Reliability Panel
AEMC

PANEL DETERMINATION

Reliability Panel AEMC

DRAFT DETERMINATION

System Restart Standard

24 February 2012

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Draft Determination

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About the AEMC

The Council of Australian Governments, through its Ministerial Council on Energy (MCE), established the Australian Energy Market Commission (AEMC) in July 2005 to be the rule maker for national energy markets. The AEMC is currently responsible for rules and providing advice to the MCE on matters relevant to the national energy markets. We are an independent, national body. Our key responsibilities are to consider rule change proposals, conduct energy market reviews and provide policy advice to the MCE as requested, or on AEMC's initiative.

About the AEMC Reliability Panel (Panel)

The Panel is a specialist body within the AEMC and comprises industry and consumer representatives. It is responsible for monitoring, reviewing and reporting on reliability, security and safety of the national electricity system and advising the AEMC in respect of such matters. The Panel's responsibilities are specified in section 38 of the National Electricity Law.

Foreword

I am pleased to present the Reliability Panel's (Panel's) draft determination of the System Restart Standard (standard), which sets a benchmark and guidelines for the procurement of system restart ancillary services (SRAS) by the Australian Energy Market Operator (AEMO). The Panel has made this draft determination in accordance with the requirements under the National Electricity Rules (Rules). In making this draft determination the Panel has taken into account comments from stakeholders, arrangements for SRAS in other markets and the arrangements under the interim system restart standard (interim standard), which was published by AEMO in 2006.

The Panel notes that the interim standard was developed with input from stakeholders (and had been approved by the Panel) and considers that it has been working well to date. Our report sets out the considerations and analysis on each aspect of the standard. In this analysis the Panel noted that many of the provisions in the interim standard are consistent with arrangements in international markets.

The draft standard retains the key aspects of the interim standard with some clarifications and additions. These include:

- guidelines on strategic locations and diversity of SRAS - the interim standard provides that AEMO must consider diversity in electrical, technological and geographical characteristics of SRAS. The draft standard retains this criteria with the addition of fuel diversity as a specific criterion; and

- restoration timeframe and reliability of services - the interim standard sets out a 1.5 hour restoration timeframe and reliability standards of 90 per cent for primary restart services and 60 per cent for secondary restart services. The draft standard retains these provisions with some minor clarifications on the wording of the provision. In assessing these requirements, the Panel took into account recent clarifications that AEMO has made to its SRAS documents.

Under the Rules, the Panel may vary the standard between electrical sub-networks for technological or economic reasons. The Panel did not consider there were any reasons for the standard to be varied and, as such, has determined that the standard should apply equally to all regions.

In undertaking this review to determine the standard, the Panel noted that there were no provisions under the Rules for the Panel (or any other body) to undertake a periodic review of the standard once it has been determined by the Panel. The Panel considers that there would be benefit in undertaking such a periodic review as changes in technology and/or market arrangements may affect the benchmark and guidelines for the procurement of SRAS. As the AEMC may direct the Panel to undertake a review on any relevant subject matter, the Panel will request the AEMC to consider issuing standing terms of reference for periodic review of the standard.

The Panel has determined that the final standard, when it is made, shall be effective from 1 August 2013. This is to ensure that this review process does not interfere with

AEMO's current round of SRAS procurement. For future reviews the Panel will co-ordinate with AEMO to align the review and procurement processes to ensure that any changes to the standard may be captured in the latest round of SRAS procurement.

I would like to thank the stakeholders that have made submissions to this review process. The stakeholders' views and comments have assisted us with our considerations and assessments. I would also like to thank AEMO for the advice and information it has provided to us during this process.

I look forward to engaging with you further at the Public Meeting to be held in Sydney, at the AEMC office, on 11 April 2012.

Neville Henderson
Chairman, AEMC Reliability Panel
Commissioner, AEMC

Reliability Panel members

Neville Henderson, Chairman and AEMC Commissioner

Trevor Armstrong, Executive General Manager, Transmission and System Operations, Ausgrid

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1 Introduction

In accordance with the requirements under the National Electricity Rules (Rules) the Reliability Panel (Panel) has undertaken this review to determine the System Restart Standard (standard). This report sets out the Panel's consideration on each element of the standard as well as other specific factors taken into account in making its decision. The draft standard is also outlined in this report.

1.1 Requirement for the review

The Australian Energy Market Commission (AEMC or Commission) made the National Electricity Amendment (System Restart Ancillary Services and pricing under market suspension) Rule and associated Rule determination in 2006. The Rule change related to the arrangements for the standards applying to the procurement of, and payment for, system restart ancillary services (SRAS).

A requirement introduced by the Rule change is that the Panel is required to determine the System Restart Standard for the acquisition of SRAS. The system restart standard would set out the requirements that are to be met by the Australian Energy Market Operator (AEMO) in acquiring sufficient SRAS to restart the power system following a major supply interruption. The Rules provide that the Panel is to determine the System Restart Standard 'as soon as practicable'.[1] Until such time as the Panel determined a System Restart Standard, the Rules required AEMO (NEMMCO at the time) to determine an interim system restart standard which would be approved by the Panel.[2] An interim system restart standard has been in place since November 2006.

The Panel acknowledges that, although the Rules require the Panel to determine the standard 'as soon as practicable', there has been a reasonable time lag from the time when the requirement was introduced to now. However, the Panel notes that AEMO undertook consultation in establishing the interim standards and that these interim standards were approved by the Panel (as required by the Rules).[3] In addition, experience from the operation of the interim standard may assist the Panel in developing a meaningful standard. Given these considerations, and the relatively low probability of a 'black system' event occurring and that an event has not occurred in the national electricity market (NEM) to date, the Panel did not initiate this work until this time.

In September 2011, the AEMC provided the Panel with terms of reference to determine the System Restart Standard.[4]

1 Clause 8.8.3(a)(5) of the Rules.

2 Clause 11.2.1(b)(3) of the Rules.

3 Clause 11.2.1 of the Rules.

4 The terms of reference for this review is published on the AEMC Reliability Panel's website.

1.2 Black system conditions

In the event of a major supply interruption to the NEM such that a black system condition were to occur, most generating units could be expected to shut down. Such a condition would likely cause significant disruption to businesses and the broader community as a whole. In order to ensure the costs of a black system event are minimised, provisions need to be in place to provide for the restoration of the power system in a timely, orderly and effective manner.

To restore the power system following a black system event, generating units would need to be progressively restarted and load restored. However, most generating units require a source of electrical power to restore their auxiliary plant and restart. The provision of this emergency starting power is termed 'black start capability'.

Restarting the system in this situation is a highly complex and technical task that requires the coordination of many parties in the NEM, including AEMO, network service providers, generators and customers. Restarting generation units need to be matched with loads, and the frequency and voltage of the system must be carefully managed to ensure the system is restarted in a stable manner. AEMO and network service providers need to follow specific operating processes and procedures in a coordinated manner. As most generating units require a source of electrical power to restore their auxiliary plant and restart, having some generating units that have black start capability is an important consideration for the NEM.

