SYSTEM RESTART ANCILLARY SERVICES GUIDELINE 2020

(INCORPORATING BOUNDARIES OF ELECTRICAL SUB-NETWORKS)

DRAFT REPORT AND DETERMINATION

Published: **August 2020**

NOTICE OF SECOND STAGE CONSULTATION – SRAS GUIDELINE

National Electricity Rules – Rule 8.9

Date of Notice: 3 August 2020

This notice informs all Registered Participants and all other interested parties (Consulted Persons) that AEMO is commencing the second stage of its consultation on amendments to the SRAS Guideline, also incorporating the boundaries of electrical sub-networks.

This consultation is being conducted under clauses 11.123.2, 3.11.7(f) and 3.11.8 of the National Electricity Rules (NER), in accordance with the Rules consultation requirements detailed in rule 8.9 of the NER.

Invitation to make Submissions

AEMO invites written submissions on this Draft Report and Determination (Draft Report).

Please identify any parts of your submission that you wish to remain confidential, and explain why. AEMO may still publish that information if it does not consider it to be confidential, but will consult with you before doing so.

Consulted Persons should note that material identified as confidential may be given less weight in the decision-making process than material that is published.

Closing Date and Time

Submissions in response to this Notice of Second Stage of Rules Consultation should be sent by email to sras.consultation.2020@aemo.com.au, to reach AEMO by 5.00pm (Melbourne time) on 4 September 2020.

All submissions must be forwarded in electronic format (searchable pdf or Word). Please send any queries about this consultation to the same email address.

Submissions received after the closing date and time will not be valid, and AEMO is not obliged to consider them. Any late submissions should explain the reason for lateness and the detriment to you if AEMO does not consider your submission.

Publication

All submissions will be published on AEMO's website, other than confidential content.

EXECUTIVE SUMMARY

The publication of this Draft Report and Determination (Draft Report) commences the second stage of the Rules consultation process conducted by AEMO on amendments to the System Restart Ancillary Services (SRAS) Guideline under the National Electricity Rules (NER). This report includes AEMO's responses to material issues raised in the first stage consultation, both in formal submissions and an industry forum conducted by AEMO.

The SRAS Guideline relates to AEMO's procurement, assessment and testing of SRAS to meet the procurement objective specified in the NER, incorporating the boundaries of electrical sub-networks for SRAS procurement. The SRAS Guideline is being updated following the *National Electricity Amendment (System restart services, standards and test) Rule* made by the Australian Energy Market Commission (AEMC) in April 2020[1] (Amending Rule). AEMO will finalise amendments to the SRAS Guideline by 2 November 2020, when the substantive provisions of the Amending Rule take effect.

This Draft Report discusses AEMO's assessment of the key areas of stakeholder feedback on the SRAS Guideline, and further proposed modifications from the first stage consultation draft Guideline that was published with AEMO's issues paper in May 2020.

SRAS procurement objective

The SRAS Guideline must include guidance on how AEMO will achieve the revised 'SRAS procurement objective' in the Amending Rule, which is to meet the Reliability Panel's system restart standard (SRS) at the lowest long-term cost.

The first stage consultation draft Guideline explained AEMO's interpretation of the procurement objective, consistent with statements in the AEMC's final determination on the Amending Rule. Specifically, the objective would allow AEMO to balance potentially higher up-front costs with long-term efficiencies, and to enter into longer duration contracts or procure various SRAS combinations if AEMO reasonably expects this to result in the lowest long-term costs for consumers. The draft Guideline included the following examples of relevant factors for AEMO in considering how to meet the objective:

- The impact of forecast power system development on the effectiveness of likely system restart paths.
- Actual and forecast availability and reliability of facilities with black start capability.
- The relative value for money of alternative sources of SRAS.
- The ability to share risk through callable options, renegotiation triggers, etc.
- The potential to facilitate or accelerate the investment, development, maintenance and availability of capabilities required to achieve the SRS in expected future power system conditions, and the associated cost and benefit.

While feedback indicated stakeholders were generally comfortable with the principles expressed, some suggested a need for more specificity on some of the examples provided, or limits on the maximum SRAS contract duration to minimise the risk of locking in poor performance or creating barriers to new services.

AEMO is conscious of the need to ensure that over-prescription in the SRAS Guideline does not inadvertently restrict the options that may be available to achieve the lowest long-term cost of SRAS, in the interest of electricity consumers. The SRAS procurement objective will require AEMO to balance variable factors in many different current and future scenarios, and the SRAS Guideline needs to remain principles -based rather than prescriptive.

