SRAS GUIDELINE
ELECTRICAL SUB-NETWORK BOUNDARIES
NSCAS TENDER GUIDELINES

FINAL REPORT AND DETERMINATION

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

EXECUTIVE SUMMARY

The publication of this Final Report and Determination (Final Report) concludes the Rules consultation process conducted by AEMO in relation to System Restart Ancillary Services (SRAS) documents. AEMO procures SRAS that are available to reliably restart generation and transmission should a major supply disruption occur, such as a black system event.

This is the first SRAS Guideline to be made following the Reliability Panel's December 2016 determination of the System Restart Standard (SRS)[1], applicable from 1 July 2018. The consultation also covered AEMO's determination of the boundaries of electrical sub-networks for system restart purposes and, as an incidental matter, the tender guidelines for Network Support and Control Ancillary Services (NSCAS) Tender Guidelines.

AEMO issued formal invitations to provide written submissions on its SRAS Guideline Issues Paper in June 2017 and its Draft Report and Determination (Draft Report) in August 2017. AEMO also held three rounds of stakeholder forums and met with Transmission Network Service Providers (TNSPs) in each National Electricity Market (NEM) region.[2]

SRAS Guideline and electrical sub-network boundaries

The new SRAS Guideline is substantially different from AEMO's 2014 SRAS Guidelines[3], reflecting changes to both the National Electricity Rules (NER) and the SRS. In addition, AEMO has incorporated changes to address recommendations from the Independent Review into the Future Security of the National Electricity Market[4] (Finkel Review), and AEMO's final report on the black system event in South Australia on 28 September 2016 (Black System Report).[5]

Submissions and forum discussions in response to the Draft Report focused on:

- How AEMO will assess both the individual reliability of each SRAS source and the aggregate reliability of SRAS procured for an electrical sub-network, in accordance with the guidance in the SRS.
- The timing, costs, coordination, and conditions required for testing of SRAS facilities, to provide adequate assurance of SRAS availability and readiness to respond if a major supply disruption occurs.
- AEMO's determination of the electrical sub-networks for Tasmania and New South Wales.

AEMO has considered the issues raised in submissions and at the regional forums, and has determined the final SRAS Guideline and electrical sub-network boundaries. The substantive changes between the draft and final SRAS Guideline are in the following areas:

- More specific description of the factors and sub-factors considered as part of individual reliability, including an additional sub-factor of communications link redundancy.
- Further explanation and examples of what constitutes a single point of failure within the transmission network, when assessing diversity for aggregate reliability.

[1] http://www.aemc.gov.au/Markets-Reviews-Advice/Review-of-the-System-Restart-Standard.
[2] Consultation documents and written submissions are available at: http://aemo.com.au/Stakeholder-Consultation/Consultations/SRAS-Guidelines-2017. Forum questions and answers were provided to the attendees.
[3] http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Ancillary-services/System-restart-ancillary-services-guidelines.
[4] http://www.environment.gov.au/system/files/resources/1d6b0464-6162-4223-ac08-3395a6b1c7fa/files/electricity-market-review-final-report.pdf.
[5] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Integrated-Final-Report-SA-Black-System-28-September-2016.pdf.

- Clarification that diversity between SRAS in each of the three elements (electrical, geographic, and fuel source) is sought, but if not reasonably practicable then the combination of SRAS sources should be as diverse as can reasonably be achieved.
- Additional detail about the process for AEMO to nominate an annual SRAS test date, in particular the role of network service provider(s), and a clearer statement that AEMO will seek to minimise the impact on SRAS Providers in relation to the timing of these tests.
- Examples of potential special conditions or additional requirements for SRAS testing, and clarification that test procedures should be kept up to date.
- Amendments where desirable to clarify the roles or responsibilities of TNSPs, AEMO, and SRAS Providers relevant to SRAS modelling, reliability assessment, procurement, and testing.
- Clarification of circumstances in which direct negotiation of SRAS contracts, rather than a competitive tender process, will be considered appropriate.

On publishing this Final Report, AEMO will also submit a rule change proposal to the Australian Energy Market Commission (AEMC) to ensure that SRAS Providers will not be in breach of their obligations under clause 5.7.5 of the NER in respect of SRAS tests nominated by AEMO at short notice.

In other respects, the structure and parameters for determining individual and aggregate reliability, SRAS test requirements, modelling and assessment of capability, and procurement options remain substantially as discussed in the Draft Report. The electrical sub-network boundaries will also remain unchanged at this stage.

NSCAS Tender Guidelines

AEMO has also determined the NSCAS Tender Guidelines. The key differences between the new guidelines and the last version published in December 2011 result from the incorporation of content previously contained in the sample forms of request for expressions of interest and invitation to tender originally published with the guidelines.

No submissions were received on the draft NSCAS Tender Guidelines, and the final version is unchanged from the draft.

AEMO's final determination is to make the:

- SRAS Guideline (incorporating electrical sub-network boundaries) and
- NSCAS Tender Guidelines

in the forms published with this Final Report.

CONTENTS

1. STAKEHOLDER CONSULTATION PROCESS

As required by the NER, AEMO has consulted on its determination of the SRAS Guideline, boundaries of electrical sub-networks and NSCAS Tender Guidelines, in accordance with the Rules consultation process in rule 8.9.

The consultation commenced in June 2017, and the key dates in the consultation timeline are set out below.

Deliverable	Indicative date
Notice of first stage consultation and Issues Paper published	1 June 2017
First round forums in each NEM jurisdiction	3-10 July 2017
First stage submissions closed	11 July 2017
Second round forums in each NEM jurisdiction	26 July – 4 August 2017
Final Report & Notice of second stage consultation (this document)	25 August 2017
Third round forums in each NEM jurisdiction	4-8 September 2017
Submissions due on Final Report	26 September 2017
Final Report published	15 December 2017

The publication of this Final Report concludes the consultation.

Note that there is a glossary of terms used in this Final Report at Appendix A.

2. BACKGROUND

2.1 NER requirements

With effect from 1 July 2015, the AEMC amended the NER to provide for a revised regime for acquiring SRAS. The transitional rule made at that time (rule 11.81) required:

- The Reliability Panel to revise the SRS as soon as practicable after 1 July 2015, to take into account the NER amendments.
- AEMO to develop and publish the first SRAS Guideline and NSCAS tender guidelines, as soon as practicable after the AEMC publishes the SRS as revised by the Reliability Panel.

The AEMC published the Reliability Panel's determination of the revised SRS on 15 December 2016.[6] The revised SRS will apply from 1 July 2018.

The SRS included revised guidelines to be applied by AEMO in determining the boundaries of electrical sub-networks for the purpose of acquiring SRAS, under clause 3.11.8 of the NER

AEMO was required to consult on the first SRAS Guideline and NSCAS tender guidelines, and the boundaries of electrical sub-networks, in accordance with the Rules consultation procedures in rule 8.9 of the NER.

2.2 First stage consultation

AEMO issued a Notice of First Stage Consultation on 1 June 2017, together with an Issues Paper and draft SRAS Guideline.[7]

AEMO received seven written submissions in the first stage of consultation, from AGL Energy, EnergyAustralia, Energy Networks Australia (ENA), ERM Power, Hydro Tasmania, Origin Energy, and Snowy Hydro.

AEMO also held meetings and forums with Consulted Persons as described in the following table.

Meeting	Date	Meeting	Audience	Location
1.	13 June 2017	TNSP Meeting 1	TNSPs	Teleconference
2.	23 June 2017	Q&A Sessions	All Consulted Persons	Teleconference
3.	30 June 2017	TNSP Meeting 2	TNSPs	Teleconference
4.	3 July 2017	Consultation Forum Round 1 - QLD	All Consulted Persons	Brisbane
5.	4 July 2017	Consultation Forum Round 1 - NSW	All consulted persons	Sydney
6.	5 July 2017	Consultation Forum Round 1 - SA	All consulted persons	Adelaide
7.	6 July 2017	Consultation Forum Round 1 - VIC	All consulted persons	Melbourne
8.	10 July 2017	Consultation Forum Round 1 - TAS	All consulted persons	Hobart
9.	26 July 2017	Consultation Forum Round 2 - QLD	All consulted persons	Brisbane

[6] Reliability Panel, Review of the System Restart Standard, Final Determination, 15 December 2016, Sydney
[7] System Restart Ancillary Services Guideline 2017, Available at: http://aemc.gov.au/Rule-Changes/System- Restart-Ancillary-Services http://www.aemo.com.au/Stakeholder-Consultation/Consultations/SRAS-Guidelines-2017

Meeting	Date	Meeting	Audience	Location
10.	27 July 2017	Consultation Forum Round 2 - NSW	All consulted persons	Sydney
11.	28 July 2017	Consultation Forum Round 2 - TAS	All consulted persons	Hobart
12.	31 July 2017	Consultation Forum Round 2 - VIC	All consulted persons	Melbourne
13.	4 August 2017	Consultation Forum Round 2 - SA	All consulted persons	Adelaide

2.3 Second stage consultation

AEMO published its Draft Report and Determination (Draft Report) and associated draft SRAS Guideline, NSCAS Tender Guidelines, and draft forms of SRAS and NSCAS Agreement on 25 August 2017.[8] Stakeholders were invited to make submissions in the second stage of consultation, and a further forum was held in each NEM region.

AEMO received written submissions from Energy Networks Australia (ENA), Hydro Tasmania, Origin Energy, Snowy Hydro, and TransGrid, and a late submission from the Australian Energy Regulator (AER).

AEMO held meetings and forums with Consulted Persons as described in the following table.

Meeting	Date	Meeting	Audience	Location
14.	4 September 2017	Consultation Forum Round 3 - VIC	All Consulted Persons	Melbourne
15.	5 September 2017	Consultation Forum Round 3 - NSW	All consulted persons	Sydney
16.	6 September 2017	Consultation Forum Round 3 - QLD	All consulted persons	Brisbane
17.	6 September 2017	Consultation Forum Round 3 - TAS	All consulted persons	Hobart
18.	7 September 2017	Consultation Forum Round 3 - SA	All consulted persons	Adelaide

Copies of all written submissions (excluding any confidential information) have been published on AEMO's website at: http://www.aemo.com.au/Stakeholder-Consultation/Consultations/SRAS-Guidelines-2017.

Minutes of meetings with TNSPs have been provided to the attendees at those meetings.

The main issues raised at consultation forums were summarised in question and answer format and provided to all attendees.

[8] System Restart Ancillary Services Guideline 2017, Available at: http://aemc.gov.au/Rule-Changes/System- Restart-Ancillary-Services http://www.aemo.com.au/Stakeholder-Consultation/Consultations/SRAS-Guidelines-2017.

3. SUMMARY OF MATERIAL ISSUES

The key material issues arising from the proposal and raised by Consulted Persons in the second stage of consultation – on the Draft Report, draft SRAS Guideline and associated consultation documents – cover the matters summarised in the following table.

No.	Issue	Raised by
1.	Individual Reliability – determination of individual reliability	**ENA, TransGrid, Origin**
2.	Individual Reliability – Start-up Performance	**Snowy Hydro**
3.	Individual Reliability – redundancy and operational reliability, single points of failure	**Hydro Tasmania, TransGrid, ENA**
4.	Aggregate Reliability – determination of Aggregate Reliability	**Hydro Tasmania, Origin, TransGrid**
5.	SRAS testing regime, including endorsement/verification of test procedures, NSP involvement, costs	**Hydro Tasmania, TransGrid, AER, ENA**
6.	Modelling and Assessment – including data requirements, specificity of assessment criteria, procedures for TNSP involvement/role	**Hydro Tasmania, ENA, AER**
7.	Procurement process – Engagement for innovative solutions	**Hydro Tasmania**
8.	Boundaries of electrical sub-networks (NSW and Tasmania)	**Hydro Tasmania, Snowy Hydro, ENA, TransGrid**
9.	System restart roles and responsibilities, including System Restart Plan and Local Black System Procedures	**AER**
10.	Drafting matters: Guideline and SRAS agreement Proforma	**Origin, AER**

The discussion of the material issues in Section 4 deals only with submissions and forum feedback on the Draft Report. Issues raised in the first stage of consultation are generally not repeated in this Final Report, except where required for context.

A detailed summary of issues raised by Consulted Persons in written submissions, together with AEMO's responses, is contained in Appendix B.

4. DISCUSSION OF MATERIAL ISSUES

4.1 Individual reliability

4.1.1 Issue summary and submissions

The SRS requires AEMO to assess the individual reliability of each SRAS selected for an electrical sub-network, as part of its determination of whether the specified aggregate reliability of SRAS for that electrical sub-network will be met. The SRS states that the individual reliability of an SRAS must incorporate the expected:

- Availability of the service.
- Start-up performance.
- Reliability of transmission components between the SRAS source and the first transmission substation[9] to which it is connected.

In the Draft Report, AEMO defined 'availability' as a system's ability and readiness to perform a function at any point in time (and includes considerations like maintenance); and 'reliability' as the probability that a system will operate without failure.

Consistent with these definitions and the revised SRS, the Draft Report concluded that the reliability of an individual SRAS source ('SRAS individual reliability') should be assessed on the basis of:

- Composite reliability[10] of the SRAS equipment, being the product of:
  - 'SRAS Equipment Availability' (availability of the equipment up to the transmission network connection point).
  - 'SRAS Equipment Reliability' (incorporating expected start-up performance).
- 'Transmission Component Reliability' (reliability of the transmission components between the SRAS equipment and the first transmission substation or switchyard to which it is connected).

Explanations of SRAS Equipment Availability, SRAS Equipment Reliability, and Transmission Component Reliability were provided in the Draft Report, and illustrative examples of an SRAS individual reliability calculation were provided in Appendix C of the Draft Report.

Submissions received on AEMO's draft determination of individual reliability are outlined under relevant sub-headings below.

General determination of individual reliability

Origin was satisfied with the proposed individual and aggregate reliability factors that are being employed to assess potential candidates for SRAS contracts. Origin believes this assessment will determine the best sources of SRAS to meet the system restart standard set by the AEMC Reliability Panel.

[9] In some regions the term substation is used. In others this may be the terminal station or the power station switchyard

[10] Composite reliability was defined alternatively as the combination of start-up performance and availability (economic assessment supporting AEMC Final Determination) and combination of start-up performance and availability and transmission component reliability (Sensitivity Analysis supporting AEMC Final Determination) (Reliability Panel, Review of the System Restart Standard, Final Determination, 15 December 2016, Sydney). The former definition is intended here.

SRAS equipment availability

AEMO's draft determination was to consider SRAS equipment available when it meets the individual defined availability requirements appropriate for that service. In general, this is based on:

- One or more of the alternative units[11] that can provide SRAS being available.
- All equipment that is needed for any alternative unit to deliver SRAS being available.
- The SRAS equipment being 'in date' for testing[12].

No further submissions were received on SRAS Equipment Availability.

For clarity, there is a distinct contractual definition for 'Availability' in SRAS agreements. This definition takes into account both the SRAS equipment and any transmission components between the SRAS Provider's plant and the contractual delivery point for the service. This is because unavailability of those transmission components will prevent delivery of the contracted service, just as much as unavailability of the SRAS equipment itself. In any case where there are additional transmission components measured as part of individual reliability (for SRS purposes) but located downstream of the contract delivery point for the service, those downstream components would not be taken into account in determining the 'Availability' of the SRAS for contract purposes.

SRAS agreements will specify specific limitations or conditions on contractual 'Availability'.