1.3 System restart ancillary services (SRAS)

SRAS refers to these services that enable other generators to start up, which would then allow power to be progressively restored to the whole system in accordance with local system black procedures and AEMO's system restoration plans.

SRAS is sourced from generating units that have 'black start capability', which is commonly provided in the following ways:[5]

- inherent black start sources - generating units that can start without being connected to external power supplies such as some hydro generating units and some gas turbines;
- combination system restart sources - large generating units which can be started from a nearby small power station such as thermal power stations with adjacent black start gas turbine generating units; and
- trip to house load schemes (or islanding schemes) - large generating units that can disconnect from the transmission network and continue to supply their own auxiliaries or an isolated segment of system load.

5 As discussed in the final Rule determination for the National Electricity Amendment (System Restart Ancillary Services and pricing under market suspension) Rule 2006 and related Rule change proposal.

Under the Rules, AEMO is required to procure sufficient SRAS for the NEM.[6] AEMO's responsibilities relating to SRAS include publishing details that are relevant to its procurement obligations such as the 'SRAS Description', 'SRAS Quantity Guidelines' and 'SRAS Tender Guidelines' (these documents are discussed further below in section 1.5.3). The Rules also set out two types of SRAS - primary restart services and secondary restart services. The SRAS Description must identify the SRAS that are to be considered primary and secondary restart services.[7] Currently the SRAS Description provides that (italicised terms are defined in the SRAS Description):[8]

- primary restart service - 'involves supply from the *Service Provider's* generating units following a major supply disruption to *specified generating units* using a *Restart Path* to the *Delivery Point*' and '[t]he purpose of a primary restart service is to assist the *specified generating units* to restart following a major supply disruption'.

- secondary restart service - 'involves supply from the *Service Provider's* generating units following a major supply disruption using a *Restart Path* to the *Delivery Point*. In the case of a secondary restart service based on *TTHL* [trip to house load] scheme, the generating unit(s) providing the service would have a nameplate rating of less than 100MW, making it ineligible for a primary restart service' and '[t]he purpose of a secondary restart service is to assist the *notional specified generating units* to restart following a major supply disruption'.

The Panel notes that, in consultation with stakeholders, AEMO has recently amended the SRAS Description to clarify the provisions relating to primary and secondary restart services.

1.4 The System Restart Standard

AEMO is responsible for procuring sufficient SRAS for the NEM.[9] The System Restart Standard, which the Panel is required to determine, provides the benchmark that defines what services AEMO should procure.[10] In essence, the standard sets out the SRAS requirements for the market to efficiently minimise expected economic costs of a major supply interruption while balancing the costs of procuring SRAS. The standard provides consistency and clarity in the definition of SRAS in a way which achieves the

6 Clause 3.11.4A(b) of the Rules provides that 'AEMO must use reasonable endeavours to acquire system restart ancillary services'.

7 Primary and secondary restart services are defined in the Rules with respect to the reliability requirements of these services as set out in the System Restart Standard (or interim standard prior to the Panel's determination of a standard). In AEMO's interim standards, primary services are required to be assessed by AEMO to be likely to perform on more than 90 per cent of the occasions the service is called upon and secondary services more than 60 per cent of the occasions (AEMO 2006, op cit, pp. 9-10).

8 AEMO, SRAS Description, 11 November 2011, p. 7 and p. 10.

9 Clause 3.11.4A(b) of the Rules.

10 The specific requirements of the System Restart Standards as defined under the Rules are discussed in Chapter 3 below.

right balance between having sufficient guidance on the services to be procured and allowing AEMO appropriate discretion to carry out its functions. (The specific requirements of the standard are discussed in detail in Chapter 3.) The System Restart Standard does not define or specify the operational procedures to be followed by AEMO or market participants in the event of a black system condition.

AEMO must procure sufficient SRAS for the NEM in accordance with the requirements and guidelines as set out in the standard. For this reason, the standard must be clear and set out provisions that may be practically applied.

To ensure that the standard provides for sufficient SRAS to be procured by AEMO, it must include specific provisions as required by clause 8.8.3(aa) of the Rules. This clause states that the System Restart Standard must:

1. be consistent with the SRAS objective;[11]

2. apply equally across all regions, unless the Panel varies the standard between electrical sub-networks to the extent necessary:

    (a) to reflect any technical system limitations or requirements; or

    (b) if the benefits of adopting the standard would be outweighed by the costs of implementing such a standard;

3. identify the maximum amount of time within which SRAS are required to restore supply to a specified level;

4. include guidelines on the required reliability of primary restart services and secondary restart services;

5. 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

6. include guidelines specifying the diversity and strategic locations required of primary restart services and secondary restart services.

1.5 Current arrangements and advice from AEMO

1.5.1 Interim standards

Prior to the Panel's determination of the standard, the Rules require AEMO to put in place interim system restart standards.[12] In consultation with stakeholders and as

11 The SRAS objective is discussed below in section 2.2.

12 Clause 8.8.3(a)(5) of the Rules.

approved by the Panel, AEMO put in place the interim standards in November 2006. The interim standard is available on AEMO's website and it is also published under this project page on the AEMC Reliability Panel webpage.

In undertaking this review, the Panel has taken into consideration the provisions of the interim standard as discussed further in Chapter 3.

1.5.2 AEMO's advice

The Rules require that the Panel establish the System Restart Standard on the advice of AEMO.[13] In September 2011, the Panel requested AEMO to provide advice on this matter. AEMO's advice is published on the AEMC's Reliability Panel webpage with this Draft Report. The Panel has taken AEMO's advice into consideration and, where relevant, specific issues raised in AEMO's advice are also discussed in this paper.

The Panel also notes that AEMO initiated consultation on its 'SRAS documents' in September and that AEMO aims to execute new SRAS agreements by the end of June 2012.[14] The Panel has worked closely with AEMO throughout this review process to ensure that any issues raised in AEMO's consultations are taken into consideration by the Panel where appropriate. The Panel considers the final System Restart Standard should take effect from 1 August 2013 so that there would be no uncertainties for AEMO's current round of SRAS procurement and execution of agreements.[15]

1.5.3 AEMO's SRAS documents

The Panel notes that AEMO is required to develop and publish a number of guidelines in relation to specific areas defined under the standard.[16] These guidelines would likely be more detailed than the standard and take into consideration specific implementation and operational issues. To clarify the provisions of the standard and the other guidelines and determinations that AEMO is required to publish, the specific provisions include that:

- the standard is to set out guidelines on the required reliability of primary restart services and secondary restart services, and AEMO is to develop the SRAS description that identifies whether a service is a primary or secondary restart service and the technical and availability requirements of each service (SRAS description);[17]