After considering all submissions, AEMO decided to include some additional guidance to indicate the types of forecast changes in the power system that will be relevant to SRAS procurement decisions. AEMO will

[1] AEMC 2020, available at: https://www.aemc.gov.au/rule-changes/system-restart-services-standards-and-testing

also consider the feasibility of establishing a register or panel arrangement that could be drawn on to more quickly establish 'temporary' SRAS contracts should an existing source experience extended availability issues.

SRAS capabilities

The Amending Rule expanded the definition of SRAS to include any plant or combination of facilities with black start capability, no longer limited to generation. The rule also created a new category of SRAS called restoration support services, whose capabilities must be described in the SRAS Guideline.

It is important to note that AEMO is **not required** to acquire restoration support services in any electrical sub-network. They will only be needed if assessment indicates that restoration along a minimum restart path may not otherwise meet the SRS, given power system performance expectations. In the short term, AEMO expects to procure very few, if any, restoration support services. They are expected to play a more important role as the generation mix and power system conditions continue their transition.

The first stage consultation draft of the SRAS Guideline included amendments to address the additional content described by the Amending Rule. The bulk of the amendments related to restoration support services, which required a demonstrated capability to provide at least two specified attributes relating to:

- Self-start capability.
- Voltage or reactive power control capability.
- Frequency control capability.
- Provision of stabilising load.
- Provision of fault current.

AEMO made several further amendments to the first stage consultation draft SRAS Guideline in response to feedback on SRAS technical capabilities and testing requirements, including to confirm that:

- SRAS can be provided by combinations of facilities, including under separate ownership, although network service providers (NSPs) cannot themselves be SRAS Providers. This is consistent with the AEMC's final determination on the Amending Rule.
- A restoration support service need only provide one of the nominated capabilities, but self-start capability alone would not be procured.
- Load, or indeed any other facility, would only be considered as a restoration support service to meet an identified need for a restart path if the facility would not provide the relevant attribute or capability in any event. AEMO can only value a capability that would not otherwise be inherently delivered in expected power system restoration conditions.

AEMO also updated the draft Guideline in response to suggestions to clarify and improve the clarity of the capability and assessment requirements for black start services.

SRAS tests

In the first stage consultation draft of the SRAS Guideline, AEMO included revised guidance on the identification of differences between test procedures and actual restart conditions, including the role of NSPs in test facilitation and reporting. AEMO also proposed changes seeking to clarify the nature of plant maintenance that may trigger a requirement for an SRAS test.

Key issues raised in submissions on SRAS tests focused on the use of NSP measurement devices for test data, and on the appropriate trigger for post-maintenance SRAS testing.

In response to submissions, AEMO has decided to further modify the draft Guideline to:

- Incorporate the efficiency of using NSP-owned devices for recording test data where installed and available, but the availability or otherwise of those devices will not reduce the SRAS Provider's test reporting obligations.
- Provide that the need for testing must be considered after maintenance or alteration of plant or systems, where that work has the potential to materially impact SRAS performance or delivery.

Testing of system restart paths

The introduction of new provisions allowing AEMO and transmission network service providers (TNSPs) to test the viability of system restart paths was a major feature of the Amending Rule. A system restart test will verify what happens after an SRAS energises a transmission network delivery point, to confirm continued stable energisation further into the network, or identify unexpected interactions which can then be addressed.

As required by the Amending Rule, AEMO's first stage consultation draft of the SRAS Guideline included new guidance on factors influencing AEMO's decision to conduct a system restart test, and on the measurements and data to be reported to AEMO on the operation facilities during a test. The Amending Rule itself sets out a detailed process to consult with the test participants to develop the test schedule and program, so this is not included in the SRAS Guideline.

AEMO received a number of submissions that commented on matters that are regulated in the Amending Rule. AEMO decided not to expand on these matters in the draft Guideline, as that risks unnecessarily restricting the considerations and actions that may be needed for any given system restart test scenario. AEMO agreed with a number of other stakeholder recommendations, including the need for consultation with participants whose facilities are not participating in a test, but may be directly impacted by it, and modifications to some of the data measurement and reporting requirements.

Boundaries of electrical sub-networks

AEMO's Issues Paper outlined a proposal to combine the existing two electrical sub-networks within the Queensland region into one, and requested submissions on any drawbacks, advantages or unintended consequences not identified in the Issues Paper, or matters for deeper investigation.