SRAS equipment reliability (start-up performance)

AEMO's draft determination was to assess 'SRAS Equipment Reliability', taking into account successful start-up demonstrated through an SRAS Test, single points of failure within the SRAS source, and operational factors such as age and condition of components, fuel storage and supply, and previous experience (see Section 4.1.2 below for a full overview of factors).

Submissions and forum comments were received relating to expected start-up performance, and some of the specific sub-factors in that assessment. These included:

- Snowy Hydro reiterated its view that SRAS start-up performance is the most critical element of the overall aggregate reliability assessment, and should be weighted more heavily than other components.
- Snowy Hydro provided its own example of weighting based on AEMO's initial draft. In this example the Generator start-up reliability (Gen) was separately considered and weighted at 60%, and the multiple of the diesel generator (DG), circuit breaker (CB), auxiliary supplies (Aux), CB, and transformer (Txr) at 40%. The effect of the weighted calculation was to increase the overall individual reliability score to 91.9%, compared to 82.4% in AEMO's unweighted example.
- Hydro Tasmania strongly agreed with the ENA submission (in the first stage of consultation) that a clear elucidation of a weighting process to assess individual reliability of potential SRAS Providers is required. AEMO's proposed methodology is logical, but some form of weighting of increased risk of loss during a system black event should be considered.
- Hydro Tasmania supported AEMO's addition of redundancy and operational reliability factors for addressing 'single point[s] of failure' when considering individual reliability of SRAS sources. Hydro Tasmania commented that these additional factors can only add to the overall surety that the SRAS source will respond as anticipated.

[11] This may be an agreed minimum number of units depending on how the source availability is determined.
[12] 'In date' for testing means the equipment has successfully passed the most recent SRAS test and is not overdue for testing. This is the historical start-up performance.

Transmission component reliability

AEMO's Draft Report proposed that transmission component reliability for an individual SRAS will be assessed for transmission components between the connection point of the SRAS generating system and the first transmission substation/terminal or power station switchyard (which is often the Delivery Point), based on engineering assessments provided by the TNSP and reviewed by AEMO.

TransGrid supported the use of quantifiable methods by AEMO when assessing system restart sources. In line with the reliability block diagram approach AEMO proposed in the draft report, TransGrid advised it would be able to provide the probability of failure for plant and equipment forming part of the restoration pathway. In relation to this data, TransGrid suggested:

- Given the small data set for each component, AEMO should undertake sensitivity checks of at least ±25%.
- Qualitative assessments should also be considered. The extent of inter-organisation communications in a system black situation may impact on the effectiveness and efficiency of a restart source.
- The probability of failure of system components may materially change over time. AEMO should take into account the possible need to revisit the reliability calculations over the SRAS contract life.

4.1.2 AEMO's assessment

The SRAS Guideline defines the key terms identifying equipment components and reliability or availability concepts for the purposes of procurement. Where relevant, these terms are carried through into the form of SRAS agreement.

General determination of individual reliability

The purpose of assessing the reliability of an individual SRAS is to determine the probability that it will deliver its service as intended. Focusing on this objective, AEMO has considered the feedback received to determine how concepts of reliability, availability and maintenance can be meaningfully applied to the assessment of individual reliability.

AEMO has incorporated the three individual reliability factors specified in the SRS, namely SRAS Equipment Availability, Start-up performance (SRAS Equipment Reliability), and Transmission Component Reliability. In formulating guidelines for assessment, taking into account submissions and forum feedback, AEMO identified sub-factors, which contribute to the reliability factors.

Figure 1 provides a visual representation of the factors, and sub-factors, contributing to SRAS reliability.

Figure 1 SRAS reliability factors and sub-factors

<table>
<tr><th colspan="2">SRS Final Determination</th><th colspan="3">System Restart Standard</th><th colspan="2">SRAS Guidelines (2017)</th></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td>Considerations</td><td>Factors</td><td>Sub-factors</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>SRAS Equipment Start Up historical</td><td></td></tr>
<tr><td rowspan="6">SRAS Reliability</td><td rowspan="5">Composite Reliability[13]</td><td rowspan="6">Aggregate Reliability</td><td rowspan="5">Individual Reliability</td><td rowspan="4">Expected Start Up Performance</td><td rowspan="4">SRAS Equipment – Reliability</td><td>Points of Failure</td></tr>
<tr><td>Component Age and Condition</td></tr>
<tr><td>Fuel storage</td></tr>
<tr><td>Previous SRAS experience</td></tr>
<tr><td>Comms Link Redundancy</td></tr>
<tr><td>Availability of SRAS Service</td><td>SRAS Equipment – Availability</td><td></td></tr>
<tr><td>Transmission component reliability</td><td>Transmission component reliability</td><td>Reliability of transmission components</td><td>Transmission Component Reliability</td><td></td></tr>
</table>

Figure 1 notes the relationship between different terms that have been used interchangeably or with equivalent meaning in different contexts, such as:

- Composite reliability and Individual reliability.
- SRAS reliability and aggregate reliability.
- Expected start up performance and SRAS Equipment Reliability.

SRAS agreements will specify individual reliability levels or parameters to be maintained, and assessed on an annual basis, with supporting information to be provided by the SRAS Provider. This will assist AEMO to determine whether the target aggregate reliability for an electrical sub-network continues to be met by the combination of contracted SRAS.

SRAS equipment availability

No submissions were made on SRAS Equipment Availability in response to the Draft Report, and AEMO has not changed its approach to determining this factor.

[13] Composite reliability was defined in the Draft AEMC Determination on the SRS as the combination of reliability and availability. In the final AEMC Determination, a sensitivity analysis expanded the scope of composite reliability to include transmission component reliability. The former definition is used here. Transmission component reliability is treated separately and assessed based on advice from TNSPs,

To summarise, SRAS Equipment Availability is an assessment of the expected percentage of time that the SRAS equipment is operationally capable of delivering SRAS. AEMO will not prescribe a minimum availability requirement for prospective SRAS Providers, but the agreed minimum availability level will be specified in each SRAS agreement.

Prospective and contracted SRAS Providers will be asked to advise AEMO of their historical and expected availability. This advice must include outage assessments for all major plant items comprising the SRAS equipment. Major plant is expected to include items such as emergency diesel generator, station service transformer, generating unit, circuit breaker, other auxiliary equipment needed to start up, and unit transformer.

The aggregate reliability assessment is intended to account for unavailability of SRAS Providers, on a planned or unplanned basis. As an operational matter, AEMO will monitor the availability of SRAS generating units and, wherever possible, seek to avoid the concurrent unavailability of SRAS in a Region. This will include the monitoring of planned maintenance in medium term PASA timeframes. AEMO will work with SRAS Providers to de-conflict any concurrent planned outages where possible. Clear forecasts of planned maintenance will facilitate the early resolution of such conflicts.

In rare circumstances, concurrent forced (unplanned) outages of all SRAS Providers in a Region may be unavoidable.[14]

SRAS Equipment Reliability (Start-up performance)

The start-up performance factor specified in the SRS is referred to as 'SRAS Equipment Reliability' in this Final Report and the SRAS Guidelines. As depicted in Figure 1, this incorporates a number of sub-factors:

- Single points of failure in SRAS equipment.
- Component age and condition.
- Fuel storage.
- Previous SRAS experience.
- Communications link redundancy (new since Draft Report).

A guide to the relative priorities of these sub-factors to AEMO's assessment of SRAS Equipment Reliability is provided in Appendix C.

Through generator performance standards, local black system procedures (LBSPs), previous SRAS agreement performance, and other generating unit data registered with AEMO, AEMO expects to have substantial reference sources to verify component age and condition, fuel storage and previous SRAS experience. AEMO will validate or fill gaps in this knowledge with additional information from the SRAS Provider as required.

Single points of failure within SRAS equipment and communications link redundancy sub-factors are discussed in more detail under separate headings below.

Single points of failure within SRAS Equipment

AEMO agrees with Snowy Hydro and Hydro Tasmania's observations that start-up performance is critical to the performance of SRAS units. As a result, AEMO has incorporated it in two ways:

[14] In accordance with the SRAS Procurement Objective, AEMO cannot procure a greater number of SRAS to provide higher levels of availability or redundancy than are needed to meet the SRS.

- Historical start-up performance – SRAS equipment will only be considered available if it is 'in date' for testing, meaning that it the equipment has successfully passed the most recent SRAS test and is not overdue for testing.
- Expected future start-up performance is measured in the sub-factors for individual reliability calculations.

AEMO will ask SRAS Providers to:

- Identify reliability of individual elements of SRAS equipment.
- Identify the configuration of SRAS equipment.
- Provide further advice as required to assist AEMO in its determinations.

The need for equipment reliability weightings of plant with an SRAS source should be considered on a case by case basis where justified. However, where items of plant are equally necessary to the delivery of SRAS, they should be equally weighted. Specific circumstances would need to be identified to justify giving different weightings to items of plant within a source. As the components, configuration and operation of SRAS equipment can vary significantly between sources, it is impractical to apply a common set of weightings, or weighting criteria, for all current and potential SRAS.

Hydro Tasmania suggested that individual reliability should incorporate a weighting of increased risk of loss during a system black event. The effects of a major supply disruption are difficult to predict. As a result, the Reliability Panel incorporated diversity factors into the SRS to allow for the possibility of single points of failure. Any additional contingency measures adopted by AEMO beyond this would be inconsistent with the SRAS Procurement Objective expressed in the NER.

Communications link redundancy

At the third SRAS forum in Sydney, it was suggested that the reliability of control rooms and communication links can impact the ability of an SRAS to start when required. AEMO considers that it is appropriate to include specific assessment of communications as a sub-factor of SRAS Equipment Reliability. AEMO will ask SRAS Providers to identify any communications links relied on to start and control SRAS generating units, for example where there is no control room or operational staff on site.

AEMO acknowledges that both inter- and intra-organisation communication may affect the successful activation of SRAS. For inter-organisation communications (such as between AEMO/TNSP and generator control centres), there are data communications standards under the NER.

Where an internal communications link is relied on for an SRAS to operate (such as a signal between a control room and a remote generating facility, AEMO will assess the redundancy within that communications infrastructure.

Transmission Component Reliability

As set out in the Draft Report, AEMO will ask the relevant TNSP to provide reliability data for any transmission components between the SRAS source and the first transmission substation or similar point on the network. This data will be included in AEMO's individual reliability assessment.

As noted by TransGrid, that the data set requested on each component may be small, and AEMO acknowledges a sensitivity check may be appropriate. However, AEMO is of the opinion that the TNSP itself is best placed to advise AEMO of proposed sensitivity margins at the time of providing the data.

AEMO will consider sensitivity analysis in the determination of transmission system reliability. As noted above, AEMO will consult with TNSPs to obtain reliability information for their respective plant and systems, including error margins as appropriate. AEMO will ask TNSPs to:

- Identify reliability of individual elements of transmission equipment.
- Identify the configuration of SRAS equipment.
- Provide further advice as required to assist AEMO in its determinations.

4.1.3 AEMO's conclusion

The SRAS Guideline will incorporate the same factors that make up the individual reliability component of the aggregate reliability assessment as were identified in the Draft Report: SRAS Equipment Availability, SRAS Equipment Reliability (start-up performance), and Transmission Component Reliability. The final Guideline will also itemise the following sub-factors contributing to SRAS Equipment Reliability:

- Single points of failure within the SRAS equipment.
- Component age and condition.
- Fuel storage.
- Previous SRAS experience.
- Communications link redundancy.

Where SRAS equipment and transmission components are equally important for the start-up and delivery of the SRAS, they will be equally weighted unless there are particular circumstances that justify a different approach. AEMO will consider each circumstance on its merits in consultation with the SRAS Provider and the TNSP.

AEMO will consult with TNSPs and SRAS Providers to obtain reliability information for respective plant and systems, as needed to supplement and update data that AEMO already holds. The final SRAS Guideline clarifies the information expected from each party.

4.2 Aggregate reliability

4.2.1 Issue summary and submissions

In assessing the potential of available SRAS sources to satisfy the aggregate reliability requirements for each electrical sub-network from 1 July 2018, the SRS requires AEMO to consider the following factors:

- SRAS individual reliability, as discussed in Section 4.1.
- Diversity (electrical, geographical and fuel source).
- Strategic location of SRAS.

The SRS goes on to state that, that in accounting for electrical diversity, AEMO should consider the failure of any single significant transmission element, such as a single line or corridor downstream of the first transmission substation in the restoration path.

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.

Specific issues raised in stage 2 submissions in relation to the diversity and strategic location elements of aggregate reliability are outlined below**.**

Hydro Tasmania supported AEMO's recognition that reliability assessments should be conducted as a whole-of-network exercise. However, no detailed reliability measures had been made available for comment (rather, in the Draft Report AEMO proposed to include a set of principles for assessment, based on good engineering practice). Hydro Tasmania reiterated ENA's submissions from the first stage of consultation that:

- AEMO must include the ability to restore significant customer load from the SRAS source(s) and not confine the application of the SRS.
- It is insufficient for AEMO to procure SRAS sources in a generation-rich area (like the West Coast of Tasmania) with the ability to meet the standard, if that generation cannot facilitate power system restoration because of vulnerable transmission corridors connecting major load centres.

Hydro Tasmania commented that there appears to be little particular consideration of path diversity other than standard reliability calculations, and requested AEMO to include specific criteria they are considering for evaluating these diversity and strategic locational risks, including weighting factors.

ENA also mentioned that the optimal choice of SRAS sources should be informed by risks arising from (among other things) natural disasters and transmission corridor single points of failure. Otherwise, ENA considered AEMO's Draft Report addresses many of the issues it had raised in response to the Issues Paper. Outstanding issues for ENA members included a need for further clarity around data requirements, whether the focus on connection point analysis is too narrow, and timing requirements for collating data for AEMO's assessment of aggregate reliability measurements.

TransGrid commented that AEMO examples in the Draft Report appear to have adopted a 'shallow connection policy', with the connection point and delivery point appearing to be at the same substation/switching station. TransGrid noted the SRS requirement for AEMO to consider the failure of any single significant transmission element, such as a single line or corridor, downstream of the first transmission substation in the restoration path, and sought further explanation on how AEMO will implement this requirement.

Origin was satisfied with the proposed individual and aggregate reliability factors proposed to assess potential candidates for SRAS contracts. Origin considered that this assessment would determine the best sources of SRAS to meet the system restart standard set by the Reliability Panel.

4.2.2 AEMO's assessment

General

AEMO proposes to assess diversity and strategic location based on good engineering practice as described in the Draft Report. AEMO considers the inclusion of prescriptive reliability measures in the SRAS Guideline is impractical, as sufficient flexibility must be preserved to make appropriate decisions about individual circumstances.

Load restoration

AEMO understands and shares stakeholder concerns that in a black system scenario the ultimate objective is to securely restore load to as many customers as possible, as quickly as possible. However, the SRS and the SRAS Guideline are about restoration of supply (generation and transmission), that can in turn restore load. Certainly, AEMO should acquire enough SRAS to support its obligations under clauses 4.2.6(e) and 4.3.1(p) of the NER, to allow the restoration of power system security and coordinate a response to a major supply disruption. However, AEMO's discretion to procure any quantity of SRAS is limited by the SRAS Procurement Objective. That is, AEMO can only procure the combination of SRAS that meets all aspects of the SRS *at the least cost*. AEMO is not permitted to select a combination that may provide greater capacity, diversity, speed or contingency allowance than the SRS requires, *if* that combination would cost more than another option that just meets the SRS criteria.