13 Clause 8.8.1(a)(1a) of the Rules.

14 AEMO's SRAS documents are discussed further in section 1.5.3 below.

15 The application of the new arrangements is discussed in section 4.1.2.

16 Detailed discussion of the content of the System Restart Standard is discussed in Chapter 3.

17 Clause 8.8.3(aa)(4) and clause 3.11.4A(d) of the Rules.

- the standard is to set out guidelines for determining electrical sub-networks, and AEMO is required to determine the boundaries of the electrical sub-networks;[18] and

- the standard is to set out guidelines specifying the diversity and strategic locations required for SRAS, and AEMO is required to develop and publish the procedure for determining the number, type and location of SRAS for each electrical sub-network (SRAS quantity guidelines).[19]

AEMO is also required to develop and publish guidelines for undertaking modelling and assessment of the technical capabilities and physical testing of SRAS (SRAS guidelines).[20] In addition, AEMO is required to determine and publish ancillary services tender guidelines.[21]

The Panel's review relates to the determination of the standard only. To the extent required, the Panel has taken into consideration provisions in AEMO's SRAS documents in making its determination.

1.6 Review process and consultation

The Panel initiated this review in November 2011 with the publication of an Issues Paper. The Issues Paper outlined the purpose of the review, provided some background information and set out a series of questions to facilitate consultation. Consultation on the Issues Paper closed on 2 December 2011 and four submissions were received. Where relevant, issues raised in the submissions are discussed throughout this report and a summary of the issues raised is also set out in Appendix B.

The Panel will hold a Public Meeting to present this draft of the System Restart Standard and provide an opportunity for stakeholders to raise any questions. This Public Meeting will be held in Sydney at the AEMC office on 11 April 2012. To attend, please register via the AEMC website.

The key milestones for this review are set out in the table as follows.

18 Clause 8.8.3(aa)(5) and clause 3.11.4B(b).

19 Clause 8.8.3(aa)(6) and clause 3.11.4A(f).

20 Clause 3.11.4A(e) of the Rules.

21 Under clause 3.11.5(b) of the Rules, AEMO must determine and publish tender guidelines in respect of non-market ancillary services. The Rules provides that AEMO may publish separate guidelines for network control ancillary services and system restart ancillary services, which AEMO has elected to do.

Timetable

Stage of review / milestone	Date
Draft System Restart Standard published	24 February 2012
Close of submissions on the draft standard	23 March 2012
Public Meeting (Sydney, AEMC Office)	11 April 2012
Final System Restart Standard published	25 May 2012 (indicative)

1.7 Structure of the paper

The remainder of this draft determination is structured as follows:

Chapter 2 Determination of the System Restart Standard - sets out the Panel's consideration in making the draft standard;

Chapter 3 Elements of the Standard - sets out the specific aspects of the standard and the Panel's consideration in determining each aspect; and

Chapter 4 Other considerations - sets out the other factors that the Panel considers are relevant to its decision including the implementation date of the standard and the on-going requirement for periodic review of the standard.

2 Determination of the System Restart Standard (draft)

This Chapter sets out the Panel's considerations in making the System Restart Standard (draft).

2.1 The Reliability Panel's determination of the standard

In accordance with the provisions under clauses 8.8.1(a)(1a) and 8.8.3(a)(5) of the Rules, the Panel has determined a draft of the System Restart Standard. As required by the Rules, the Panel has sought, and considered, advice from AEMO in making this determination. The Panel is consulting on this draft prior to finalising its determination.

2.2 The Reliability Panel's considerations

In making its determination of the draft of the System Restart Standard, the Panel has taken a number of factors into consideration including:

- consistency of the standard with the SRAS objective;[22]
- application of the interim standard to date;
- stakeholder submissions on the Issues Paper;
- AEMO's advice; and
- AEMC's System Restart Ancillary Services and pricing under market suspension Rule determination (and relevant consultant reports).[23]

2.3 Consistency with the SRAS objective

The Rules require that the standard must be consistent with the SRAS objective, which states:[24]

> "The objective for system restart ancillary services is to minimise the expected economic costs to the market in the long term and in the short term, of a major supply disruption, taking into account the cost of supplying system restart ancillary services, consistent with the national electricity objective."

The SRAS objective refers to the minimisation of the expected economic costs of a supply disruption. However, the economic cost of a black start event could be difficult

22 The SRAS objective is discussed in section 2.3.

23 AEMC, National Electricity Amendment (System Restart Ancillary Services and pricing under market suspension) Rule 2006, Rule Determination, 20 April 2006.

24 The SRAS objective is set out in clause 3.11.4A(a) of the Rules.

to estimate although it could potentially be very significant. For example, the black system event that occurred in north-east USA and parts of southern Canada in 2003, which affected 50 million customers over a two-day period, was estimated to have cost the economy US$10b.[25]

Instead of attempting to estimate the potential costs of a black start event, the Panel has considered whether the standard is consistent with the SRAS objective in terms of whether the standard inhibits the standard economic efficiency criteria that applies to the procurement of SRAS. That is:[26]

- Static efficiency - whether SRAS is being provided by the lowest cost operators;
- Dynamic efficiency – whether SRAS is being provided by the lowest cost operators over time; and
- Allocative efficiency – where there is an appropriate amount of SRAS being purchased.

The Panel considers that the standard does not inhibit the efficiency criteria. With respect to static efficiency criterion the process under the Rules requires AEMO to procure SRAS through a competitive tender process, which promotes static efficiency. As discussed further in Chapter 3, the standard also sets targets that are clear and consistent with those applied internationally and thus it promotes dynamic efficiency as it does not unnecessarily exclude any potential SRAS providers from offering their services.

The standard also does not inhibit allocative efficiency as it provides targets that are realistic and achievable; as well as providing transparent guidelines for AEMO to set boundaries of electrical sub-networks and transparent guidelines on diversity of services. That is, the standard provides clear guidelines to allow AEMO to carry out its role in procuring SRAS. As AEMO is a well-informed decision maker and undertakes open and consultative processes to set the relevant detailed SRAS provisions, the standard also promotes allocative efficiency in this regard. For these reasons, the Panel considers that the standard is consistent with the SRAS objective.

The Panel notes that, in its submission on the Issues Paper, Snowy Hydro submits that it would be of benefit for the Panel to undertake a 'marginal cost/marginal benefit analysis as key input' for setting the standard.[27] Although the Panel agrees in principle that such an analysis would provide useful information on the costs and benefits of SRAS, the Panel considers that it would not be practical to carry out such an analysis at this time. A marginal cost/benefit analysis would need to be based on many assumptions that may be difficult to quantify. As such, the outcomes of such a study

25 Combined Heat and Power Partnership, Calculating Reliability Benefits, US EPA, 2010.

26 These efficiency concepts are discussed in the Firecone report to the AEMC: Firecone Ventures Pty Ltd, Review for the AEMC of the proposed NEMMCO Rule change for System Restart Ancillary Services, Final Report, December 2005, p. 11.