AEMO recognises that any change to the boundaries will require the Reliability Panel to amend the SRS, and has been in ongoing discussion with the AEMC and panel members.

Most of the feedback on the single sub-network proposal was cautious or negative. However, most objections seemed to be based on a premise that AEMO could, or would, procure fewer SRAS sources in a combined sub-network, or procure SRAS sources only in the southern part of the Queensland region. This is an incorrect assumption. It is certainly not AEMO's intention, and would be inconsistent with fundamental principles of diversity and reliability in the SRS. Within the limits of the SRAS procurement framework, the ability to restore supply to as much of the power system as possible as quickly as possible in a worst-case black system scenario is of paramount importance to AEMO.

AEMO remains of the view that combining the sub-networks will reduce the inefficiency created by the need to allocate SRAS exclusively to a single sub-network. It will allow increased restoration path flexibility and better access to stabilising loads. This greater flexibility will be of benefit both under conditions where system restoration is required in any given part of the Queensland power system, or if necessary to restart the entire system.

AEMO's draft determination is to consolidate the north and south Queensland electrical sub-networks into a single sub-network, aligning with the NEM regional boundary for Queensland. If this remains AEMO's final decision, however, it will not take effect unless and until the Reliability Panel determines a revised SRS for the sub-network. The SRS will set the standard on which AEMO's procurement is based, supported by the economic analysis that many submissions noted was required.

AEMO will continue discussions with the Reliability Panel, Powerlink and other key stakeholders in Queensland to assist the Panel in its determination of an SRS that appropriately addresses any residual issues. In this regard, a hybrid approach as was adopted for the SRS for New South Wales could also be applied to Queensland to provide certainty that SRAS sources in both Central and South Queensland will continue to be procured.

This Draft Report sets out AEMO's detailed consideration of the material issues raised in the first round of consultation, and the further modifications AEMO has decided to make to the SRAS Guideline in its draft determination. An updated draft SRAS Guideline reflecting AEMO's draft determination has been published with this Draft Report, for the second stage of consultation with interested parties.

CONTENTS

1. STAKEHOLDER CONSULTATION PROCESS

As required by clauses 11.123.2, 3.11.7(f) and 3.11.8 of the National Electricity Rules (NER), AEMO is consulting on amendments to the SRAS Guideline (Guideline), incorporating boundaries of electrical sub-networks, in accordance with the Rules consultation process in rule 8.9.

Consultation documents are published and available on AEMO's website.[2]

AEMO's indicative timeline for this consultation is outlined below. Future dates may be adjusted depending on the number and complexity of issues raised in submissions.

Deliverable	Indicative date
Notice of first stage consultation and Issues Paper published	13 May 2020
First stage submissions closed	3 July 2020
Draft Report & Notice of second stage consultation published	3 August 2020
Submissions due on Draft Report	4 September 2020
Final Report published	15 October 2020

The publication of this Draft Report marks the commencement of the second stage of consultation.

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

2. BACKGROUND

2.1. Context for this consultation

On 2 April 2020, the Australian Energy Market Commission (AEMC) made the *National Electricity Amendment (System restart services, standards and testing) Rule 2020 No. 6*[3] (Amending Rule). The Amending Rule included substantive amendments in Schedule 1 and transitional provisions in Schedule 2.

Schedule 1 will commence on 2 November 2020; Schedule 2 commenced on 2 April 2020.

As required by the transitional provisions in NER clause 11.123.2(a), AEMO is amending the SRAS Guideline to reflect the Amending Rule by 2 November 2020.

2.2. Relevant NER requirements

As part of its power system security responsibilities under the NER, AEMO uses reasonable endeavours to acquire adequate system restart ancillary services (SRAS), to coordinate restoration of the power system following a major supply disruption, including a black system.