In any system restart process, the restoration of load to stabilise generation will be necessary to maintain a satisfactory, and then secure, operating state. AEMO's modelling assessment will determine, from the available offers, the SRAS that can effectively facilitate the restoration of load that supports re-energisation of further generation and transmission.

Any vulnerable transmission lines or corridors will be taken into account as part of the assessment of the diversity criteria, as discussed below, to the extent they represent a single point of failure that would prevent achievement of the SRS.

It is AEMO's intention to request TNSP advice with regard to any technical network reasons that may impact the effectiveness of a potential SRAS source before making a final procurement decision. The

region's Jurisdictional System Security Coordinator (JSSC) will also be consulted on any relevant considerations for the development of regional system restart plans.

Connection point/Delivery point and network reliability

Both TransGrid and ENA indicated concerns with an apparent focus by AEMO on reliability of components at the connection point, rather than deeper into the network. This is not the case. There is a clear delineation in the SRAS between the individual reliability considerations that apply to the reliability of the components up to the first transmission substation (or terminal station or switchyard) in the restoration path from an SRAS source, and the aggregate reliability (diversity) considerations that apply to transmission network components downstream of that first substation. Both are accommodated in the SRAS Guideline. In many cases the generator connection point or the SRAS delivery point will in fact be at the first transmission substation, but this will vary between SRAS.

It should be noted that the examples provided in Appendix C of the Draft Report are focused on individual reliability of an SRAS source.

Diversity (electrical, geographical, and fuel source)

The aggregate reliability assessment must account for all of the diversity criteria specified in the SRS, namely electrical, geographical and fuel source. In assessing combinations of SRAS sources for their ability to meet the aggregate reliability requirements, AEMO will assess the diversity of each combination. Consistent with the intent of the SRS, to avoid single points of failure, AEMO seeks diversity in all three factors:

- Fuel source – multiple SRAS sources are not solely reliant on a common fuel source (such as gas pipeline, coal mine, or reservoir).
- Electrical diversity – SRAS sources should not share the same single transmission element or corridor between the first transmission substation and the auxiliaries of units that will assist the restart process.
- Geographic diversity – SRAS sources are sufficiently separated that they are unlikely to be affected by a single localised event (such as bushfire, tornado, or flash flood).

The following principles, described in the Draft Report, will also be included in the final SRAS Guideline for assessing electrical diversity:

- A single point of failure within the transmission network is generally considered to exist where a credible contingency event can impact the ability of more than one SRAS source to energise the auxiliaries of other power stations.
- The failure of any single major transmission element is considered a credible contingency event, irrespective of the cause.
- The failure of a transmission corridor that is considered generally susceptible to interruption due to a single event, such as transmission lines vulnerable to lightning, will be treated as a credible contingency event.
- Except in relation to vulnerable lines, contingency events that are normally non-credible (including multiple credible contingencies), will not be taken into account in determining potential single points of failure.

As indicated at SRAS forums, the outcome of assessing source diversity is normally a binary outcome, such as for SRAS Source A and SRAS Source B, the assessment is:

- Electrical diversity – Yes.
- Geographic diversity – Yes.
- Fuel source diversity – No.

Where there are no viable SRAS combinations within a region that provide diversity in all three aspects, AEMO will consider the combinations that achieve as much diversity as reasonably practicable. If AEMO believes that there is insufficient diversity of capable SRAS sources offered for an electrical sub-network, AEMO will report that the SRS may not be met.

Strategic location

AEMO will determine the locational value of SRAS based on its capability to electrically assist the network restoration process more quickly or readily than other sources. Factors considered may include ability to supply active and reactive power, and support network voltage. The location of a source will inherently influence the capability and characteristics which determine whether it will contribute to meeting the SRS.

4.2.3 AEMO's conclusion

AEMO's final determination is to incorporate the factors contributing to aggregate reliability in the SRAS Guideline as follows:

- SRAS individual reliability (see Section 4.1).
- Diversity of electrical, geographic, and fuel sources will be assessed for each potential combination of SRAS sources, with the objective of seeking diversity in each factor, but if this is not reasonably practicable then the combination of SRAS sources should be as diverse as can reasonably be achieved.
- A single point of failure within the transmission network is generally considered to exist where a credible contingency event can impact the ability of more than one SRAS source to energise the auxiliaries of other power stations in the electrical sub-network, as outlined in clause 4.2.2.
- SRAS sources will be considered to be strategically located where they can quickly establish a path to the transmission network and other generating units, and facilitate pick up of stabilising load to support restoration.

AEMO will use its own data and relevant information from TNSPs and generators (including LBSPs) and JSSCs, applying good engineering practice principles, to evaluate the diversity and strategic location of, and between, potential SRAS sources.

4.3 SRAS testing

4.3.1 Issue summary and submissions

Consistent with recommendations of the Reliability Panel, the Black System Report and the Finkel Review, AEMO proposed a more comprehensive testing regime that tests the black start capability of the SRAS equipment and associated network elements in conditions that are as close as reasonably possible to a real black system scenario.

The Draft Report concluded that an SRAS Test would be conducted:

- Once a year, at a time nominated by AEMO, on at least five business days' notice to the SRAS Provider. The nominated time will be within windows provided to AEMO in advance by the TNSP, and AEMO would avoid scheduling the test during expected high system demand periods.
- After any period of maintenance where any major SRAS equipment or transmission components are out of service for at least seven days.

SRAS tests will require a full demonstration of the capability of the service to start and energise a dead bus. The TNSP and any other equipment owners would need to be involved in testing, and endorse the test procedure to be delivered to AEMO in accordance with the SRAS Guideline.

Submissions on the Draft Report in relation to testing broadly fell into three categories:

- Timing and coordination.
- Cost impacts.
- Test procedures.

Timing and coordination

Hydro Tasmania supported AEMO in its endeavours to improve testing, appreciated AEMO's position in proposing a short notice test, and did not seek any special SRAS Provider's convenience. Hydro Tasmania did, however, request further documented comfort that industry's concerns in relation to market price events are separately identified (along with the other factors already identified). Hydro Tasmania indicated that additional certainty and comfort around market risks may result in reduced cost of testing.

ENA wanted to see established, clear, and workable protocols and arrangements between AEMO and TNSPs in the scheduling and conduct of SRAS testing as foreshadowed in the Draft Report. Testing windows should only be held open for the minimum time necessary to mitigate against potential deleterious market and performance impacts.

Similarly, TransGrid had no objection to the process outlined by AEMO, but said it expected a protocol to support the arrangement. TransGrid noted that reserving test windows may impose work restrictions, and expects to work closely with AEMO to ensure the move from test window options to a confirmed test window is achieved expeditiously.

Both Origin and TransGrid reiterated concerns that the five business-day test notice under clause 4.2.2(b)(ii) of the SRAS Guideline could place SRAS Providers in breach of clause 5.7.5 of the NER. This requires a Registered Participant to give the relevant NSP at least 15 business days' notice in writing of a planned test requiring changes to normal operation of equipment at a connection point. In response to a request from AEMO for advice on potential non-compliance with clause 5.7.5, the Australian Energy Regulator (AER) suggested a rule change should be sought. The AER indicated it would be willing to consider 'no action' requests if the rule change could not be completed by 1 July 2018.

Origin also commented on the proposal for testing after maintenance. Origin suggested the type of outage, rather than the duration of maintenance, should determine the requirement for testing. Origin suggested an SRAS test should only be warranted if the outage materially affects the performance of the SRAS equipment, in consultation with the SRAS Provider. For example, an item of SRAS equipment could be out of service for eight days (which would trigger a test), but the outage may have been unrelated to the performance of the unit and not materially changed the operating status of the SRAS equipment.

The AER pointed out that the SRAS agreement includes provision for 'special test conditions', but no guidance is provided as to what these might be. It suggested this could be clarified in the SRAS Guideline.

Cost impacts

TransGrid noted AEMO's view in the Draft Report that outages required for SRAS tests would be excluded from the market impact component of the AER's service target performance incentive scheme (STPIS). However, TransGrid wanted a written statement from the AER confirming this interpretation. It also commented that amendments to the STPIS may result in material scheme changes during an SRAS contract period. The ENA also suggested AEMO should seek AER involvement in relation to any potential impacts on incentive schemes.

At AEMO's request, the AER submission addressed this concern, stating that SRAS testing outages would be excluded from the STPIS market impact.

TransGrid and ENA also made a number of comments on cost recovery arrangements. ENA again suggested that AEMO seek AER involvement with regard to the regulatory treatment of SRAS costs incurred by TNSPs, and considered that AEMO should be preparing for third party indemnities and costs to be part of the contracting arrangements with potential SRAS Providers.

The AER also addressed this issue in its submission. As a negotiated transmission service, the AER said the cost of SRAS testing should not be included in a regulated revenue proposal, but are expected to be negotiated with the SRAS Provider in accordance with the principles in clause 6A.9.1 of the NER, and consistent with the TNSP's approved negotiating framework and the criteria in clause 6A.9.2.

Test procedures

The AER made several suggestions in relation to test procedures, in particular the process for their approval by third parties (including NSPs) and AEMO, and consistency with other procedures. The AER's suggestions are detailed in Appendix B, and included:

- The SRAS Provider should ensure the third party/NSP reviews, agrees with and consequently provides formal approval of the test procedure and system switching plan (SSP). These should be the same as the start-up process and switching sequence that would be used for the system restart procedure, with any differences identified and assurance provided that they will no compromise SRAS delivery.
- AEMO should independently review the implications and risks associated with any differences identified between the SRAS test procedure and SSP and the system restart procedure and SSP.
- The SRAS guideline should include requirements on the form of approval, what is being approved, what each party is warranting by way of approval, and the evidence to be given to AEMO.
- There is no guidance on how the system restart test procedure/SSP is being provided to the SRAS Provider for the test or being checked by the SRAS Provider, TNSP, and AEMO. For the short notice test, there is no guidance regarding the process for the SRAS Provider to approve and organise other approvals of the test procedure in advance.

4.3.2 AEMO's assessment

Timing and coordination

It is impossible to provide absolute comfort that high market price events can be avoided altogether in relation to testing. Even under the current regime, where SRAS Providers schedule their own tests and give advance notice to AEMO, it is not possible to predict that a high price event will not occur during the scheduled test timeframe. To the extent that high price events coincide with either a shortage of supply or a system security issue that could be alleviated by continued normal operation of the relevant SRAS source and local network, as a prudent operator AEMO would not schedule or proceed with a test in those circumstances.

The SRAS Guideline will incorporate a form of wording similar to clause 5.7.6(d) of the NER, to the effect that AEMO will endeavour to minimise the impact on expected unit commitment and dispatch. To the extent that prospective SRAS Providers retain legitimate concerns about scheduling, they may wish to consider innovative forms of test pricing that appropriately balance risk.

AEMO considers that the SRAS Guideline should provide the essential requirements for the scheduling of testing between AEMO and TNSPs for the scheduling of SRAS testing, and supports active engagement and the development of protocols with TNSPs to provide as much clarity as practicable. AEMO understands the constraints that multiple test windows may have on TNSP planning. The concept of test windows has been proposed to assist in provide some flexibility in minimising impacts on TNSPs and SRAS Providers, by allowing contingencies for unexpected market or system conditions. AEMO will not ask TNSPs to provide more than four test windows, although TNSPs may specify additional windows if they wish.

On the possible breach of clause 5.7.5, in the Draft Report AEMO noted the TNSP's involvement in the process of scheduling SRAS tests, and proposed to confirm in the SRAS Guideline that AEMO would give the TNSP at least the 15 business days' notice required from the Generator under clause 5.7.5. However, AEMO did also refer the question to the AER, whose view was that a rule change should be sought to exclude SRAS tests from this notice requirement. The AER said it would be willing to consider 'no action' requests if the rule change could not be made with effect from 1 July 2018.

AEMO therefore intends to submit a rule change proposal to amend clause 5.7.5 around the date of publication of this Final Report. AEMO notes that careful drafting will be required to avoid the risk raised by Origin of changing the notice period required for other work.

On tests after maintenance, AEMO acknowledges the intent behind Origin's suggested change to clause 4.2.2(b)(i) of the draft SRAS Guideline. However, AEMO is also of the view that any maintenance that has required major components of the SRAS equipment to be taken out of service for a period of time, and the process of then returning them to operation, could affect the performance of the equipment. It will rarely, if ever, be the case that an SRAS Provider will perform maintenance knowing that it will materially degrade SRAS equipment performance. However, it will not necessarily be evident whether even a fairly minor change or reconfiguration of ancillary equipment has had an unintended effect on the performance of the SRAS equipment.

AEMO notes that the proposed period of 10 business days to conduct a test after maintenance was specified in the draft SRAS Guideline, but 20 business days in the proforma SRAS agreement. This was also identified by the AER in its submission. Noting that some additional flexibility may be required after a period of maintenance, AEMO has decided that 20 business days is an appropriate period.

AEMO agrees that the SRAS Guideline should include some clarification on what could be included as 'special test conditions' in an SRAS agreement, noting that flexibility will be required to accommodate individual circumstances. These may be exceptions to the testing requirements in the Guideline, for example to minimise the impact on non-contracted generators, or additional requirements such as regular start-up tests for a low-voltage generator (consistent with recommendation 14 in AEMO's Black System Report).

Cost impacts

AEMO expects SRAS Providers to consider the reasonable expected costs and risks of testing when formulating their SRAS offers. The NER indicate (in clause 3.11.9) that NSPs are expected to negotiate in good faith with prospective SRAS Providers with regard to the resolution of issues that would prevent the delivery of effective SRAS by that provider, and to participate in and facilitate testing of a proposed service (subject to recovery of reasonable costs from the provider as a negotiable service). AEMO expects these arrangements to be in place both for pre-contract testing and testing during an SRAS contract, and understands this has been normal practice for many years. It follows that the SRAS Provider is likely to incorporate any NSP charges in its tendered SRAS testing charge. AEMO will clarify in the SRAS Guideline that the provisions of NER 3.11.9 should extend throughout the period of any contract entered into for the relevant SRAS.

To be clear, while AEMO will consider any reasonable proposal or methodology for testing costs, it will not be giving indemnities to either SRAS Providers or NSPs.

NSPs, as the regulated businesses in this case, should seek to resolve directly with the AER any concerns they have regarding the application of the regulatory regime to their involvement in SRAS. It is not AEMO's role to advocate any position with the AER on behalf of NSPs. Nevertheless, AEMO made the AER aware of submissions received from NSPs and their representatives with regard to both STPIS and the recovery of testing costs. The AER has set out its view on those matters in its submission, and AEMO does not intend to make any changes to the SRAS Guideline or SRAS agreement in respect of testing costs.

Test procedures

An SSP typically addresses the process that occurs from the SRAS delivery point out into the network, and as such is normally prepared to support the regional system restart plans, not for the initial delivery of SRAS. SSPs might be required in the testing process where elements of the NSPs network are needed in order to provide the SRAS capability to the delivery point, although currently these are rare. Where relevant, however, AEMO agrees that the NSP should provide and sign off on any network processes involved prior to a delivery point, and this is covered in the final SRAS Guideline. However, matters relevant to the determination of the system restart plan are beyond the scope of the SRAS Guideline.

AEMO agrees with the AER's submissions that the test procedure should replicate an actual restart scenario, and any differences should be identified and understood by all parties involved. However, AEMO does not see a need for additional warranties beyond those in the SRAS agreement. Clause 4.1(b)(iii) of the draft SRAS Guideline stated that AEMO will only approve a test procedure after approval by each other party involved. AEMO does not propose to independently review the procedure, and does not have the necessary expertise to do so. AEMO's approval will be a checklist exercise, and this will be made clear in the final SRAS Guideline.