27 Snowy Hydro, submission on the Issues Paper, 6 December 2011, p. 2.

would likely be subjective and potentially inaccurate. Given this, the Panel's assessment of the standard is with respect to the economic efficiency criteria principles.

The Panel also notes that, in submissions on the Issues Paper, Origin notes that the current annual costs of SRAS at $36.7m is a very small percentage of the NEM's annual spot revenue, which was around $7.4b for the last financial year;[28] and that Alinta notes the services provided are reasonably priced.[29]

2.4 Draft System Restart Standard

The Panel has determined a draft of the standard, which incorporates specific elements as required under clause 8.8.3(aa) of the Rules.[30] The draft standard is provided in Attachment A of this report and the specific considerations relating to each element of the standard is discussed in detail in Chapter 3.

28 Origin Energy, submission on the Issues Paper, 2 December 2011, p. 1.

29 Alinta Energy, submission on the Issues Paper, 2 December 2011. p. 1.

30 The specific elements of the standard as required under the Rules are discussed in section 1.4.

3 Elements of the standard

This chapter sets out the Panel's consideration of each element in the standard.

3.1 Time to restore supply

Summary of key points

The Panel's draft determination of the standard is consistent with the interim standard and specifies the target timeframe to restore supply at 1.5 hours to re-supply and energise the auxiliaries of the power station/s. The Panel considers that this timeframe is an achievable target and provides a guide for AEMO in its procurement of SRAS. The Panel has taken into consideration that this timeframe is consistent with the provisions in other markets and that submissions from some stakeholders supported the current provisions.

The Panel also considers that the measures against the 'peak load' be retained as they provide a clear and measurable target.

3.1.1 Rules requirement

The Rules require that the standard 'must identify the maximum amount of time within which system restart ancillary services are required to restore supply to a specified level'.[31] As discussed by the Panel and noted in the Issues Paper, the Panel had acknowledged that in practice, the timeframe for the restoration of supply following a black system event would be affected by a number of factors including the location of the supply interruption, the nature of the disruption as well as the types of ancillary services that may be available. Taking this into account, the Panel noted that any restoration timeframes set out in the standard should be considered 'target timeframes'.

3.1.2 How the interim standard meets this requirement

The interim standard sets out that restart services should be procured for each electrical sub-network sufficient to:[32]

- 'Re-supply and energise the auxiliaries of power stations within 1½ hours of a major supply disruption occurring such that there would be sufficient capacity to meet 40% of the peak demand in the affected electrical sub-network'; and
- 'Restore generation and transmission within the affected electrical sub-network such that 40% of the electrical sub-network's peak demand could be supplied within four hours of a major supply disruption occurring'.

31 Clause 8.8.3(aa)(3) of the Rules.

32 AEMO 2006, op cit, p. 5.

In the interim standard AEMO notes that there are no guarantees whether timeframes for restoration of supply may be met given a major supply disruption as it would be affected by a number of factors.[33] For this reason, the interim standard includes the requirement for the re-supply and energisation of the auxiliaries of power stations.[34] AEMO believes the target of 1.5 hours to restore supply to the levels specified is broadly achievable.[35] AEMO also believes that the target to restore 40 per cent of peak demand of an affected sub-network is an effective benchmark as a 40 per cent restoration marks the point at which most of the available network paths would need to have been restored.[36] The restoration timeframe was set giving consideration to modelling undertaken of prospectively contracted restart services.[37]

3.1.3 Stakeholder submissions

The Issues Paper included questions on the factors that would affect the time in which supply could be restored and what would be a reasonable timeframe. The following comments were made in submissions on this issue.

Origin notes it considers the current interim standard is generally suitable.[38]

Transend notes that it supports the current timeframes in the interim standard and supports AEMO's advice to the Panel noting that the restoration timeframes were to guide acquisition of SRAS and considers that 'a more relaxed standard can extend the restoration times following a major supply disruption'.[39]

Alinta considers that 'flexibility around target timeframes would appear suitable'. It further considers that 'where providers are capable of provid[ing] services in excess of target timeframes these should be identified and rewarded where justified'.[40]

Snowy Hydro considers that a target timeframe 'provides weak incentives for all relevant bodies' and that the Panel 'should instead set a specific timeframe ... that is economically determined based on the SRAS objective which must be achieved in the event of a Black System event'.[41]

33 AEMO 2006, op cit, p. 6.

34 ibid, p. 7.

35 ibid

36 ibid

37 ibid, p. 17.

38 Origin Energy, submission on the Issues Paper, 2 December 2011, p. 1.

39 Transend Networks, submission on the Issues Paper, 2 December 2011, p. 2.

40 Alinta Energy, submission on the Issues Paper, 2 December 2011, p. 2.

41 Snowy Hydro, submission on the Issues Paper, 6 December 2011, p. 4.

3.1.4 Panel's considerations

Restoration timeframe

As discussed in the Issues Paper, the Panel considers the purpose of the standard should be to set a restoration timeframe target. This is consistent with AEMO's approach in the interim standard where the restoration timeframe is based on the amount of time to re-supply and energise the auxiliaries of power stations within 1.5 hours. This provides a clear and definite timeframe that is broadly achievable. The target also appears consistent with the technical capabilities set for black start units in other markets, such as in the Pennsylvania-New Jersey-Maryland (PJM) market where there is a target of 90 minutes for black start units to re-energise.[42] As discussed above in section 1.2, the Panel considers that given the number of factors that could affect the time to restore the system if a black system event did occur, it would not be practical to specify a definite time in which the system should be restored. In addition, the purpose of the standard is to set a standard to guide the procurement of SRAS and not to set any specific operational requirements.

The interim standard also refers to the restoration of demand to a level at which most of the available network paths would need to have been restored within four hours (i.e. 40 per cent of peak load). This is a useful consideration as it provides a benchmark of the time in which services may be restored and potentially limits the amount of unserved energy in a black system event. However, the Panel considers minor clarifications to the wording of the requirements in the interim standard could be made.

Procurement of SRAS and practical application of the standard

The Panel notes that, as with other criteria set out in the standard, this restoration timeframe benchmark is to assist AEMO with the procurement process. It does not directly determine the actual time that would be required to restart the system following a black system event. This approach is consistent with the provision in other markets where generally there are no specific time limits set for the restoration of the system following a black system event.

In the AEMC's rule determination on system restart ancillary services, the AEMC noted that it 'would expect one of the factors that the Reliability Panel would take into account in defining [the restoration timeframe] would be the ability for [AEMO] to practically apply the standard as part of the procurement process'.[43] The Panel considers that a restoration timeframe target based on the time to re-energise auxiliaries and in reference to peak load are measurable and may be practically applied.

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42 In accordance with section 4.6.10 of the PJM Balancing Operations, a generation unit providing black start services 'must have the ability to close the output breaker to a dead bus within 90 minutes'.

