a) To the extent practicable, the *power system* should be operated such that it is and will remain in a *secure operating state*.

(b) Following a *contingency event* (whether or not a *credible contingency event*) or a significant change in *power system* conditions, *AEMO* should take all reasonable actions:

(1) to adjust, wherever possible, the operating conditions with a view to returning the *power system* to a *secure operating state* as soon as it is practical to do so, and, in any event, within thirty minutes; or

(2) if any principles and guidelines have been *published* under clause 8.8.1(a)(2a), to adjust, wherever possible, the operating conditions, in accordance with such principles and guidelines, with a view to returning the *power system* to a *secure operating state* within at most thirty minutes.

(c) *Emergency frequency control schemes* should be available and in service to:

(1) restore the *power system* to a *satisfactory operating state* following *protected events*; and

(2) significantly reduce the risk of *cascading outages* and *major supply disruptions* following significant multiple *contingency events*.

(d) The measures taken to reduce the potential impact of a significant [*indistinct*] *credible contingency event* should be sufficient to increase the resilience of the *power system* to that event, such that *AEMO* reasonably expects that the *power system* can be restored to a *satisfactory operating state* following the event. ~~**[Deleted]**~~

(e) Sufficient *system restart ancillary services* should be available in accordance with the *system restart standard* to allow the restoration of *power system*

*security* and any necessary restarting of *generating units* following a *major supply disruption*.

(f) Sufficient *inertia* should be available in each *inertia sub-network* to meet the applicable *inertia requirements*.

(g) Sufficient *three phase fault level* should be maintained at each *fault level node* to meet the applicable *system strength requirements*.