It should also be noted that the initial test procedure must be submitted as part of the SRAS tender material, and is not expected to change materially for each test. AEMO envisages the test procedure will be a standing document, which can be amended at any time, and therefore the most recently approved test procedure provided to AEMO will be the one used for any short notice test.

4.3.3 AEMO's conclusion

After review of the feedback received from participants, AEMO has not changed its position on testing during an SRAS contract. There will be up to two tests per contract year, as previously documented:

- One on five business days' notice by AEMO, after prior consultation with, and notice to, the relevant TNSP.
- One within 20 business days after a period of maintenance where any major components of the SRAS equipment have been out of service for at least seven days.

Special testing requirements may apply in individual cases, and an indication of possible special conditions is included in the final SRAS Guideline.

No guarantees can be given – either under the current or future SRAS testing regime – that high market price events will not occur at the time of a test. AEMO cannot control pricing, but will not proceed with a test in circumstances where system security or reliability is at risk. Generators should include any reasonable identified risks in their pricing considerations. AEMO has, however included an additional assurance in the final SRAS Guideline in terms similar to clause 5.7.6(d) of the NER that, as far as reasonably practicable, AEMO will use its best endeavours to schedule tests at a time that will minimise the departure from the expected commitment and dispatch.

The final SRAS Guideline includes provisions for the nomination of a minimum of four one-week testing windows in the year by TNSPs, and provisions for the coordination of scheduling of the test. AEMO is keen to work with TNSPs on any additional protocols that may be desirable. AEMO considers that the nomination of windows will allow TNSPs to plan and coordinate their operations appropriately.

Any test procedure should be approved by each party involved, and should replicate an actual restart scenario. If there are any differences, they should be minimised and their impact understood by all parties involved. Approved test procedures should always be in place, with any updates requiring the same approval process. The final SRAS Guideline includes more detailed requirements for the necessary approvals, but does not require third parties to give formal warranties. It also clarifies that approved test procedures remain in place for subsequent tests unless an amended approved procedure is submitted to AEMO.

AEMO will also immediately submit a rule change request to the AEMC to amend clause 5.7.5 of the NER, in order to exclude tests scheduled under the SRAS Guideline from the notice requirement.

4.4 Modelling and assessment

4.4.1 Issue summary and submissions

The draft SRAS Guideline (clause 4) contains requirements and principles for AEMO's proposed modelling and assessment of SRAS capability, including:

- Information AEMO needs for its modelling and assessment.
- Initial qualification, to identify all the proposed services that demonstrate compliance with the SRAS capability requirements to AEMO's reasonable satisfaction.
- Power system studies, to model the expected contribution of an SRAS to energising the auxiliaries of other power stations and rebuilding the power system in an electrical sub-network sufficient to meet the SRS (including aggregate reliability).
- Selection of SRAS, from the identified list of service or combination of services that meets the SRS requirements for each electrical sub-network.

Hydro Tasmania commented that AEMO's assessment appears to be highly theoretical, takes little account of operational contingencies, and thus is over-optimistic. It suggested that AEMO increase its engagement with network service providers in its procurement of SRAS.

ENA noted that its members see a need for further clarity around data requirements, but provided no further detail.

The AER commented that the draft SRAS Guideline provides no guidance in relation to AEMO's obligation (NER clause 3.11.7(c)) to consult with relevant NSPs to identify and resolve issues in relation to the capability of any SRAS to meet the SRS. The AER suggested that the Guideline should include guidance on when the consultation will occur, what assistance is required, the SRAS Provider's involvement, AEMO's process and the interaction with NER clauses 3.11.9(i)(2) and (3).

The AER also noted that clause 5.4.1(a)(vi) and (vii) of the draft SRAS Guideline should make clear that AEMO's focus is on protection and control settings external to the SRAS delivery point, and not internal to it.

4.4.2 AEMO's assessment

A principles-based approach to assessment criteria is necessary in many cases because of the differences between SRAS sources. To the extent this could be considered a theoretical approach, AEMO considers this unavoidable. AEMO considers that Hydro Tasmania's comments with regard to accounting for operational contingencies have been addressed in its consideration of individual and aggregate reliability in sections 4.1 and 4.2.

It is difficult for AEMO to respond to the ENA's comment without further detail. However, AEMO is not currently proposing any changes to the existing SRAS generator modelling data requirements published on its website. These remain suitable for existing SRAS sources using conventional restart sources and generating systems. If any potential SRAS Providers propose to utilise new technologies, including batteries, the existing data requirements may need to be adapted or supplemented.

AEMO has actively sought engagement with TNSPs in each NEM region throughout the Guideline consultation process, and will continue to do so in preparation for and during the forthcoming procurement. In addition to transmission component reliability data (discussed in Section 4.1), the primary assistance needed from TNSPs (and where applicable DNSPs) is for the technical assessment of restart capability of potential sources, individually and in combination. TNSPs already have, and will continue to have, a key role in formulating the regional restart plans and procedures.

AEMO notes the AER's suggestion for more detailed guidance on the process for TNSP involvement. Given that potential SRAS sources will vary widely in the complexity of associated network configuration and restart paths, a common consultation process cannot readily be specified. The Guideline includes a requirement for NSPs to provide information about the reliability transmission components within an SRAS, and AEMO also proposes to specify that NSPs should provide information as reasonably required by AEMO to establish or verify restart paths into the network. Otherwise, AEMO considers that the breadth of the NER requirements is appropriate and does not warrant further detailed specification at this stage. AEMO remains open to the development of protocols with the TNSP with the benefit of experience.

In relation to the assessment of the operation of protection and control systems, the AER correctly points out that AEMO's assessment is limited to those systems that directly interface with the transmission system. AEMO does not assess the individual operation of protections and controls on elements of the SRAS equipment located further upstream.

4.4.3 AEMO's conclusion

All prospective SRAS Providers will be required to either provide new data as specified in the generator modelling data schedule (if not previously provided), or update previous information if relevant.

Updates will be necessary where there have been changes to SRAS equipment or related generation plant since the last valid set of modelling data was provided to AEMO (in many cases during the 2014–15 SRAS procurement). Changes include new or upgraded plant, and new or amended protection and control systems.

The final SRAS Guideline includes minor amendments to Section 5 to confirm the nature of information and assistance that may be required from TNSPs in power system studies, but this will not limit what may be necessary under NER 3.11.7. Minor changes have also been made to clarify that AEMO considers the impact of operating modes and control/protection settings of the SRAS equipment only at the interface with the transmission network.

4.5 Procurement process

4.5.1 Issue summary and submissions

In the Draft Report, AEMO set out the two alternative processes for procurement of SRAS, namely open competitive tender or direct request for offer. The draft Guideline identified the matters AEMO would consider in determining which procurement process to use, and the steps involved in each process.

In light of the information it has now collected with regard to the performance of current known SRAS sources, AEMO also decided that an expression of interest (EOI) stage would not be mandated for SRAS procurement.

Hydro Tasmania noted AEMO's comments that any potential provider is free to approach AEMO at any time, and AEMO would request the data necessary to assess its SRAS potential. This would indicate a level of flexibility AEMO may have when procuring SRAS. Hydro Tasmania would like to clarify further the level of flexibility AEMO has, or will be willing to demonstrate as the entitled entity under clause 6.5(c), during negotiations. Hydro Tasmania would like AEMO to be able to engage with it in innovative ways to find the best possible solution not only to satisfy the National Electricity Rules objective but also to mitigate identified Tasmanian system restart risks.

4.5.2 AEMO's assessment

AEMO is open to any proposals from Hydro Tasmania, noting that the flexibility given to AEMO is limited to the procurement and contracting process. AEMO remains subject to the rules that limit the

extent of AEMO's contracting to those services that will meet the SRS at least cost. That is, AEMO cannot acquire a combination of services that exceed the SRS, if they would cost more than a different combination of services that also meets the SRS.

AEMO notes that Tasmania has only one capable SRAS Provider, meaning that there is no value in a competitive procurement process for that electrical sub-network. A direct negotiation process in this case seems more likely to lend itself to innovative SRAS solutions.

Even in other electrical sub-networks where there are multiple providers, there may be situations where one or two facilities are essential SRAS services at any point in time, meaning that the SRS cannot be met without those services. In those cases it also makes sense for AEMO to negotiate directly with the relevant providers.

AEMO acknowledges that, in time, there will be a need for investment in new or replacement black start facilities, and some generators may be unwilling to invest in those improvements without the security of an SRAS contract to recover the cost of their investment. It will only be possible to accommodate this type of arrangement where the SRAS Procurement Objective continues to be met. That is, sufficient existing SRAS must be procured to maintain the SRS on a continuous basis where possible, and at least cost.

4.5.3 AEMO's conclusion

AEMO proposes no substantive changes to the draft SRAS Guideline with respect to the Procurement process, except to add an additional provision to clarify that direct negotiation may also be appropriate for services that must be contracted in an electrical sub-network if the SRS is to be met.

4.6 Determination of electrical sub-networks

4.6.1 Issue summary and submissions

In the Draft Report, AEMO concluded that the current electrical sub-networks remain consistent with the revised guidance in the SRS for determining their boundaries.

ENA requested clarification of the decision-making process as to why AEMO reverted to 2015 material, rather than undertaking a new economic and technical analysis/examination of the criteria for assessing electrical sub-networks. ENA proposed that, at a minimum, AEMO should outline in its Final Report what criteria or 'triggers' it considers are necessary for it to undertake new analyses of the boundaries.

Other submissions on the Draft Report focused on New South Wales and Tasmania.

- Snowy Hydro suggested AEMO had not critically assessed whether it is more appropriate for New South Wales to have two electrical sub-networks, and that fewer electrical sub-networks may dilute AEMO's responsibility to restore 1500 MW of supply in two hours. Due to the imbalance of generation and load in New South Wales South and North respectively, Snowy Hydro said that where AEMO chooses to restore supply would create an equity issue across customers in different regions in New South Wales. It considered the previous two electrical sub-networks provided a more equitable outcome across the whole of New South Wales.
- Snowy Hydro considered the additional SRS requirement for AEMO to procure sufficient SRAS to independently restart at least 500 MW of generation capacity north of Sydney within four hours with at least 75% aggregate reliability was an acknowledgement by the Reliability Panel that additional SRAS was required in the New South Wales North region. Snowy Hydro suggested that it would be more consistent to apply the SRS to a separate electrical sub-network for New South Wales North that specifies the target megawatt (MW) supply restoration capability, timeframes, and aggregate SRAS reliability requirements, rather than a requirement that deviates from that used by all other NEM electrical sub-networks.

- Hydro Tasmania noted AEMO was aware of its position concerning sub-networks in Tasmania and appreciates AEMO working with the local TNSP to address the risk of the North–South transmission corridor separation. This risk should be a critical consideration as part of AEMO's upcoming SRAS procurement process and associated aggregate reliability assessments.
- TransGrid commented that it had seen no evidence of further engagement by AEMO with Tomago Aluminium, following the information provided at the Sydney SRAS forum on 27 July 2017. TransGrid's understanding was that AEMO would obtain specific quantitative and qualitative information to facilitate an economic and technical appraisal of the restoration of New South Wales with both one and two electrical sub-networks.

4.6.2 AEMO's assessment

AEMO is obliged by the NER to set electrical sub-network boundaries in accordance with the guidance specified in the SRS. AEMO determined in the Draft Report that the current boundaries are consistent with all the considerations in the revised SRS, and therefore no changes will be made prior to 1 July 2018.

AEMO notes that the Reliability Panel itself undertook an extensive economic assessment based on technical information made available by AEMO and advice by Deloitte. Undertaking any further economic assessment of these matters is clearly outside AEMO's remit. There have been no significant technical changes in the majority of the network since 2015 that would affect the considerations relevant to the determination of sub-networks, therefore AEMO considers that repeated studies using essentially the same data would be a poor use of valuable time and resources.

AEMO would reassess the boundaries if there was a material change in power system conditions, such as:

- Retirement of a significant SRAS generating system, or significant non-SRAS generation critical to stable power system restoration.
- Major transmission network reconfiguration or removal of major components.
- Significant change in the availability of major stabilising load to support restoration.

These examples will be included in the SRAS Guideline. AEMO continues to encourage TNSPs to provide AEMO with detailed information and studies if they consider a relevant change has occurred.

In relation to New South Wales, the additional requirement in the SRS was certainly intended to ensure that an SRAS source was procured north of Sydney (as AEMO currently does). This was based on the Reliability Panel's examination of the restart curves supplied by AEMO to the Panel using different restart services. The Panel noted that a delay to supplying the auxiliaries of New South Wales generators north of Sydney would significantly delay the restoration of the sub-network, due to the large distance between these generating units and the generation in the south of the sub-network.[15]

However, this requirement does not indicate that a second sub-network would add value in the restoration. While distance between generating centres is a consideration in AEMO's determination of electrical sub-network boundaries, it is not the only one. In this case, a separate sub-network in the north of New South Wales (incorporating generation in the Newcastle/Hunter Valley region) would not be able to independently support a restart standard comparable with a separate southern New South Wales sub-network.

In a north New South Wales sub-network, the vast majority of generation would be coal-fired with six to eight hour start-up times. This means very little generation could actually be produced in order to start the restoration process within three or four hours. Even when significant generation could be produced (after several hours), with a large number of synchronous machines online, the amount of available

[15] Reliability Panel, Review of the System Restart Standard, final determination, 15 December 2016, Sydney, p.101

stabilising load may be insufficient to support them. It is for these reasons that the SRS specifies only that the auxiliaries of 500 MW of generation in the north should be energised within four hours. This would speed up restart timing in what is most likely the quickest scenario of the network being rebuilt from southern New South Wales or southern Queensland.

AEMO therefore considers that a single New South Wales sub-network has a number of benefits over two, allowing greater diversity of SRAS sources to be used to benefit the region as a whole without artificial restrictions.

AEMO also notes that it will procure SRAS in a way that is consistent with its broader power system security responsibilities. Accordingly, to the extent that AEMO has a choice about where to procure SRAS, and subject to the SRAS Procurement Objective, it will naturally select SRAS that allow it to restore the power system securely to enable as much load to be supplied as possible within as short a time as possible.

AEMO cannot comment in this report on the position of any specific loads, but notes again that economic assessment in relation to load restoration is the responsibility of the Reliability Panel and has been incorporated in the determination of the SRS.

4.6.3 AEMO's conclusion

AEMO's final determination is that the boundaries of electrical sub-networks will remain unchanged from the Draft Report, namely the current boundaries.

The final SRAS Guideline will state that AEMO will review the boundaries when it becomes aware of any significant changes in the power system that could reasonably be expected to affect the ability to restore supply, including specific examples. The Guideline will also state that TNSPs may provide information to AEMO about the impact of such changes.

4.7 System restart roles and responsibilities

4.7.1 Issue summary and submissions

The AER's submission on the Draft Report suggested a number of inclusions to the SRAS Guideline to address potential uncertainty on the respective roles of AEMO, TNSPs, and SRAS Providers with regard to both the delivery and procurement of SRAS. The AER said it considered the SRAS Guideline and agreement to be an important contributor to the successful delivery of SRAS in the event it is required, and that there is an opportunity for the Guideline to clearly set out the roles and responsibilities of each party involved in SRAS, from procurement to delivery.