43 AEMC 2006, National Electricity Amendment (System Restart Ancillary Services and pricing under market suspension), Rule Determination, 20 April 2006, p. 19.

Exceeding target timeframes

In response to the issue raised by Alinta on rewarding services that exceed target timeframes, the Panel notes that, where all other factors are equal, a service that provides a higher degree of certainty in being able to achieve the target timeframe would be considered more favourably and therefore would more likely be awarded an SRAS contract. As discussed above, the actual time to restore services are subject to many factors, there can be limited certainty of actual restoration times. Therefore, if a number of services meet the restoration target, it is questionable whether rewarding a provider that can exceed the target will actually reduce the overall unserved energy in a black start event. For this reason, the Panel considers there would be no efficiency gains in rewarding providers that can exceed the restoration target.

3.2 Guidelines on required reliability of SRAS

Summary of key points

The Panel has determined that the reliability for primary restart services and secondary restart services be set at 90 per cent and 60 per cent respectively, consistent with the interim standard. The reliability of 90 per cent for primary restart services is a 'high' standard and is consistent with provisions in other markets. The reliability of secondary restart services do not need to be as high as primary services and there is no evidence to suggest that the current 60 per cent reliability level set in the interim standard is inappropriate or unjustly excludes any services from being considered. In addition, the Panel considers the provision in the interim standard that specifically allows SRAS services to be considered 'in combination' should be retained.

3.2.1 Rules requirement

The Rules require that the standard 'must include guidelines on the required reliability of primary restart services and secondary restart services'. AEMO is required under the Rules to publish a description of each type of SRAS (the SRAS description) and the description of primary and secondary services must be in accordance with the guidelines for these services under the standard (among other things).

As outlined above in section 1.3, the reliability of primary and secondary restart services are to be set in the standard whereas the actual detailed description of the services are determined by AEMO, in consultation with stakeholders, and set out in the SRAS Description.

3.2.2 How the interim standard meets this requirement

The interim standard sets out that:[44]

44 AEMO 2006, op cit, pp. 9-10

- Primary restart services: are required to be assessed by AEMO to be likely to perform on more than 90 per cent of the occasions the service is called upon to deliver the service; and

- Secondary restart services: are required to be assessed by AEMO to be likely to perform on more than 60 per cent of the occasions the service is called upon to deliver the service.

The interim standard also provides that individual restart services could be considered in combination to meet a higher level of reliability than the individual service.

In the interim standard AEMO notes that it is not aware of any practicable study to determine the 'correct' reliability for restart services. In making the interim standard, the reliability of the services was set in a 'deterministic manner'. AEMO believes that thresholds meet the presumed community expectations and should be reasonably achievable with current technology and processes.[45]

3.2.3 Stakeholder submissions

The Issues Paper included questions on what factors affect the reliability of restart services and whether the current definitions in the interim standards were acceptable. The following comments were raised in submissions on this issue.

In its submission, Alinta notes that there are benefits in requiring a high level of availability and reliability from SRAS providers but it also offers a countervailing view that 'such high standards may rule out options that may be capable of providing services at a lower level of availability'.[46]

3.2.4 Panel's considerations

Reliability and availability of services

The Panel notes that in practice AEMO applies a 'combined reliability and availability' measure. The Panel understands that AEMO considers the combined availability and reliability requirement indicates the likelihood that a service would be capable of successfully delivering the service should it be required – that is 'would it be available and, if so, will it work'. AEMO considers that this concept of reliability is consistent with the system restart standard, as the concept under the standard relates to whether a service is likely to perform. AEMO determines the combined reliability and availability factor for a service by giving consideration to testing statistics submitted by SRAS providers with their annual testing report providing evidence of the periods that the service was available and details relating to attempted starts and the number of unsuccessful attempts. The information relating to the methodology for determining SRAS reliability is set out in the SRAS Assessment Guidelines, which AEMO develops in accordance with the consultation procedures under the Rules.

45 AEMO 2006, op cit, p. 11.

The Panel notes that provisions in other markets use availability measures such as a 90 to 95 per cent service availability in the UK market and a 90 per cent availability in the Texas market.[47] Although the measure in the system restart standard is reliability rather than availability, the Panel notes that the 90 per cent value is consistently applied in other markets. Also, as AEMO has raised, the Panel agrees that the concept of reliability under the System Restart Standard relates to whether a service is likely to perform and therefore we consider that the interim standard is consistent with availability requirements used in other markets. On this basis, the Panel considers that a 90 per cent reliability level is to be adopted for primary services given that primary services should demonstrate a high degree of reliability and 90 per cent is an acceptable benchmark.

Primary services should provide a 'high' level of reliability while secondary services, by nature of the definition, do not need to be as reliable as primary restart services however they should still be sufficiently reliable. In considering the appropriate level of reliability for secondary services, the Panel took into account the fact that there does not generally appear to be specific provisions for 'secondary' services in other markets. There is often a trade-off between the reliability and price of services and the Panel has not received any evidence to suggest that a 60 per cent reliability level for secondary services is inappropriate. In response to Alinta's comment of whether high standards rule out potential options, the Panel notes that no potential SRAS providers have submitted that their potential services are being excluded and the Panel is not otherwise aware of there being insufficient secondary services available in the NEM.

Combining SRAS

The interim standard provides for services to be considered in 'combination'. The Panel considers that this provision provides additional flexibility and options to AEMO, which would benefit consumers by providing additional competition in the provision of SRAS. The Panel understands there have been issues raised by stakeholders about requiring clarity in the definition of what constitutes 'combined services'. AEMO has advised the Panel that in it's recent determination of the amended SRAS documents it has provided clarification on these issues. The clarifications include noting that combined units would need to be capable of being allocated to the same electrical sub-network and provide similar roles in power system restoration. The units would not need to have common ownership but evidence of appropriate agreements between the SRAS provider and the other party would need to be accepted by AEMO. The Panel also notes that AEMO has made other clarifications in its SRAS documents following from its recent consultations such as amendments to the definition of 'specified generating unit' to clarify the relevant requirements.

The ability for services to be combined provides flexibility to AEMO's procurement process and increases competition. For these reasons the Panel has determined that this provision also be included in the system restart standard. However, consistent with the requirement for AEMO to define the services under the SRAS Description, AEMO

46 Alinta Energy, op cit, p.2.

47 The National Grid Company, An Introduction to Black Start, February 2001, p. 4.

should be required to specifically clarify and define the criteria for services to be combined under the SRAS Description.[48]

3.3 Variation of the standard between regions

Summary of key points

The Panel has determined that the standard is to apply equally to all electrical sub-networks. Stakeholders did not raise any issues on this particular matter and the Panel is not aware of any reasons why the standard should be varied for any electrical sub-networks.

3.3.1 Rules requirement

The Rules require that the standard 'must apply equally across all regions, unless the Reliability Panel varies the system restart standard between electrical sub-networks to the extent necessary:[49]

> "(A) to reflect any technical system limitations or requirements; or
>
> (B) if the benefits of adopting the system restart standard would be outweighed by the costs of implementing such a standard."

