

The System Restart Standard

1. Introduction

This System Restart Standard (standard) was determined by the Reliability Panel (Panel) in accordance with clauses 8.8.1(a)(1a) and 8.8.3 of the National Electricity Rules (Rules). The purpose of this standard is to provide guidance and set a benchmark to assist the Australian Energy Market Operator (AEMO) in procuring sufficient system restart ancillary services (SRAS) to meet the requirements of the National Electricity Market (NEM). This standard is effective from 1 July 2018.

2. Requirements of the standard

The requirements of the standard are specified in clause 8.8.3(aa) of the Rules, which states that (italicised terms are defined under the Rules):

“The system restart standard must:

1. be reviewed and determined by the *Reliability Panel* in accordance with the *SRAS Objective*;
2. identify the maximum amount of time within which *system restart ancillary services* are required to restore *supply* in an *electrical sub-network* to a specified level, under the assumption that *supply* (other than that provided under a *system restart ancillary services* agreement acquired by *AEMO* for that *electrical sub-network*) is not available from any neighbouring *electrical sub-network*;
3. include the aggregate required reliability of *system restart ancillary services* for each *electrical sub-network*;
4. apply equally across all regions, unless the Reliability Panel varies the system restart standard between electrical sub-networks to the extent necessary:
 - (a) to reflect any technical system limitations or requirements; or
 - (b) to reflect any specific economic circumstances in an *electrical sub-network*, including but not limited to the existence of one or more *sensitive loads*;
5. specify that a *system restart ancillary service* can only be acquired by *AEMO* under a *system restart ancillary services* agreement for one *electrical sub-network* at any one time;
6. include guidelines to be followed by *AEMO* in determining *electrical sub-networks*, including the determination of the appropriate number of *electrical sub-networks* and the characteristics required within an *electrical sub-network* (such as the amount of *generation* or *load*, or electrical distance between *generation centres*, within an *electrical sub-network*); and
7. include guidelines specifying the diversity and strategic locations required of *system restart ancillary services*.”

The Panel has detailed the factors that it considered in making its determination of the standard in its decision, “AEMC Reliability Panel 2016, System Restart Standard, Final Determination, 15 December 2016”. This final determination explains how the Panel has reviewed and determined the standard in accordance with the SRAS Objective. The Panel’s decision with respect to the other requirements of the standard in clause 8.8.3(aa) are outlined below.

3. Restoration timeframe

For each electrical sub-network, AEMO shall procure SRAS sufficient to, following a major supply disruption, restore generation and transmission in that electrical sub-network such that supply¹ in that electrical sub-network is restored to the level set out in column 2 of Table 1 within the restoration time set out in column 3 of Table 1.

The restoration timeframe represents the 'target time-frame' to be used by AEMO in the SRAS procurement process. It is not a specification of any operational requirement that should be achieved in the event of a major supply disruption.

4. Aggregate reliability of SRAS

Aggregate reliability is the probability that the generation and transmission in a sub-network is expected to be restored to the specified level within the specified time. For each electrical sub-network, the required aggregate reliability shall meet or exceed the values shown in column 4 of Table 1.

The reliability of any individual SRAS will incorporate the availability of that service, the expected start-up performance and the reliability of the transmission components between the SRAS source and the first transmission substation to which it is connected.

The aggregate reliability of the procured SRAS in each electrical sub-network shall be determined by AEMO, considering the combination of the individual reliabilities of the SRAS procured in that electrical sub-network, together with an assessment of the impact of the points of failure set out in the guidelines for diversity in section 8 of the standard.

AEMO will determine the manner in which reliability will be assessed in accordance with the requirements in the Rules.

5. Applicability of the standard in electrical sub-networks

This standard shall apply equally across all regions and electrical sub-networks, except as varied between electrical sub-networks in Table 1 and set out below.

In addition, for the New South Wales electrical sub-network AEMO shall procure SRAS north of Sydney, sufficient to also:

- independently restart, without drawing power from the power system, at least 500 MW of generation capacity north of Sydney within four hours of a major supply disruption with an aggregate reliability of at least 75 per cent.

¹ Supply is defined in chapter 10 of the Rules as “the delivery of electricity”.

6. Use of SRAS in neighbouring electrical sub-networks

A system restart ancillary service can only be acquired by AEMO under a system restart ancillary services agreement for one electrical sub-network at any one time.

7. Guidelines for the determination of electrical sub-networks

In determining the boundaries for electrical sub-networks, AEMO must consider the technical characteristics that would facilitate the achievement of AEMO's power system security responsibility of procuring adequate system restart ancillary services to enable it to co-ordinate a response to a major supply disruption.² These technical characteristics would include without limitation the following factors:

- the number and strength of transmission corridors connecting an area to the remainder of the power system;
- the electrical distance (length of transmission lines) between generation centres; and
- an electrical sub-network should be capable of being maintained in a satisfactory operating state to the extent practicable during the restoration process, and in a secure operating state from a stage in the restoration when it is practicable to do so, as determined by AEMO.

8. Guidelines for assessing the diversity of services

In determining the aggregate reliability of SRAS in an electrical sub-network, AEMO shall incorporate an assessment of the impact of diversity of the services by taking into account the following guidelines:

- Electrical - diversity in the electrical characteristics shall be considered particularly to account for any single points of electrical or physical failure across the procured SRAS sources for each electrical sub-network;
- Geographical - diversity in geography shall be considered particularly to account for any single points of failure related to the potential impact of geographical events such as natural disasters; and
- Energy Source - diversity in the energy source or fuel utilised by services shall be considered particularly to account for any single points of failure across the procured SRAS sources for each electrical sub-network.

In accounting for the electrical diversity AEMO needs to consider the failure of any single significant transmission element, such as a single line or corridor that is downstream of the first transmission substation in the restoration path.

² Clause 4.3.1(p) of the Rules.

9. Guidelines for the strategic location of services

AEMO shall determine the strategic location of SRAS based on an assessment of how the geographical and electrical location of those services best facilitates the power system restoration. The locational value of SRAS relates to its ability to energise the transmission network and assist other generating units to restart. A strategic location for an SRAS may be either within or outside the electrical sub-network for which the service is procured.

Table 1 Time, Level and Aggregate Reliability by Electrical Sub-Network

1. Electrical Sub-Network³	2. Level of Restoration (MW)	3. Restoration time⁴ (hours)	4. Required Aggregate Reliability
North Queensland	825	3.5	90%
South Queensland	825	3.0	90%
New South Wales	1500	2.0	90%
Victoria	1100	3.0	90%
South Australia	330	2.5	90%
Tasmania	300	2.5	95%

³ The electrical sub-network boundaries are defined in the AEMOs 2014 SRAS Guideline.

⁴ For explanation, the restoration time in column 3 is the maximum time allowed to restore supply (generation and transmission capability) to the level in column 2, subject to the aggregate reliability. This restoration time does not refer to the time required to restore supply to all customers in the affected electrical sub-network, which could be significantly longer.