Several of the detailed suggestions related to testing procedures, in particular responsibilities for endorsement of those procedures and any associated switching plans. These have been discussed in Section 4.3 of this Final Report. The AER also made the following suggestions:

- The SRAS Guideline should include specific statements of roles, consistent with the expectation that the SRAS Provider is responsible for identifying and managing technical issues internal to the SRAS delivery point, while AEMO with TNSPs are responsible for identifying issues in the network from the delivery point. Any identified issues should be identified in the SRAS agreement and the SRAS Provider should provide evidence of arrangements in place to address them. AEMO should check the requirements identified in the procurement process are in the SRAS agreement and that the formal arrangements are in place.
- Where an SRAS Provider is dependent on the equipment or services of a third party to provide the contracted SRAS, those arrangements should be formalised as a risk mitigation measure, and if necessary this could be a condition precedent to the SRAS agreement.
- AEMO should provide any information identified during the procurement process and in the SRAS agreement to the TNSP for use in developing the system restart procedures and SSPs. Formal

processes should be established for sharing this information and the SRAS agreement should include (in the schedule) any plant-specific technical requirements. This will also provide a cross-check for the SRAS Provider's local black system procedures (LBSP).

4.7.2 AEMO's assessment

AEMO considers it a fundamental principle of the provision of SRAS that the provider makes all the arrangements necessary for that service to be delivered in accordance with its contract. This is an obvious requirement when any party agrees to provide a service.

AEMO has no objection to making this as clear as possible in the SRAS Guideline, in particular that the service involved in SRAS is to energise the Delivery Point only. AEMO will also include a requirement for confirmation from each party involved in delivery that it has documented arrangements in place to ensure SRAS can energise the delivery point, and will participate in testing.

However, AEMO does not agree that it should verify the content of those formal arrangements or be responsible for identifying any discrepancies. Matters specific to the generator's plant and any third party equipment (whether a network or another generator), and the interface between them, are within the expertise of the respective operators, not AEMO. AEMO seeks only to establish that all the capabilities specified in the Guidelines are tested and demonstrated within the parameters in the relevant SRAS agreement.

The detail of the process to develop LBSPs and the regional system restart plans is not a matter for the SRAS Guideline. The SRAS Guideline under clause 3.11.7 deals with matters relevant to the acquisition of SRAS by AEMO. The LBSPs and system restart plans are governed by clause 4.8.12. However, AEMO agrees that the terms of any SRAS offer, and subsequent agreement should be consistent with the SRAS Provider's LBSP.

For procurement purposes, typically AEMO would expect the TNSP to have more information than AEMO with regard to its network and directly connected plant. AEMO intends to seek verification by the TNSP of an SRAS Provider's technical information in relation to the provision of SRAS prior to contracting a particular service.

4.7.3 AEMO's conclusion

AEMO has amended the final SRAS Guideline from the draft by including specific provisions to make the following requirements clear:

- The SRAS Provider is responsible for arranging the correct operation, testing and control of all equipment necessary for the delivery of the service to the contracted delivery point.
- The terms of any SRAS offer, and subsequent agreement should be consistent with the SRAS Provider's LBSP.
- AEMO intends to seek verification by the TNSP of an SRAS Provider's technical information in relation to the provision of SRAS prior to contracting a particular service.

4.8 Drafting matters

4.8.1 Issue summary and submissions

SRAS Guideline

The AER made several detailed drafting suggestions on the draft SRAS Guideline. These are set out in Appendix B, together with AEMO's response indicating whether AEMO has made corresponding changes to the final Guideline.

The AER also noted that the draft SRAS Guideline did not address some of the matters covered by the 2014 version of the combined SRAS guidelines (under the NER in effect at that time). These were:

- 'Assistance by others' (Section 7.3 of 2014 guidelines), which expressed an expectation that (among other matters) NSPs should negotiate in good faith with SRAS Providers under what is now NER clause 3.11.9(i)(2). The AER considered that the existence of the NER obligation should be made clear to the NSP and the SRAS Provider, and guidance would be helpful as to the timing of when this should most usefully occur in the SRAS procurement process and the form the discussions should take. The AER suggested this may elicit information that may not be identified in consultation between AEMO and the NSP.
- Use of external networks (schedule 4.1 item 11 of 2014 guidelines), which required supplementary evidence relating to this capability where relevant, namely: 'provide procedure or equivalent documentation endorsed by NSP'. The AER considered this requirement would increase the importance of ensuring the required SRAS test procedure and SSP approvals have been obtained and there is a check for the existence of formal arrangements.
- Forms of request for EOI, invitation to tender and generator modelling data (schedules to 2014 guidelines). The AER considered these documents should be referred to as schedules to the SRAS Guideline as an alert to documents that are relevant /required for an SRAS Provider to be aware of.

SRAS agreement

Submissions from Origin and the AER raised some issues in connection with the drafting of the SRAS agreement.

The AER's detailed drafting suggestions are set out in Appendix B, together with AEMO's response indicating whether AEMO has made corresponding changes to the form of SRAS agreement.

Origin noted that generally that the testing provisions of the draft SRAS agreement (clause 6) should be updated to reflect the final SRAS Guideline produced by AEMO. Origin raised specific concerns about the absence of an obligation for AEMO to confirm its assessment of the test report (to be provided by the SRAS Provider within 15 business days of the test). Origin suggested SRAS contractors may be uncertain if their unit has passed or failed the test, including if follow up testing is required. AEMO should report back to the SRAS contractor on the outcome of the test within 5 business days of receiving the report.

Origin observed that this leads to further issues under clause 6.5(b) of the SRAS agreement, which requires a repeat test to be conducted within 20 business days of the original test. If it is unclear when the results will be returned by AEMO, it is difficult for participants to undertake appropriate repairs within a compressed and uncertain timeframe. Origin suggests that the repeat test should be undertaken within 20 business days after receipt of the testing outcomes from AEMO. This provides participants with confidence in knowing the timeframes they are required to meet when undertaking any changes required as part of a further SRAS test.

4.8.2 AEMO's assessment

SRAS Guideline

AEMO's consideration of the AER's detailed drafting suggestions is set out in Appendix B.

Generally, AEMO's approach is not to include material in its procedures and guidelines that either:

- Repeats or summarises the rules, beyond identifying provisions that support the subject matter of the guideline.
- Is outside the subject matter to be covered by the Guideline, as specified in the NER.
- May be updated regularly or vary dependent on individual circumstances.

With these principles in mind, AEMO has reviewed the 2014 guideline matters suggested by the AER for inclusion in the new SRAS Guideline, and considers that:

- Other parts of the SRAS Guideline will cover requirements for NSPs and other parties to provide assistance, information and approvals, to enter into appropriate arrangements with the SRAS Provider where necessary. It seems unlikely that drawing attention to NER clause 3.11.9(i) in the SRAS Guideline will help to remind participants of that obligation, if the previous SRAS guidelines were not effective in doing so.
- Requirements for multiple site SRAS are already covered by the new defined concepts of SRAS Third Party Equipment. All other asset owners must endorse the test procedure.
- All of the documents included as schedules to the 2014 guidelines will be on the AEMO SRAS web page when required, but AEMO does not consider it appropriate for them to be part of the SRAS Guideline because they may change with every procurement. The Generator Modelling Data is expected to be available at all times so that any potential new SRAS Providers can understand what they need to provide to AEMO, although for new technologies these requirements will need modification. A current form of SRAS agreement is also expected to remain on AEMO's website. Tender forms will be published for each procurement.

SRAS agreement

AEMO's consideration of the AER's detailed drafting suggestions is set out in Appendix B.

In relation to Origin's comments, AEMO accepts that it should provide formal notice of its acceptance of test results, and in the case of failure on a non-material item will confirm whether the SRAS Provider can avoid loss of availability payments if a second test is passed within 20 business days. That time will run from the date of AEMO's notice.

Generally, however, AEMO's acknowledgment will only assume importance if the test results do not indicate a clear pass or fail (noting that AEMO's representative will often be present to witness the test). To prevent the process of producing the test report and receiving acknowledgment causing undue delay, an additional provision will be added to the SRAS agreement testing clauses to clarify that, on a 'clear fail', the SRAS Provider must immediately notify AEMO that the SRAS equipment is unavailable.

4.8.3 AEMO's conclusion

AEMO has made some minor drafting changes for clarification in both the SRAS Guideline and the form of agreement. In particular, the SRAS agreement will require AEMO to formally respond to a test report, and the 20-day time period required to re-test for a non-material item will run from the date of AEMO's response. For a clear fail, however, the SRAS Provider must immediately notify AEMO that the SRAS is unavailable pending a further test.

4.9 NSCAS Tender Guidelines

4.9.1 Issue summary and submissions

No submissions were received on the draft NSCAS Tender Guidelines and draft form of NSCAS agreement published with the Draft Report.

4.9.2 AEMO's assessment

AEMO has not changed its assessment of the matters contained in the NSCAS Tender Guidelines from those discussed in the Draft Report. The final NSCAS Tender Guidelines will be amended from the 2011 version, to:

- Update the structure for consistency with AEMO's latest template.

- Reflect amendments in the terminology used in the NER (from NMAS to NSCAS).
- Include provisions taken substantially from the forms of EOI and ITT that were attached to the guidelines at that time.
- Provide for flexibility in the term of the agreement AEMO will seek.

4.9.3 AEMO's conclusion

AEMO has determined the final NSCAS Tender Guidelines and accompanying sample NSCAS Agreement with no changes from those published with the Draft Report.

5. FINAL DETERMINATION

Having considered the matters raised in submissions and at meetings/forums, AEMO's final determination is to make the SRAS Guideline in the form published with this Final Report, in accordance with clauses 11.81.3 and 3.11.7 of the NER.

AEMO's final determination of electrical sub-network boundaries is set out in clause 7 of the final SRAS Guideline. These are unchanged from the existing electrical sub-networks, determined in September 2014.

AEMO has made a final determination of the NSCAS Tender Guidelines in the form published with this Final Report, together with a form of ancillary service agreement for NSCAS.

APPENDIX A - GLOSSARY

Term or acronym	Meaning
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator Limited
AER	Australian Energy Regulator
Black System Report	AEMO, Black System in South Australia 28 September 2016, Final Report, March 2017[16]
DNSP	Distribution Network Service Provider
ENA	Energy Networks Australia
EOI	Expression of Interest
Finkel Review	Independent Review into the Future Security of the National Electricity Market[17]
GPS	Generator performance standards (under chapter 5 of the NER, in particular schedule 5.2)
ITT	Invitation to Tender
JSSC	Jurisdictional System Security Coordinator
LBSP	Local black system procedures (under clause 4.8.12 of the NER)
MW	Megawatts
NEM	National Electricity Market
NER	National Electricity Rules
NSCAS	Network support and control ancillary service
NSCAS Tender Guidelines	The guidelines to be developed and published by AEMO under clause 3.11.5(b) of the NER.
NSP	Network Service Provider (distribution or transmission)
NSW	New South Wales region of the NEM
RP or Reliability Panel	The Reliability Panel established by the AEMC in accordance with rule 8.8 of the NER
SRAS	System restart ancillary service
SRAS Guideline	The guideline to be developed and published by AEMO under clause 3.11.7(c) of the NER
SRAS Procurement Objective	The objective AEMO is to achieve by procuring SRAS, as set out in clause 3.11.7(a1) of the NER
SRAS Provider	A Registered Participant who provides SRAS, or has offered to provide SRAS, to AEMO.
SRS	System restart standard. Unless otherwise specified this refers to the version determined by the Reliability Panel and published by the AEMC on 15 December 2016, effective from 1 July 2018
SSP	System switching plan
TNSP	Transmission Network Service Provider

[16] http://aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Integrated-Final-Report-SA-Black-System-28-September-2016.pdf.

[17] 'Blueprint for the Future' report, June 2017, available at: https://www.environment.gov.au/system/files/resources/1d6b0464-6162-4223-ac08-3395a6b1c7fa/files/electricity-market-review-final-report.pdf.

APPENDIX B - SUMMARY OF SUBMISSIONS AND AEMO RESPONSES

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
Energy Networks Australia	**SRAS Individual Reliability**	There are residual concerns in the calculation of individual reliability measures. ENA states these values would indicate that there is quite a large confidence interval that may undermine the econometric validity of these 'assumed' values.	AEMO understands that this comment was intended to reflect the concerns raised by TransGrid in its separate submission, in relation to Transmission Component Reliability. Please refer to AEMO's response on that issue.
	Aggregate Reliability (Measure)	ENA understands there are common concerns as to the detail, form and potential formulaic representation of the aggregate reliability measure. TNSPs will need to develop and provide reliability data for a black start context, and therefore need to understand the likely black start sources and relevant parts of their networks. AEMO and TNSPs should jointly develop the approach used to determine aggregate reliability, and ENA looks forward to providing more comments as AEMO develops its interpretation of and approach to this important measure. AEMO's Draft Report addresses many of the issues ENA raised in response to the Issues Paper. Outstanding issues for ENA members include a need for further clarity around: (a) data requirements. (b) whether the focus on connection point analysis is too narrow. (c) timing requirements for collating data for AEMO's assessment of aggregate reliability measurements.	AEMO is keen to engage TNSPs as part of the development of the appropriate measures and values input upfront. AEMO would prefer the reliability measures to be developed with TNSP assistance, not by AEMO providing a detailed approach for comment, as this would be inefficient. As far as practical, reliability assessments should be conducted as a whole of network exercise, so that AEMO and TNSPs are able to identify which parts of the network are more susceptible than others in assessing the value of potential SRAS sources located at different points to restore supply across the sub-network. This seems preferable to performing assessments targeting only the restart paths of sources that are currently considered likely. The SRAS Guideline must focus on the two aspects of reliability required by the SRS - individual and aggregate. The aggregate reliability assessment clearly incorporates the reliability and diversity of network and other elements beyond the connection point. The individual reliability components in the SRS are very specific, and incorporate all elements up to the first transmission substation (which may or may not be the connection point). AEMO must naturally apply reliability considerations to: the equipment owned and operated by an SRAS Provider, equipment uniquely connecting that equipment to the network; and common transmission equipment. On timing, AEMO would like to obtain any additional assessment data from NSPs and current SRAS-capable sources as early as possible in the process, if possible by the end of 2017. This will allow AEMO to undertake assessments prior to the receipt of SRAS offers (anticipated to be required by early February 2018).