3.3.2 How the interim standard meets this requirement

The interim standard applies equally across all sub-networks. AEMO had noted that the Rules provide for the Reliability Panel to vary the system restart standard and AEMO did not believe it had any authority to propose an interim standard that varied across sub-networks.[50]

3.3.3 Stakeholder submissions

The Issues Paper included questions on whether the standard should be varied for any electrical sub-networks and if so, which sub-networks and for what reasons.

Apart from the general support of the current interim standards as noted above, there were no specific issues raised by stakeholders on whether the standard should be varied for different electrical sub-networks.

48 Under the Rules AEMO is required to consult on any amendments to the SRAS Description.

49 Clause 8.8.3(aa)(2) of the Rules.

50 AEMO 2006, op cit, p. 4.

3.3.4 Panel's considerations

As set out in the Rules, the standard may only be varied for technical or economic reasons. The Panel has determined that the standard shall apply equally in all electrical sub-networks as the Panel is not aware of any technical or economic reasons that would require the standard to be varied for an electrical sub-network. The Panel has taken into consideration that stakeholders have not raised any issues on this matter and that, in other markets, any specific system restart arrangements typically apply generally. However, the Panel notes that should there be any changes or developments in the market in the future that can affect the application of the standard in an electrical sub-network, the provisions of the standard should be reviewed. (The requirement for periodic review of the standard is discussed further in Chapter 4.)

The Panel understands that there may be a greater number of potential SRAS providers in some electrical sub-networks compared to others. In theory, a greater number of potential SRAS providers would lead to higher levels of competition, and likely achieve more competitive results ensuring that the market is paying efficient prices. Although the Panel has not been provided with any evidence to suggest that competition in any particular electrical sub-network is inefficient, or that the prices paid for SRAS services are inefficient, the Panel is interested in stakeholder views and comments on ways in which competition in the SRAS market may be promoted.

3.4 Guidelines for determining electrical sub-networks

Summary of key points

The Panel has determined that the guidelines in the interim standard for determining electrical sub-networks be adopted as they have assisted AEMO to establish the current boundaries. AEMO's determination of the boundaries was completed in consultation with stakeholders and the Panel is not aware of any deficiencies in the current provisions.

3.4.1 Rules requirement

The Rules require that the standard 'must 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)'.

3.4.2 How the interim standard meets this requirement

The guideline in the interim standard for determining the boundaries for electrical sub-networks sets out that the electrical sub-networks will be determined by taking into account, but not limited by, the following factors:[51]

- '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;
- 'a significant quantity of generation in an area, of the order of 1000MW or more;
- 'a significant quantity of load in an area, of the order of 1000MW or more.'

The interim standard also noted that '[g]eneration centres will be deemed sufficiently remote from each other to warrant consideration of separate sub-networks, if the transmission network between those centres is likely to take in excess of two hours to fully re-energise following a major supply disruption'.[52]

In determining these guidelines, AEMO took into consideration the factors set out in the AEMC's rule determination on system restart services and pricing under market suspension as well as outcomes from the SRAS review conducted by AEMO (NEMMCO at the time).

3.4.3 Stakeholder submissions

The Issues Paper included questions on whether the factors identified in the interim standards were sufficient or whether additional factors should be taken into account. The Issues Paper also asked whether it would be appropriate to allow electrical sub-networks to overlap and what potential benefits this would provide.

Alinta submits that although it 'agrees that the existing sub-networks are appropriate', it notes that it 'would not be averse to additional redundancy being built-in via overlapping sub-networks and additional services being provided from adjacent sub-networks in the case of an extreme event'.[53]

3.4.4 Panel's considerations

The Panel notes that the guidelines under the standard should provide sufficient guidance to AEMO to allow it to determine the appropriate number of electrical sub-networks. The Panel also notes that in many other markets, 'regions' are based on transmission operator regional boundaries or determined by the system operator. This

51 AEMO 2006, op cit, p. 12.

52 ibid

53 Alinta Energy, op cit, p. 2.

approach of setting out guidelines in the standard provides additional clarity and transparency on the determination of electrical sub-networks.

The Panel has taken into consideration that AEMO has determined the current electrical sub-networks in accordance with the criteria as set out in the interim standards and in consultation with stakeholders. Given that stakeholders have been involved in this process and that the Panel is not aware of any specific issues or deficiencies with the current provisions, we consider that the existing requirements under the interim standards are appropriate to guide AEMO in determining electrical sub-networks.

In considering the issues of overlapping sub-network boundaries, we note that one of the main potential advantages in allowing electrical boundaries to overlap is that a system restart service may provide services to more than one sub-network. This could provide efficiencies and have a possibility of lowering the overall cost of SRAS for the market. However, allowing electrical sub-network boundaries to overlap would likely affect operational procedures to restore an electrical sub-network in the event of black system conditions and would need to be assessed by AEMO and stakeholders on a sub-network by sub-network basis. These operational factors would need to be taken into consideration.

On balance, the Panel considers that sub-networks should be uniquely defined and electrical boundaries should not overlap. However, AEMO should take advantage of any flexibility in the supply of SRAS where it could be obtained effectively and efficiently from suppliers in adjacent sub-networks. The Panel notes that AEMO currently permits an SRAS to be utilised in more than one electrical sub-network. The Panel considers that AEMO can clarify in its SRAS documents the factors it would take into consideration in assessing whether an SRAS could be applied in an adjoining electrical sub-network.

3.5 Guidelines on strategic locations and diversity of SRAS

Summary of key points

The Panel has determined that the guidelines for strategic location and diversity of restart services include guidelines on electrical, technological, geographical and fuel diversity. This would be consistent with the interim standards with the addition of 'fuel' as a specific, separate criterion.

3.5.1 Rules requirement

The Rules require that the standard 'must include guidelines specifying the diversity and strategic locations required of primary restart services and secondary restart services'.

3.5.2 How the interim standard meets this requirement

The guideline set out under the interim standard for specifying the diversity of restart services are diversity with respect to electrical, technological and geographical characteristics:[54]

- Electrical: '[i]t is important that there is an appropriate degree of independence between the services, in particular regarding any potential single points of electrical or physical failure. Consideration should be given to the potential for a major power system disturbance to adversely affect more than one service'.

- Technological: [d]iversity of technologies should also be considered to minimise the reliance of services on a common attribute. For example, a restoration strategy may be less robust if the services all relied on gas supplies or all services were trip-to-house load'.

- Geographical: '[w]here there is potential for a natural disaster such as a severe bad weather event or earthquake or other event to adversely affect services that are closely located by geography, consideration should be given to achieving geographic diversity'.

The interim standard also discusses that any strategic location for primary restart services would need to be well placed both geographically and electrically to facilitate power system restoration.[55]

3.5.3 Stakeholder submissions

The Issues Paper included questions on the types of SRAS that are available in the NEM and what factors are relevant in considering the diversity of SRAS and strategic geographical locations.

Alinta notes that 'technological diversity and geographical disparity are key considerations in selecting services across sub-networks'.[56]

3.5.4 Panel's considerations

Diversity in SRAS is required to ensure sufficient redundancy and prevent the system from being vulnerable to a single point of failure. A certain level of independence should exist between the SRAS procured for the NEM.

In the Issues Paper, the Panel noted the importance of fuel diversity in the provision of SRAS. Although fuel diversity appears to be addressed by the interim standard in the description for 'technological' diversity, the Panel considers it is of value to specifically include fuel as a separate category. The Panel also considers that this goes towards

54 AEMO 2006, op cit, p. 14.

55 ibid, pp. 14-15.

56 Alinta, op cit, p. 2.

addressing the issue raised by Alinta regarding the growing integration of the gas and electricity markets (as discussed further below in Chapter 4). However, depending on the availability of SRAS based on different fuel sources, adding a specific fuel criterion could impact on the overall costs of SRAS in particular sub-networks. The Panel welcomes any comments on the potential value of including diversity in fuel and whether increasing costs would be a risk.

4 Other considerations

The Panel has taken into consideration a number of other issues during the review process, which are discussed further in this chapter.

4.1 Effective date and transitional considerations

The Panel considers that its determination of the standard should not interfere with the existing processes being undertaken by AEMO to procure SRAS.

4.1.1 AEMO's current procurement process

As discussed in Chapter 1, AEMO undertook consultation from September 2011 on its SRAS Documents and in November 2011 sought 'expressions of interest' for providing SRAS. The Panel understands that AEMO plans to issue requests for tender in March 2012 with a view to finalising SRAS contracts to apply from July 2012. Given the work that has been undertaken by AEMO and market participants in accordance with the current provisions under the interim standard, the Panel considers that the final System Restart Standard should not come into force until after July 2012 to provide regulatory certainty for the current round of procurement.

4.1.2 Application of new arrangements

The Panel considers that it is likely AEMO will be required to review its SRAS documents to ensure that it is consistent with the final System Restart Standard. To allow sufficient time for this review to be conducted, the Panel proposes that the System Restart Standard be effective from 1 August 2013. This timeframe takes into consideration that AEMO has recently completed a review of its SRAS documents and that AEMO and participants would have had time to consider the impacts of the new standard as well as any learning from the latest round of SRAS procurement. However, on an on-going basis (in periodic reviews of the standard as discussed below), there should be alignment of the Panel's review process and AEMO's SRAS procurement such that changes to the standard may be captured more immediately in the latest round of SRAS procurement. The Panel will co-ordinate with AEMO on the timing of future reviews.

4.2 Periodic review of the standard

Currently the Rules require that the Panel establish the System Restart Standard, however there are no specific provisions requiring the Panel to undertake regular reviews of the standard. The Panel considers that there would be benefit in undertaking periodic review of the standard.

4.2.1 Benefits of periodic review

As discussed above, the purpose of the standard is to set a 'benchmark' for the requirements and procurement of SRAS. Although, once established, these provisions should not need to be varied significantly, the Panel considers that changes in market arrangements and technology could impact the standard in the future. For example, developments in technology may impact restoration timeframe targets or the criteria for determining electrical sub-networks; and changes in the generation and load profiles of regions may affect the ways in which electrical sub-network boundaries should be determined. For these reasons, the Panel considers that periodic review of the standard should be completed.

4.2.2 AEMC direction to undertake review

Currently under the Rules, the AEMC may direct the Panel to undertake reviews on relevant matters. The Panel considers that this could include a direction to undertake a review of the System Restart Standard. The Panel will liaise with the AEMC to request that it considers providing the Panel with a standing terms of reference for periodic review of the standard to be undertaken. Given AEMO's SRAS procurement terms of 5 years, it would appear reasonable that a review of the standard could be undertaken at least every five years.

4.3 Growing integration of gas and electricity markets

In its submission on the Issues Paper, Alinta notes that 'the growing integration of the energy market, in particular gas and electricity, means the implications of a gas supply event need to be considered in the context of black start and in the order in which SRAS providers may be called upon'.[57] The Panel agrees that generally there can be interdependencies between various energy market sectors that could impact the operation of the market. In respect to influences on SRAS, the Panel has taken this into consideration in requiring AEMO to consider fuel diversity in its procurement of SRAS (as discussed above in section 3.5). At this stage the Panel is not aware of any other specific issues that could affect the procurement of SRAS more generally. However, should any potential issues arise in the future, the Panel considers that this would be identified through the periodic review of the standard that the Panel is recommending.

4.4 Arrangements for undertaking testing

The Panel notes that stakeholders have raised issues relating to the testing requirements associated with providing SRAS.

4.4.1 Stakeholder comments

In submissions on the Issues Paper, the following issues are raised:

57 Alinta Energy, op cit, p. 2.

- Alinta notes that the 'testing obligations placed upon providers are not necessarily onerous but are costly';[58]

- Transend notes that in the case where the SRAS provider is at a different location to the generator that it is to provide SRAS to, the testing regime set out by AEMO 'requires the primary SRAS provider to demonstrate its ability to deliver the service under normal network conditions when the restart path is utilised for a shared purpose'. Transend suggests that the options to demonstrate this capability can be very costly and suggests that '[r]igorous network studies can be substituted for this part of the test.[59]

4.4.2 Panel's considerations

The Panel acknowledges that testing of SRAS is an important aspect of providing these services. However, the Panel notes that under clause 3.11.4A(e) of the Rules, AEMO is required to determine the specific testing requirements for SRAS providers and that AEMO does so in consultation with stakeholders (the SRAS Guidelines). AEMO is also required to consider the SRAS objective in carrying out its obligations in relation to SRAS procurement. Given that there are specific Rules requirements for AEMO to consult with stakeholders on testing requirements and the Rules acknowledge AEMO's operational expertise in these matters, the Panel considers that these issues relating to details of the testing requirements are outside the scope of the standard. However, the Panel will raise these comments from stakeholders with AEMO for its further consideration.

58 Alinta Energy, op cit, p. 2.

59 Transend, op cit, p. 2.

Abbreviations

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
Commission	See AEMC
NEM	national electricity market
Panel	Reliability Panel
PJM	the Pennsylvania-New Jersey-Maryland market
Rules	National Electricity Rules
SRAS	system restart ancillary services
standard	System Restart Standard (unless otherwise stated)

A System Restart Standard (draft)

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 August 2013].