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	Electrical sub-networks	ENA requested clarification of the decision making process as to why AEMO reverted to 2015 material, rather than undertaking a new economic and technical analysis/examination of the criteria for assessing electrical sub-networks. At a minimum. AEMO should outline in its Final Report what criteria or 'triggers' it considers are necessary for it to undertake new analyses of these important boundaries.	The process of modelling undertaken in 2014-15 built a comprehensive picture of generator and network capability and performance characteristics for the NEM that had not existed before. It was never intended for that process to be completely every few years. Rather, that modelling forms a base that could be incrementally adjusted as material changes to power system equipment or operations occur. In its market operator role AEMO is aware of material changes to generation and transmission, noting that registered participants are required by the NER to inform AEMO of such changes. As previously requested, if NSPs consider that any changes have occurred since 2015 of which AEMO is not aware, or have not been taken into account, please immediately notify AEMO. Economic analysis is not part of AEMO's role in determining the boundaries; the Reliability Panel undertook that economic analysis in determining the revised SRS, based on technical information provided by AEMO
	SRAS Testing - scheduling	Establishing clear and workable protocols and arrangements between AEMO and TNSPs in the scheduling and conducting of SRAS testing as foreshadowed in the Draft Report. Testing windows should only be held open for the minimum time necessary to mitigate against potential deleterious market and performance impacts.	AEMO agrees clear protocols are desirable between AEMO and TNSPs for the scheduling and conduct of SRAS testing. AEMO notes ENA's view with regard to minimising testing windows, cognisant of the need to allow for unexpected market or system conditions, as ENA acknowledges. See also response to TransGrid's comments on this matter.
	SRAS Test – Cost Recovery	It is still unclear as to what AEMO considers is the best way for TNSPs and SRAS Providers to negotiate and recover the potential costs of the proposed SRAS testing arrangements. Short notice testing can create both costs and risks for TNSPs, customers and generators. It is highly likely that generators will be in a position to address this as part of their quotations and offers. But for TNSP's, AEMO should seek clear involvement from the Australian Energy Regulator (AER) for its considered position as to the regulatory treatment of testing costs and in relation to any potential impacts on existing AER incentive schemes. Energy Networks Australia considers that in due course, AEMO should be preparing for third party indemnities and costs to be part of the contracting arrangements with potential SRAS Providers.	AEMO expects SRAS Providers to consider the reasonable expected costs and risks of testing when formulating their SRAS offers. The NER indicate (in clause 3.11.9) that NSPs are expected to negotiate in good faith with prospective SRAS Providers with regard to the resolution of issues that would prevent the delivery of effective SRAS by that provider, and to participate in and facilitate testing of a proposed service (subject to recovery of reasonable costs from the provider as a negotiable service). AEMO expects these arrangements to be in place both for pre-contract testing and testing during an SRAS contract, and understands this has been normal practice for many years. It follows that the SRAS Provider is likely to incorporate any NSP charges in its tendered SRAS testing charge. AEMO will clarify in the SRAS Guideline that the provisions of NER 3.11.9 should extend throughout the period of any contract entered into for the relevant SRAS. AEMO will consider any reasonable proposal or methodology for testing costs, but will not be giving indemnities to either SRAS Providers or NSPs. NSPs as the regulated businesses in this case, should seek to resolve directly with the AER any concerns they have regarding the application of the regulatory regime to their involvement in SRAS. It is not AEMO's role to advocate any position with the AER on behalf of NSPs. Nevertheless, AEMO made the AER aware of submissions received from NSPs and their representatives with regard to both STPIS and the recovery of testing costs. The AER has set out its view on those matters in its submission. As a result AEMO does not intend to make any changes to the SRAS Guideline or SRAS agreement in respect of testing costs.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
Hydro-Electric Corporation (Hydro Tasmania)	**Individual Reliability**	Hydro Tasmania supports AEMO's move to add redundancy and operational reliability factors for addressing 'single point[s] of failure' when considering individual reliability of SRAS sources. These additional factors can only add to the overall surety that the SRAS source will respond as anticipated. Hydro Tasmania strongly agrees with the Energy Networks Australia (ENA) [from first round consultation] that a clear elucidation of a weighting process to assess individual reliability of potential SRAS Providers is required. AEMO's proposed methodology is logical but some form of weighting of increased risk of loss during a system black event should be considered.	Noted. Refer to response to Snowy Hydro submission on weighting. In relation to the increased risk of loss during a black system event, the effects of a major supply disruption are difficult to predict. As a result, the Reliability Panel has incorporated diversity factors into the SRS to allow for the possibility of single points of failure. Any additional contingency measures adopted by AEMO beyond this would be inconsistent with the SRAS Procurement Objective expressed in the NER.
	Aggregate Reliability (Number, Location, Diversity)	Hydro Tasmania is pleased AEMO recognises that reliability assessments should be conducted as a whole-of-network exercise. AEMO has stated in its draft report it proposes to include a set of principles for assessment in the Guideline, based on good engineering practice, rather than detailed reliability measures. AEMO has not provided any further detail for comment and the diversity criteria is not adequately covered. Hydro Tasmania echoes ENA's documented request that AEMO must include the ability to restore significant customer load from the SRAS source(s) and not confine the application of the System Restart Standard. ENA continued that it is insufficient for AEMO to procure SRAS sources in a generation-rich area (like the West Coast of Tasmania for example) with the ability to meet the standard, if that generation cannot facilitate power system restoration because of vulnerable transmission corridors, like the Tasmanian North-South corridor, which connect major load centres. Whilst there is little detail to evaluate based on AEMO's general approach there appears to be little particular consideration of path diversity other than standard reliability calculations. Hydro Tasmania again requests that AEMO include the specific criteria they are considering for evaluating these diversity and strategic locational risks including considering weighting factors as suggested above.	With respect to the diversity criteria, AEMO has stated that aggregate reliability assessment will account for all of the diversity criteria specified in the SRS, namely electrical, geographical and fuel source. In assessing combinations of SRAS sources for their ability to meet the aggregate reliability requirements, AEMO will assess the diversity of each combination. Consistent with the intent of the SRS, to avoid single points of failure, AEMO seeks diversity in all three factors: • Fuel source – SRAS sources are not solely reliant on a common fuel source, such as gas pipeline, coal mine, or reservoir. • Electrical diversity – SRAS sources to not share the same single transmission element or corridor from respective Delivery points to the auxiliaries of units that will assist the restart process. This is distinct from reliability calculations from for Individual reliability of SRAS Sources. • Geographic diversity – SRAS sources are sufficiently separated that they are unlikely to be affected by a single localised event, such as bushfire, tornado, or flash flood. Engineering judgement is required for some of these assessments as there may be no absolute assessment e.g. no fixed distance that provides geographic diversity. If AEMO believes that there is insufficient diversity in amongst capable SRAS sources in a region, AEMO will advise that the SRS standard may not be met. With respect to the restoration of load, refer to the response to Snowy Hydro's submission on this question.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	SRAS Testing	Hydro Tasmania supports AEMO in its endeavours to improve testing, appreciates AEMO's position for proposing a 5 business day notice period and does not seek any special SRAS Provider's convenience. Hydro Tasmania does however seek further documented comfort from AEMO that industry's concerns in relation to market price events and the like are separately identified (along with the other factors already identified). AEMO providing certainty and comfort to providers around market risks may result in reduced cost of testing.	AEMO considers it impossible to provide absolute comfort that high market price events can be avoided altogether in relation to testing. Even with the current regime where providers schedule their own tests and give advance notice to AEMO, it is not possible to predict that a high price event will not occur. To the extent that high prices coincide with either a shortage of supply or a system security issue that the relevant SRAS source could help alleviate, as a prudent operator AEMO would not schedule or proceed with a test in those circumstances. AEMO will include in the Guideline a statement of its intent to minimise the impact on commitment and dispatch as far as practicable. To the extent prospective SRAS Providers retain legitimate concerns about scheduling, they may wish to consider innovative forms of test pricing that appropriately balance risk.
	Electrical sub-networks	Hydro Tasmania believes AEMO is well aware of our position concerning sub-networks in Tasmania and appreciates AEMO working with the local transmission network service provider to address the risk of the North-South transmission corridor separation. Hydro Tasmania believes that this risk should be a critical consideration as part of AEMO's upcoming SRAS procurement process and associated aggregate reliability assessments.	Noted. AEMO will continue engagement with TasNetworks. Given Hydro Tasmania is currently the only possible SRAS Provider in the Tasmania sub-network, AEMO proposes to also engage with Hydro Tasmania with a view to directly requesting offers for combinations of SRAS sources that meet the SRS.
	Procurement Process	Hydro Tasmania notes AEMO's comments that any potential provider is free to approach AEMO at any time, and AEMO would request the data necessary to assess its SRAS potential. This would indicate a level of flexibility AEMO may have when procuring SRAS. Hydro Tasmania would like to clarify further the level of flexibility AEMO has, or will be willing to demonstrate as the entitled entity under clause 6.5(c), during negotiations. Hydro Tasmania would like AEMO to be able to engage with it in innovative ways to find the best possible solution not only to satisfy the National Electricity Rules objective but also to mitigate identified Tasmanian system restart risks.	AEMO's constraints are set by the NER and the SRS. The 2015 amendments to the NER contemplated that AEMO could acquire SRAS other than through a competitive tender process where appropriate, and the SRAS Guideline would describe the procurement processes AEMO may use and in what circumstances. However note that AEMO cannot procure SRAS in excess of, or which does not meet, the SRS and the NER requirements.
	Modelling and Assessment	In terms of the assessment process, similar to others we believe AEMO's assessment appears to be highly theoretical and takes little account of operational contingencies and thus is over-optimistic. We reiterate Snowy Hydro's comments and the Reliability Panel's recommendations that AEMO increase its engagement with network service providers in its procurement of SRAS.	Any vulnerable transmission lines or corridors will be taken into account as part of the assessment of the diversity criteria, as discussed below, to the extent they represent a single point of failure that would prevent achievement of the SRS. It is AEMO's intention to request TNSP advice with regard to any technical network reasons that may impact the effectiveness of a potential SRAS source before making a final procurement decision. The region's Jurisdictional System Security Coordinator (JSSC) will also be consulted on any relevant considerations for the development of regional system restart plans.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
Origin Energy Ltd (Origin)	**SRAS Testing**	Origin reiterated the need for caution on the test notice period specified in clause 4.2.2(b)(ii) of the SRAS Guideline as it may place a registered participant in breach of the NER. Clause 5.7.5 of the NER requires a Registered Participant to give the relevant NSP at least 15 business days' notice in writing of a planned test of equipment related to a connection point, which requires changes to normal operation of that equipment. Origin notes other participants need to be assured that they are not in breach of the Rules when complying with Clause 4.2.2(b)(ii) under the proposed testing regime, and suggested AEMO to seek legal advice and/or written acknowledgment from the AER and provide it to participants. An alternative course of action would be to submit a Rule change proposal to the AEMC. However, Origin believes that this would have a number of unintended consequences including: risking delaying the implementation of the SRS due to the time it takes to complete a rule change determination, and changing the TNSP notice periods for other types of work.	See response to TransGrid submission on the clause 5.7.5 issue. AEMO will submit a rule change proposal to the AEMC.
		Clause 4.2.2(b)(i) allows AEMO to undertake an SRAS test if any type of maintenance is conducted that causes the SRAS Equipment to be out of service for 7 days or more. Origin contends that it is not the timeframe of the outage, but the type of the outage that should be considered. An AEMO SRAS test should only be warranted if the outage materially affects the performance of the SRAS equipment. For example, a piece of SRAS equipment could be out of service for 8 days (which would trigger a test), however the outage is unrelated to the performance of the unit and there has been no material change to the operating status of the SRAS equipment. Origin suggests that the wording should be changed to the following: Clause 4.2.2(b)(i): within 10 business days after a period of maintenance that materially affects the performance of the SRAS Equipment or SRAS Transmission Components in consultation with the SRAS contractor.	With regard to the maintenance test, AEMO acknowledges the intent of Origin's submission, but wishes to cover the possibility that any maintenance outage of major components of the SRAS Equipment, and the process of returning them to operation, could affect the performance of the equipment. It will not necessarily be evident whether what might be considered a minor change or reconfiguration of ancillary equipment has had an unintended effect on the performance of the SRAS equipment.
	Aggregate Reliability	Origin is satisfied with the proposed individual and aggregate reliability factors that are being employed to assess potential candidates for SRAS contracts. We believe this assessment will determine the best sources of SRAS to meet the system restart standard set by the AEMC Reliability Panel.	Noted.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	SRAS agreement	Generally items 6.1 and 6.2 should reflect the final guidelines document produced by AEMO. This includes altering the two testing procedures if there are changes to the testing notice periods following the final round of consultation. Under item 6.3, it is important for participants to be notified of test results by AEMO. Currently this item requires that participants provide a test report to AEMO within 15 business days of the test being conducted. However, there is no onus on AEMO to provide their assessment of the report and to inform participants of the outcome. This often leads to issues with SRAS contractors who are uncertain if their unit has passed or failed the test, including if follow up testing is required. Item 6.3 should require that AEMO report back to the SRAS contractor on the outcome of the test within 5 business days of receipting the test report. This leads to further issues under item 6.5(b) which requires a repeat test to be conducted within 20 business days of the original test. Often a participant will submit their test results to AEMO and be unsure of when the results will be returned, this includes any areas that need to be rectified for future tests. As a result, it is difficult for participants to undertake appropriate repairs within a compressed and uncertain timeframe. Origin suggests that the repeat test should be undertaken within 20 business days after receipt of the testing outcomes from AEMO. This provides participants with confidence in knowing the timeframes they are required to meet when undertaking any changes required as part of a further SRAS test.	Noted. Amendments have been made to clarify the process and timing requirements. Note that when AEMO is present for a test, the result is normally communicated on the day, however AEMO accepts that formal notification should be provided, and 5 business days is a reasonable guide. Note that passing a repeat test within 20 business days will only result in no loss of availability where the first test was failed, effectively, on a technicality (that is, where AEMO considers that the SRAS is still likely to respond). In the case of failure on a non-material item AEMO will confirm whether the SRAS Provider can avoid loss of availability payments if a second test is passed within 20 business days. That time will run from the date of AEMO's notice. However, AEMO also notes that generally AEMO's acknowledgment will only assume importance if the test results do not indicate a clear pass or fail. Accordingly, to prevent the process of producing the test report and receiving acknowledgment causing undue delay, an additional provision will be added to the SRAS agreement testing clauses to clarify that, on a 'clear fail', the SRAS Provider must immediately notify AEMO that the SRAS equipment is unavailable.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
TransGrid	**SRAS Individual Reliability - Transmission Components**	TransGrid supports the use of quantifiable methods by AEMO when assessing system restart sources. In line with the reliability block diagram approach AEMO proposed in the draft report, TransGrid is able to provide the probability of failure for plant and equipment forming part of the restoration pathway. In using this data TransGrid proposes: a. Given the small data set for each component, it is suggested that AEMO undertakes sensitivity checks of at least ±25%. b. Qualitative assessments should also be considered. As raised at the third Sydney forum, the extent of inter-organisation communications in a system black situation may impact on the effectiveness and efficiency of a restart source. c. The probability of failure of system components may materially change over time. AEMO should take into account the possible need to revisit the reliability calculations over the SRAS contract life.	A. Noted. AEMO will consider sensitivity analysis in its determination B. AEMO acknowledges that inter- and intra-organisation communication may affect the success of SRAS. For inter-organisation communications, data communications standards exist under the NER. For intra-organisation communication, AEMO intends to include assessment standards in the final Guideline. C. Noted. AEMO will consult with TNSPs and SRAS Providers to obtain reliability information for respective plant and systems, including error margins as appropriate. It is noted that the value of reliability assessments are subject to the quality of data provided.
	Aggregate Reliability	The AEMO examples in the draft determination appear to have adopted a shallow connection policy. That is in the examples provided the connection point and delivery point appear to be at the same substation/switching station. The Reliability Panel's final determination indicated a requirement for AEMO 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. TransGrid understands this implies a deeper set of assets be included in the analysis and could include relevant transmission lines (or lines in a corridor) to a downstream transmission substation. We seek further explanation on how AEMO will implement this requirement.	The reliability values provided in Appendix C of AEMO's draft report and determination were for illustrative purposes only and related to SRAS individual reliability only. The SRS extract in TransGrid's submission is a requirement for the assessment of electrical diversity, which is a consideration in determining the aggregate reliability of SRAS for an electrical sub-network. The aggregate reliability assessment accounts for single points of failure both: - upstream of the delivery, where a single point of failure will impact the Individual Reliability of an SRAS source (part of the individual reliability assessment); and - downstream of the delivery point (and downstream of the first transmission substation in the restoration path), where a single point of failure will impact the aggregate reliability of a particular combination of SRAS sources (electrical diversity).

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	SRAS Testing	While TransGrid has no objection to the process outlined by AEMO, we would expect an agreed protocol to be in place to support this arrangement. Reserving test windows may impose work restrictions, and TransGrid would expect to work closely with AEMO to ensure the move from test window options to confirmed test window is achieved expeditiously. Potential SRAS Providers raised a concern with NER clause 5.7.5(a) and the requirement for 15 business days' notice in writing to the TNSP. TransGrid understands their concern as non-compliance with this clause carries a civil penalty. To avoid any uncertainty, we suggest AEMO align its notice period for testing to SRAS Providers to align with this clause. TransGrid notes AEMO's view on the operation of the AER incentive scheme. However, we would require a written statement from the AER confirming this interpretation. Further, the AER have a history of amending this scheme and this may result in material scheme changes during an SRAS contract period. Given that SRAS testing is a negotiable service, contractually managing this risk using back to back contractual arrangements between TransGrid - SRAS Service Provider-AEMO is the most likely outcome. We suggest that AEMO should take this into account in when developing the commercial arrangements with SRAS Providers.	AEMO considers that the SRAS Guideline should provide the essential requirements for the scheduling of testing between AEMO and TNSPs for the scheduling of SRAS testing, and supports active engagement and the development of protocols with TNSPs to provide as much clarity as practicable. AEMO understands the constraints that multiple test windows may have on TNSP planning. The concept of test windows has been proposed to assist in provide some flexibility in minimising impacts on TNSPs and SRAS Providers, by allowing contingencies for unexpected market or system conditions. AEMO will not ask TNSPs to provide more than four test windows, although TNSPs may specify additional windows if they wish. With respect to NER clause 5.7.5(a), AEMO understands the concern, but considers that the significantly longer notice period would not meet the objective of AEMO-initiated 'short notice' testing. AEMO has obtained feedback from the AER, included in the summary of its submission below. Based on that feedback, AEMO will submit a rule change request to the AEMC to clarify the 5.7.5(a) requirement. See response to ENA submission on issues relating to STPIS and cost recovery.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	Electrical Sub-Networks	a. TransGrid notes that the Reliability Panel determined the standard in a manner that mirrors two electrical sub-networks in NSW. Our understanding as to the rationale for this is that the Panel did not have the authority to amend the electrical sub-network. b. During the Sydney forum on 27 July 2017, information was forthcoming by one customer Tomago Aluminium, that we believe warranted consideration. TransGrid's understanding was that AEMO would undertake further engagement directly with Tomago to obtain specific quantitative and qualitative information to facilitate an economic and technical appraisal of the restoration of NSW with both one and two electrical sub-networks. TransGrid is unable to see evidence of this assessment being completed.	a. Noted. The Reliability Panel determined additional requirements for the NSW region based on analysis which included input from AEMO, including supply restoration curves using different individual and combined SRAS sources, and extensive economic analysis by Deloitte. AEMO has not identified a need to amend the number of electrical sub-networks in NSW, based on the guidance in the SRS as well as physical limitations. AEMO does not agree that the Panel imposed the additional SRS requirement to mirror two electrical sub-networks in NSW. It does not, and cannot do so, due to the nature of generation (majority slow-start coal plant) and the limitations on stabilising load north of Sydney. Instead, the requirement is for AEMO to procure a source in the north (as it already does) that will energise the auxiliaries of 500MW of plant. No extra MW could be generated using such a source within the 2 hour SRS timeframe for NSW, and most likely significantly longer. b. AEMO took the question from Tomago on notice. AEMO has discussed Tomago's situation previously with both Tomago and TransGrid representatives. Specific discussion of an individual load cannot be included in this public report, however: • AEMO has no remit to revisit the economic analysis already undertaken by the Panel. • AEMO will continue to engage further with TransGrid during the modelling process and during the development of system restart plans, to account for technical limitations of the network in a way that facilitates load restoration as quickly as is feasible.
Snowy Hydro Ltd	**SRAS Individual Reliability**	Start-up performance of the SRAS is the most critical element in the overall aggregate reliability and hence should be weighted more heavily than the other components of aggregate reliability. One way to do this using the example shown by AEMO is to have the generator start-up reliability (Gen) weighting of 60% and the multiple of the DG, CB, Aux, CB, and Txr at 40%. Using example 1 in the Appendix C, the Individual SRAS Reliability (Source A and Transmission Type 1) is: = 96% * 60% + (95% * 99% * 98% * 97% * 98% * 98%) * 40% = 0.576 + 0.343 = 91.9% As expected the weighting placed to the "Gen" start-up reliability has increased the overall Individual SRAS Reliability to 91.9% compared to the 82.4% calculation in AEMO's unweighted example.	AEMO agrees that start-up performance is critical to the performance of SRAS units. As a result, AEMO has proposed that start-up features is incorporated in two ways with - (historical start-up performance) SRAS Equipment will only be considered available if it is 'in date' for testing, meaning that it the equipment has successfully passed the most recent SRAS test and is not overdue for testing. - (expected future start-up performance) in individual reliability calculations The weighting proposed by Snowy Hydro has been considered, but AEMO considers that as a general principle the reliability of items of equipment that are equally essential for delivery of the service should be equally weighted. The need for non-equal equipment reliability weightings of plant with an SRAS source should be considered on a case by case basis where justified. Specific circumstances would need to be identified to justify giving different weightings to items of plant within a source. As the components, configuration and operation of SRAS equipment can vary significantly between sources, it is impractical to apply a common set of weightings, or weighting criteria, for all current and potential SRAS.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	Electrical sub-networks (Load Restoration)	Snowy Hydro does not believe AEMO has critically assessed whether it is more appropriate for NSW to have two electrical sub-networks. In Snowy's opinion one sub-network for NSW may dilute AEMO's responsibility to meet 1500MW of supply to be restored in 2 hours, and where AEMO chooses to energise supply would create an equity issue across customers in different regions in NSW. Snowy gives an example of AEMO meeting the SRS by only energising the auxiliaries of generation in the NSW-South region, resulting in load located in NSW-North taking longer to be restored.	AEMO understands and agrees with the concerns of Snowy Hydro and other stakeholders that in a black system scenario load should be restored to as many customers as possible as quickly as possible, but the SRS and the SRAS Procurement Objective are about restoration of supply to the auxiliaries of other generation and transmission that can in fact restore load. In addition, under NER 4.2.6(e) and 4.3.1(p) sufficient SRAS should be available to allow the restoration of power system security and enable AEMO to coordinate a response to a major supply disruption. AEMO's mandate (which limits its discretion to procure any quantity of SRAS is to procure sufficient SRAS to meet all aspects of the SRS at the least cost (SRAS Procurement Objective). Of course in developing and implementing the system restart plan AEMO will be endeavouring to securely restore supply in a way that maximises load restoration, but in terms of the SRAS sources that may be used in that process, AEMO can only procure that combination of services that meets the SRS at least cost. The NER do not allow AEMO to spend more to procure incremental services (or a higher-cost combination of services) solely on the basis that more load could be restored in a shorter timeframe.
	Electrical sub-networks	Snowy considers the additional SRS requirement for AEMO to procure sufficient SRAS to independently restart at least 500 MW of generation capacity north of Sydney within four hours with an aggregate reliability of at least 75% was an acknowledgement from the Reliability Panel that additional SRAS was required in the NSW-North region. Snowy Hydro submitted it would be more consistent to apply the SRS Standard to a separate NSW electrical sub-network for NSW-North that specifies the target megawatt (MW) supply restoration capability, timeframes and aggregate SRAS reliability requirements for this electrical sub-network, rather than a requirement that deviates from that used by all other NEM electrical sub-networks.	AEMO agrees that the additional requirement in the SRS was designed to ensure that an SRAS source was procured north of Sydney (as AEMO currently does). The Panel noted that a delay to supplying the auxiliaries of NSW generators north of Sydney would significantly delay the restoration of the sub-network, due to the large distance between these generating units and the generation in the south of the sub-network. The standard nominates three characteristics that AEMO must consider in that evaluation, as a minimum: 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 ability to maintain the electrical sub-network in a satisfactory operating state to the extent practicable during the restoration process, and in a secure operating state from a stage when it is practicable to do so. AEMO's assessment is that the current electrical sub-network covering the NSW region is consistent with the system restart standard. There are a number of reasons why a north-south separation would not add value, and a similar standard could not be applied to both as independent sub-networks. Refer to AEMO's response to TransGrid's submission on this issue for further detail. A single NSW sub-network allows greater diversity of SRAS sources to be used to benefit the region as a whole without artificial restrictions.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
Australian Energy Regulator	**SRAS Testing**	The AER made several suggestions on test procedures and the proposed 'surprise' SRAS test: a. The SRAS Provider should ensure the third party/NSP reviews, agrees with and consequently provides formal approval of the test procedure and system switching plan (SSP). We consider this will ensure that third party/NSP information in relation to its part of the SRAS provision is made available to the SRAS Provider. b. To ensure any difference between the SRAS test procedure and SSP will not compromise the functioning of the system restart procedure and SSP, the SRAS Provider and third party/NSP should verify whether the test procedure and SSP are the same as the system restart procedure and SSP. Where different, the SRAS Provider should identify why the difference exists and warrant to AEMO that they have fully explored that the difference will not compromise SRAS delivery. This will require the involvement of the third party/NSP as part of its test procedure approval process. The AER does not consider this will impose undue burden on those parties. c. AEMO's approval of the test procedure should be contingent on evidence of the above approvals. AEMO should independently review the implications and risks associated with any differences identified between the SRAS test procedure and SSP and the system restart procedure and SSP. d. The approval requirements AEMO has introduced at 4.1(b) are good as a check that communication of information between the SRAS Provider, third party and NSP has occurred, but the AER considers that approval should extend to include the SSP and the SRAS guideline should include guidance on the form of approval, what is being approved, what each party is warranting by way of approval, and the evidence of approval to be given to AEMO. A pro-forma approval as a schedule to the SRAS Guideline may assist, and also including the approval requirements in the SRAS agreement could ensure compliance. e. Appendix A 2a of the Guideline says 'Start using same procedure as would be used for a system restart' but there is no guidance on how the system restart test procedure/SSP is being provided to the SRAS Provider for the test or being checked by the SRAS Provider, TNSP and AEMO. f. For the proposed 'surprise' AEMO test, no guidance is provided regarding the process for the SRAS Provider to approve and organise other approvals of the test procedure in advance of this test.	a. An SSP typically addresses the switching process that occurs from the SRAS delivery point out into the network, and as such an SSP is normally prepared to support the regional system restart plans, not for the delivery of SRAS. SSPs might be required in the testing process where elements of the NSPs network are needed in order to provide the SRAS capability to the delivery point, although currently these are rare. Where relevant AEMO agrees that the NSP should provide and sign off on any network processes involved prior to a delivery point, and this is covered in the final Guideline. However, matters relevant to the determination of the system restart plan are beyond the scope of the SRAS Guideline. b. AEMO agrees that the test procedure should replicate an actual restart scenario, and any differences should be identified and understood by all parties involved. However, AEMO does not see a need for additional warranties beyond those in the SRAS agreement. c. Clause 4.1(b)(iii) already stipulates that AEMO will only approve a test procedure after approval by each other party involved. AEMO does not propose to independently review the procedure, it will be a checklist exercise only; this will be made clear in the final SRAS Guideline. d. AEMO does not propose to include a pro-forma, for approval, but will provide additional guidance on the matters to be approved. The SRAS agreement can refer to the guideline for approval requirements should the SRAS Provider propose any change to the test procedure. e. Appendix A, 2(a) is simply intended to reinforce the requirement that a test should demonstrate the capability of the SRAS to respond in a black system situation. The system restart procedure, and generally the SSP, takes over from the point at which the SRAS delivery point has been energised. f. It is expected that the initial test procedure will remain in place for all future tests unless it needs to be changed for some reason (at which time the same procedure would apply). This will be clarified in the SRAS Guideline and agreement. On this basis there should be no need to re-submit test procedures for a surprise test.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	SRAS roles and responsibility	AER suggested the SRAS Guidelines should include specific statements of role consistent with the expectation that the SRAS Provider is responsible for identifying and managing technical issues internal to the SRAS delivery point, while AEMO with TNSPs are responsible for identifying issues in the network from the delivery point. Any identified issues should be identified in the SRAS agreement and the SRAS Provider should provide evidence of arrangements in place to address them. AEMO should check the requirements identified in the procurement process are in the SRAS agreement and that the formal arrangements are in place. The AER also noted its view that where an SRAS Provider is dependent on the equipment or services of a third party to provide the contracted SRAS, those arrangements should be formalised as a risk mitigation measure, and if necessary this could be a condition precedent to the SRAS agreement.	AEMO considers it a fundamental principle of the provision of SRAS that the provider makes all the arrangements necessary for that service to be delivered in accordance with its contract. This is an obvious requirement for any service. AEMO has no objection to making this as clear as possible in the SRAS Guideline, in particular that the service involved in SRAS is to energise the Delivery Point only. AEMO will also include a requirement for confirmation from each party involved in delivery that it has documented arrangements in place to ensure SRAS can energise the delivery point, and will participate in testing. However, AEMO does not agree that it should check the content of those formal arrangements or be responsible for picking up any discrepancies. Matters specific to the generator's plant and any third party equipment (whether a network or another generator), and the interface between them, are within the expertise of the respective operator and not AEMO. AEMO seeks to establish, through tests, that all the capabilities specified in the Guidelines are established within the parameters in the relevant SRAS agreement. Ensuring you have the capability to deliver a contracted service is integral These are an integral part of the provision of any service. Further, wherever AEMO takes on any checking or verification role, those with the primary relationships and expertise are less likely to take responsibility for these matters.
	Link to System Restart Plan/LBSP	AEMO should provide any information identified during the procurement process and in the SRAS agreement to the TNSP for use in developing the system restart procedures and SSPs. Formal processes should be established for sharing this information and the SRAS agreement should include (in the schedule) any plant-specific technical requirements. This will also provide a cross-check for the SRAS Provider's LBSP.	The detail of the process to develop LBSPs and the regional system restart plans is not a matter for the SRAS Guideline. The SRAS Guideline under clause 3.11.7 deals with matters relevant to the acquisition of SRAS by AEMO. The LBSPs and system restart plans are governed by clause 4.8.12. For procurement purposes, typically AEMO would expect the TNSP to have more information than AEMO with regard to its network and directly connected plant. AEMO intends to make available to the TNSP all technical information provided by a prospective the SRAS Provider in relation to the provision of SRAS prior to contract, and will seek verification by the TNSP. This is clarified in the final Guideline.
	AEMO-TNSP Consultation	The AER noted NER 3.11.7(c), requiring AEMO to consult with the relevant NSP to identify and resolve issues in relation to the capability of any proposed SRAS to meet the SRS. The AER considers guidance should be provided on when the consultation will occur, what is required from NSPs, the involvement of the SRAS Provider and AEMO's process/how the response will interact with NER 3.11.9(2)-(3).	As each proposed SRAS source may have many potential issues or none, well-established or not, a consultation process cannot readily be specified. The Guideline includes a requirement for NSPs to provide information about the reliability transmission components within an SRAS, and the final version also includes a general requirement for the NSPs to provide information as reasonably required by AEMO to establish or verify restart paths into the network.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	Clarifications (SRAS Guideline)	The AER suggested further specification or clarification of a number of additional statements in the SRAS Guideline (those relating to testing are covered in the SRAS Tests item above). These are: a. 3.3(h) - meaning of 'no adverse effects on power system security during network switching and load restoration'. b. 4.1(b)(ii) - 'relevant' NSP c. 4.1.(c)(iv) - 'other matters' the SRAS Provider considers relevant for the test procedure d. 4.2.2(b)(i) - 10 business days (inconsistent with 20 in SRAS agreement) e. 4.2.2(a) - 'generally two' tests a year, compared with 4.2.2(b)(ii) 'not more than once a year'. f. 4.3(a) does not provide the timeframe for submission of the test report; 15 bd should be added consistent with SRAS agreement. g. 5.4.1(vi)-(vii) - not transparent that AEMO considers potential changes external to the delivery point and not internal to the delivery point. We suggest AEMO specify this to provide clarity to all parties.	a. This is necessarily open-ended as it is intended as a catch-all. AEMO does not consider it unreasonable to expect SRAS Providers to understand this conceptually - many generator performance standards are expressed in similar terms. b. The final Guideline confirms this means the NSP at the SRAS delivery point. Approval is also required from any NSP or other person that owns network or other assets within the designated SRAS Equipment (SRAS Third Party Assets). c. Other matters are those which appear relevant for the SRAS Provider. The Guideline cannot specify what these might be in any particular circumstances. d. Noted. Will be amended to 20 business days. e. Two tests based on the expectation that most SRAS Providers will undergo a period of annual maintenance, but if they do not, there may be only one test. Guideline clarified. f. Now included. g. Minor changes made to clarify that AEMO considers the impact of operating modes and control/protection settings of the SRAS equipment at and from the interface with the transmission network.
	Clarifications (SRAS agreement)	The AER suggested further clarification of a number of additional statements in the SRAS Guideline. These are: a. 6.3 - insert the word 'test' before 'requirements' so it is clear which requirements of the guideline are to be met. b. S1.5(c)(iv) - unclear what is meant by 'appropriate network controls and protection systems in place to avoid the SRAS equipment adversely affecting power system restoration'. The SRAS Guideline should clarify. c. S1.5(c)(ix) unclear what is meant by 'have no restrictions or limitations that have the potential to adversely affect power system restoration'. The SRAS Guideline should clarify. d. S1.7 Special test conditions - unclear what is contemplated here, and suggest clarification is provided in the SRAS Guideline.	a. Noted b. See response above c. See response above d. Noted. The most obvious example may be regular start-up testing for low voltage generators (black system event recommendation 14). This provision may also cover anything that may not have been contemplated in the Guideline, or any agreed exclusions from the Guideline test requirements. For example, special provisions may be desirable to minimise impact if the restart path to the transmission network involves another (non-SRAS contracted) generator.
	Matters in 2014 SRAS Guidelines	The AER commented that it would be helpful to include some material appearing in the current (2014) SRAS Guidelines, which has not been replicated in the new draft SRAS Guideline. The three areas identified by the AER are detailed below.	Generally AEMO's approach is not to include material in the Guideline that either: Repeats or summarises the rules, beyond identifying provisions that support the subject matter of the Guideline Is outside the subject matter to be covered by the Guideline, under the NER May change or be updated regularly or dependent on circumstances.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	2014 SRAS Guidelines - Assistance by others	Section 7.3 'Assistance by others', included AEMO's expectation that: a. NSPs should negotiate in good faith with SRAS Providers under what is now NER 3.11.9(i)(2); b. Any other Generator owning or operating nominated SRAS equipment should assist by providing information and assistance as to the efficacy of the nomination; c. If it would be unreasonable for NSP to participate in, or facilitate testing, the SRAS Provider may need to redefine the proposed SRAS so that testing does not require NSP participation or facilitation. The AER considered that the existence of the [NER] obligation should be made clear to the NSP and the SRAS Provider, and it would also be helpful if guidance was provided as to the timing of when this should most usefully occur in the SRAS procurement process and the form the discussions should take (this may elicit information that is distinct from that which may be elucidated under the consultation between AEMO and the NSP.	a. See above. b. AEMO considers this is well covered in other parts of the Guideline, including amendments to the final version based on AER suggestions. c. AEMO considers that all parties who would be involved in energising the delivery point in a real system restart scenario should participate in testing, therefore this provision is no longer appropriate.
	2014 SRAS Guidelines - Multiple site SRAS	Schedule 4.1 item 11 provided for supplementary information relating to the capability "use of external network between SRAS sites". The evidence required was 'provide procedure or equivalent documentation endorsed by NSP. The AER considers this requirement increases the importance of ensuring the SRAS test procedure and SSP approvals required have been obtained and there is a check of the existence of formal arrangements.	This is already covered by the new defined concepts of SRAS Third Party Equipment and the requirements for test procedure approval by any other asset owners.
	2014 SRAS Guidelines - Schedules	The AER considers that the forms of Request for EOI, ITT, SRAS Agreement, Generator Modelling Data)these documents should be referred to as schedules to the SRAS Guidelines as an alert to documents that are relevant /required for an SRAS Provider to be aware of.	All these documents will be on the AEMO SRAS web page when required, however AEMO does not consider it appropriate for them to be part of the SRAS guidelines because they may change with every procurement. The Generator Modelling Data is expected to be available at all times so that any potential new SRAS providers can understand what they need to provide to AEMO. A current form of SRAS Agreement is also expected to remain on the website. An ITT form will be published for each procurement.
	STPIS	At AEMO's request, the AER provided its position on concerns raised by stakeholders during the consultation on the application of the STPIS 'availability' measure to outages relating to SRAS testing, including tests on notice by AEMO. The AER noted that as of 1 July 2018 all mainland TNSPs will be in STPIS version 5, and the Market Incentive Component counts associated with SRAS testing described in AEMO's draft SRAS Guideline would be excluded under clause 3.	AEMO thanks the AER for its view and trusts this allays NSP concerns.