2. Requirements of the standard

The requirements of the standard are specified under 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 consistent with the *SRAS* objective referred to in clause 3.11.4A(a);
>
> 2. 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) if the benefits of adopting the *system restart standard* would be outweighed by the costs of implementing such a standard;
>
> 3. identify the maximum amount of time within which *system restart ancillary services* are required to restore *supply* to a specified level;
>
> 4. include guidelines on the required reliability of *primary restart services* and *secondary restart services*;
>
> 5. 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*);
>
> 6. include guidelines specifying the diversity and strategic locations required of *primary restart services* and *secondary restart services*."

In making its determination of the standard, the Panel detailed the factors considered in its decision in [AEMC Reliability Panel 2012, System Restart Standard, Final Determination, XX May 2012]. Consistency of the standard with the SRAS objective is

explained in this report and the final decision with respect to the other requirements under clause 8.8.3(aa) are outlined below.

3. Applicability of the standard in electrical sub-networks

This standard shall apply equally across all regions and electrical sub-networks.

4. Restoration timeframe

For each electrical sub-network, AEMO shall procure SRAS sufficient to:

- re-supply and energise the auxiliaries of power stations within 1.5 hours of a major supply disruption occurring to provide sufficient capacity to meet 40 per cent of peak demand in that sub-network; and
- restore generation and transmission such that 40 per cent of peak demand in that sub-network could be supplied within four hours of a major supply disruption occurring.

5. Reliability of services

Primary restart services shall have a reliability of 90 per cent.

Secondary restart services shall have a reliability of 60 per cent.

Services may be considered in combination to meet a higher level of reliability than the individual service.

AEMO will determine the manner in which reliability will be assessed, and clarify the provisions for combining services, in accordance with the requirements under the Rules.

6. Guidelines for the determination of electrical sub-networks

AEMO shall determine the boundaries for electrical sub-networks without limitation by taking into account 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;
- the quantity of generation in an area, which should be in the order of 1000MW or more; and
- the quantity of load in an area, which should be in the order of 1000MW or more.

7. Guidelines for specifying the diversity and strategic location of services

There shall be diversity in the SRAS procured by AEMO to provide an appropriate level of independence between the services procured. AEMO shall consider diversity of the services by taking into account the following guidelines:

- Electrical - diversity in the electrical characteristics shall be considered particularly with respect to whether there would be a single point of electrical or physical failure;
- Technological - diversity in technologies shall be considered to minimise the reliance of services on a common technological attribute;
- Geographical - diversity in geography shall be considered to minimise the potential impact of geographical events such as natural disasters; and
- Fuel - diversity in the type of fuel utilised by services shall be considered to minimise the reliance on one particular fuel source.

B Summary of submissions

Stakeholder	Issue/Comment	Reliability Panel Response
Alinta Energy	• The value of SRAS should be juxtaposed with the opportunity cost of foregoing energy supply for the duration of time it would take to restart the electrical system in the absence of SRAS. On this basis, the services provided are reasonably priced and should additional redundancy be sought then the economic case for doing so is likely to be justifiable. • There are consequential benefits in high levels of availability of SRAS but a countervailing view would be that such high standards may rule out options that may be capable of providing services at a lower level of availability. • Testing obligations on SRAS providers are necessary but onerously costly. Appropriate provisions must be made to ensure that all relevant testing costs are valued and necessary. • Agrees that the existing sub-networks are appropriate; however, would not be averse to additional redundancy being built-in via overlapping sub-networks and additional services being provided from adjacent sub-networks in the case of an extreme event. Believes technological diversity and geographic disparity to be key considerations. • The decision to 'relax' restoration timeframes should not be taken lightly, and services that can perform in excess of targets should be rewarded. • Notes the growing integration of the energy markets and further consideration of such matters is warranted going forward.	Issues raised on specific aspects of the standard are considered and discussed in various sections of Chapter 3. The issue of costs relating to testing obligations is discussed in Chapter 4.
Origin	• Considers it appropriate to review the standard periodically. • There is a balance between the costs and services required to restore the electricity system in that timely window and the cost for the necessary SRAS mix. • While the review is timely, Origin considers that the current standard delivers an appropriate level and mix of primary and	Issues raised on specific aspects of the standard are considered and discussed in various sections of Chapter 3.

Stakeholder	Issue/Comment	Reliability Panel Response
	secondary restart services. • Notes it appropriate that the new standard will not apply to the current round of AEMO's SRAS procurement (because it is unlikely that the Panel's final report will be available in advance of the negotiations for these SRAS contracts).	
Snowy Hydro	• Considers AEMO's calculation of the cost of SRAS to be conservative and estimates the actual current annual cost of SRAS to be $36.7 million, which represents a minimum cost to ensure that the NEM operates in an efficient manner, taking into account the risks and costs associated with a black start event. • Focusing on the cost of the SRAS alone would be sub-optimal as it might create a situation where service providers are unable to make a commercial return which may result in a long-term degradation of the services needed to restore the system in an economic manner. • The period of time in which supply can be restored is based on the current capital stock of generation plant. However, the NEM is responsive to any market need so if there is an economic justification to restore supply in a shorter timeframe then it is envisaged that the market will respond accordingly. • The concept of having a 'target timeframe' provides weak incentives for all relevant bodies to achieve the System Restart Standard. A specific timeframe in the Rules should be set which is economically determined based on the SRAS objective which must be achieved in the event of a black system restart. • The optimal level of SRAS needs to be understood for each electrical sub-network to meet the SRAS objective. Then the Panel can set the deterministic parameters to achieve this standard. • A number of factors can affect the reliability of restart services, such as: 1. The cash flow from SRAS contracts is inherently risky. Short contract periods mean that SRAS providers would need to factor in an uncertain timeframe from which the service provider can recover capital or operational costs used to maintain the reliability of the plant; and	Issues raised on specific aspects of the standard are considered and discussed in various sections of Chapter 3.

Stakeholder	Issue/Comment	Reliability Panel Response
	2. The reputation risk of non-conformance in the event of a system restart. • The current definitions in the interim restart standard are vague and do not attempt to quantify the reliability of a service providers' SRAS.	
Transend	• Transend has identified a high cost component of SRAS. Indeed, this hurdle may be insurmountable for a registered participant contemplating a primary restart service that utilises NSP assets to form a 'restart path' between generators offering the primary SRAS. • The mandated testing regime requires the primary SRAS provider to demonstrate its ability to deliver the service under normal network conditions when the restart path is utilised for a shared purpose. To dedicate this restart path for the exclusive use of the SRAS provider(s) is likely not to be practical for the NSP without affecting supply, reliability or security of the network. • Proposes that the testing regime for primary SRAS allows for occasions when a restart path is not available for testing and demonstration. Rigorous network studies can be substituted for this part of the test. • Considers that the purpose of the interim system restart standard is to guide the acquisition of system restart ancillary services and considers that a more relaxed standard can extend the restoration times following a major supply disruption. Transend considers the timeframes in the interim standard appropriate.	Issues raised on specific aspects of the standard are considered and discussed in various sections of Chapter 3. The issue of testing requirements for SRAS that utilises a network provider's services is discussed in Chapter 4.