Organisation	Category	Issues raised in SRAS Consultation stage 2	AEMO comments
	NER Clause 5.7.5(a)	At AEMO's request, the AER provided its position on concerns raised by stakeholders during the consultation that 'surprise' testing of SRAS could result in a potential breach of NER 5.7.5. The AER noted AEMO's advice that it would give TNSPs advance notice of testing sufficient to meet the 5.7.5(a) notice period. The AER considered there was sufficient time to seek a rule change, and would be happy to consider 'no action' requests from affected SRAS Providers if the AEMC had not completed its rule change process by that time, subject to conditions noted in the AER's submission.	AEMO will submit a rule change proposal to clarify that clause 5.7.5(a) does not apply where AEMO nominates a time for an SRAS test.
	Regulatory treatment of testing costs	In response to comments in submissions, the AER provided its view that SRAS is a negotiated transmission service. The AER said the cost should not be included in any revenue proposal submitted to the AER, but is expected to be negotiated and determined in accordance with NER 6A.9.1 and the TNSP's approved negotiating framework and criteria under NER 6A.9.2.	AEMO urges TNSPs to review the AER's response and engage directly with the AER should further clarification be required.

APPENDIX C – SRAS INDIVIDUAL RELIABILITY

SRS Final Determination		System Restart Standard			SRAS Guidelines (2017)				
-		-		Considerations	Factors	Sub-factors	Description	Example	Importance (Weighting)
-	-	-	-	-	SRAS Equipment Start Up historical	-	Pass of recent SRAS test	A unit passing an SRAS test in 6 months before contract commencement will score 100%. A service with no demonstrated evidence of SRAS testing is unlikely to score above 50%	High
SRAS Reliability	Composite Reliability	Aggregate Reliability	Individual Reliability	Expected Start Up Performance	SRAS Equipment – Reliability	Points of Failure	Reliability of SRAS Equipment based on configuration and individual equipment reliability	Single Emergency Diesel Generator used to start 1 of 2 units may score 93% (e.g. example 2 in Appendix D)	Medium
						Component Age and Condition	Relative currency of protection and control systems	A unit with recently upgraded AVR, Protection and control systems may score 100% for Component Age and Condition (1)	Low
						Fuel storage	Redundancy with the fuel supply systems	A unit that can switch to an alternative, independent fuel supply may score 100% for fuel storage	Low
						Previous SRAS experience	Proven experience delivering SRAS capability	A unit with recent experience demonstrating SRAS delivery may score 100% for Previous SRAS experience	Low
						Comms Link Redundancy	Where a communications link is relied upon to start a service	A unit may score 50% if it is reliant on a single communications bearer to initiate system restart.	Medium

SRS Final Determination		System Restart Standard		SRAS Guidelines (2017)				
			Considerations	Factors	Sub-factors	Description	Example	Importance (Weighting)
			Availability of SRAS Service	SRAS Equipment – Availability				High
	Transmission component reliability		Reliability of transmission components	Transmission equipment Reliability				High

APPENDIX D - SUPPLEMENTARY MATERIAL

Examples are provided below of SRAS equipment and subsequent individual reliability calculations. Note that these examples are for illustrative purposes only. AEMO will seek advice and information from the following participants as they have the best knowledge of their systems:

- Potential SRAS Providers, on SRAS Equipment Availability and Reliability.
- TNSPs, on Transmission Component Reliability.

These examples focus on calculating the individual reliability with an emphasis on the reliability of components that constitute the SRAS source. It assumes that the SRAS Equipment Availability and other factors to be assessed (see Section 4.1.2) are the same between different elements as summarised by the following table.

Table 1 SRAS Source Individual Reliability Components

			Assumption/Calculation
SRAS Equipment - Availability			(Same for all)
SRAS Equipment - Reliability (also known as expected Start-up Performance)		Points of failure	Calculated in examples
	Other factors	Component age and condition	(Same for all)
		Fuel storage	(Same for all)
		Previous SRAS Experience	(Same for all)
Transmission Component Reliability			Calculated in examples

Example 1. Individual Reliability calculation

Individual Reliability is calculated below (Figure 3), for the arrangement shown in **Error! Reference source not found.**, based on:

- SRAS Equipment Reliability, based on one unit that can meet the SRAS technical and capability requirements (Source A).
- Transmission Component Reliability, based on one CB connecting that SRAS Equipment (Transmission Type 1).

A final Individual Reliability is determined. N.B. This examples assumes SRAS Equipment Availability, and 'other factors' contributing to SRAS Equipment Reliability are 100%.

Figure 2 SRAS Equipment and Transmission Equipment configuration

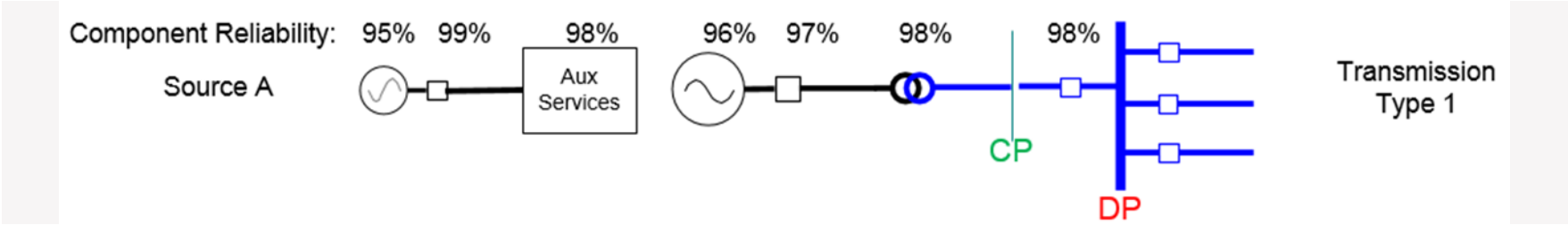

Figure 3 SRAS Equipment and Transmission Equipment calculation

	SRAS Equipment Reliability - Source A	Transmission Component Reliability - Transmission Type 1
Equipment reliability data	DG: 95.0% | CB: 99.0% | Aux.: 98.0% | Gen: 96.0% | CB: 97.0% | Txr: 98.0%	CB: 98.0%
Calculation 1	Source, Aux. and Gen. connection: 84.1%	CB: 98.0%

SRAS Equipment Reliability - Source A = 95% AND 99% AND 98% AND 96% AND 97% AND 98% = 95% x 99% x 98% x 96% x 97% x 98% = 84.1%	Transmission Component Reliability - Transmission Type 1 = 98%
Individual Reliability (Source A and Transmission Type 1) = 84.1% x 98% = **82.4%**	

Example 2. Individual Reliability calculation.

Individual Reliability is calculated below (**Figure 5**), for the arrangement shown in**Error! Reference source not found.Figure 4**, based on

- SRAS Equipment Reliability, based on two units that can meet the SRAS technical and capability requirements in their own right offered as a single SRAS source (Source B). These units have a common initial energy source e.g. diesel generator.
- Transmission Component Reliability, based on two CBs connecting that SRAS Equipment (Transmission Type 2).

A final Individual Reliability is determined. N.B. This examples assumes SRAS Equipment Availability, and 'other factors' contributing to SRAS Equipment Reliability are 100%.

Figure 4 SRAS Equipment and Transmission Equipment configuration

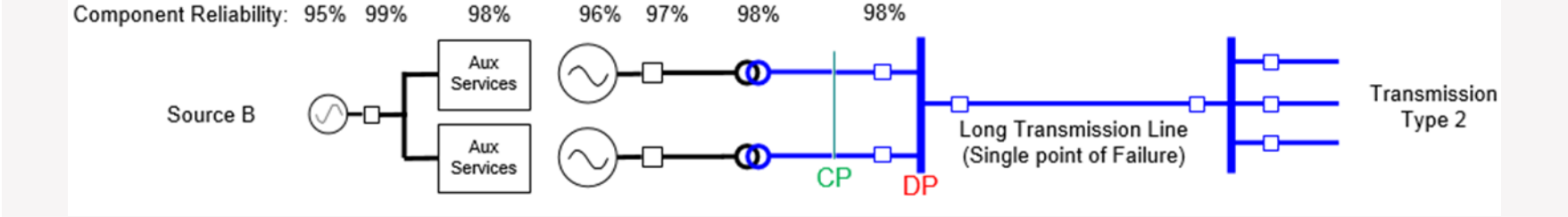

Figure 5 SRAS Equipment and Transmission Equipment calculation

	SRAS Equipment Reliability - Source B	Transmission Component Reliability - Type 2
Equipment reliability data	DG 95.0% · CB 99.0% · Aux. 98.0% · Gen 96.0% · CB 97.0% · Txr 98.0% · 98.0% · 96.0% · 97.0% · 98.0%	CB 98.0% · 98.0%
Calculation 1	DG+CB 94.1% · Aux. and Gen. connection 89.4% · 89.4%	CB 1 or 2 98.0% · 98.0%
Calculation 2	DG+CB 94.1% · Aux. and Gen. connection 98.9%	CB 1 or 2 100.0%
Calculation 3	SRAS Equipment 93.0%	Transmission Equip. 100.0%

SRAS Equipment Reliability – Source B 95% AND 99% AND ((98% AND 96% AND 97% AND 98%) OR (98% AND 96% AND 97% AND 98%)) = 95% x 99% x (1- (1- (98% x 96% x 97% x 98%)) x (1- (98% x 96% x 97% x 98%))) = 94.1% x ((1- (89.4%)) x (1- (89.4%))) = 94.1% x (98.9%) = **93%**	Transmission Component Reliability - Transmission Type 2 (98% OR 98%) = (1-(1-98%) x (1-98%)) = 100% = **100%**
Individual Reliability (Source B and Transmission Type 2) = 93% x 100% = **93%**	