Clause 3.11.7(a1) of the NER, as amended by the Amending Rule, describes the SRAS procurement objective – to acquire SRAS to meet the system restart standard (SRS) at the lowest long-term cost. AEMO publishes the SRAS Guideline to describe AEMO's procurement process and other matters prescribed in the NER, consistent with achieving the SRAS procurement objective. When the Amending Rule takes effect, clause 3.11.7(d) will require AEMO to include in the SRAS Guideline:

(1) a description of the technical and availability requirements of system restart ancillary services;

(2) a process for meeting the aggregate required reliability of system restart ancillary services for each electrical sub-network under clause 8.8.3(aa)(3);

[2] SRAS Guideline consultation documents including the Issues Paper, forum presentation and stakeholder submissions are available at: https://aemo.com.au/consultations/current-and-closed-consultations/sras-guideline-2020

[3] AEMC, System restart services, standards and testing, Rule determination, 2 April 2020

(3) a process for the modelling, assessment and physical testing of system restart ancillary services proposed to be provided by an SRAS Provider, including any assumptions to be made by AEMO regarding the state of transmission elements during a major supply disruption;

*(3A) guidance to Registered Participants on the factors influencing a decision of AEMO to conduct a system restart test, including (but not limited to) the types of conditions or changes in the power system which could necessitate a system restart test;

*(3B) guidance to Registered Participants required to participate in a system restart test under clause 4.3.6 on the measurements and data to be reported to AEMO about the operation of their facilities during the system restart test;

(4) a process for determining the number and location of system restart ancillary services required to be procured for each electrical subnetwork consistent with the system restart standard;

*(4A) requirements designed to identify any inconsistencies between the arrangements used in the testing of system restart ancillary services and those planned to be used in the deployment of system restart ancillary services following a major supply disruption and how the impact of any inconsistencies will be assessed;

(5) guidance to Registered Participants on the factors that AEMO must take into account when making a decision to follow a particular type of procurement process to acquire system restart ancillary services to meet the SRAS procurement objective;

*(5A) guidance to Registered Participants on how AEMO will achieve the SRAS procurement objective;

(6) a process for AEMO to follow for contacting a potential SRAS Provider to negotiate the provision of system restart ancillary services without a competitive tender process; and

(7) a process for a potential SRAS provider to contact AEMO to offer the provision of system restart ancillary services without a competitive tender process, which offer AEMO is in no way obliged to accept.

*The requirements in paragraphs (3A), (3B), (4A) and (5A) were added by the Amending Rule.

In addition, the SRAS Guideline includes the boundaries of electrical sub-networks for SRAS procurement purposes. These are determined by AEMO under NER clause 3.11.8.

2.3. First stage consultation

On 13 May 2020, AEMO started consultation on proposed updates to the SRAS Guideline to account for the Amending Rule. The first stage consultation included an Issues Paper to facilitate informed feedback and an initial draft amended SRAS Guideline. The main changes proposed related to:

- Specification of the requirements for SRAS, including the new category of restoration support services.
- New testing requirements, both for SRAS procurement or contract testing and for wider testing of system restoration paths.
- Additional guidance on AEMO's procurement approach in light of the NER change to the SRAS procurement objective.

The Issues Paper also asked stakeholders for feedback on a proposal to combine the two electrical sub-networks in Queensland into a single sub-network.

AEMO received eight written submissions in the first stage of consultation, from AGL, CS Energy, ERM Power, Hydro Tasmania, MEA Group, Origin Energy, Stanwell and Tesla. AEMO also held a virtual industry forum on 24 June 2020.

Copies of all written submissions (excluding any confidential information) have been published on AEMO's website at: https://aemo.com.au/consultations/current-and-closed-consultations/sras-guideline-2020.

3. SUMMARY OF MATERIAL ISSUES

The key material issues arising from the proposal and raised by Consulted Persons in written submissions are summarised in the table below. The virtual public forum held on 24 June 2020 also included discussion of several of the same topics. For completeness, forum topics not directly raised in submissions are also noted in the table.

No.	Issue	Raised by
	Procurement objective	
1	Limit the length of long-term contracts to encourage newer participants	AGL
2	Seek the appropriate balance between contract length and new entries	CS Energy
3	Define the period and sources for "forecast power system development"	MEA Group
4	Use principles rather than examples to define long-term procurement objective	Origin
6	Consider temporary contract procurement arrangements	ERM Power
	Expanded SRAS definition	
7	Correct the definition of SRAS provider and clarify NSP eligibility	Stanwell, Forum
8	Clarify whether facilities owned by different participants can provide a service, or provide both black start and system restoration services	Stanwell
9	Describe how restoration support service requirements will be applied to generating systems containing multiple technologies, and co-located load	MEA Group, Forum
	Restoration support services	
10	Restoration support services should only need to provide one or more attributes	AGL, CS Energy, Forum
11	Multiple units comprising an SRAS service to settle on natural frequency	AGL
12	When will AEMO consider restoration support services, particularly stabilising load, and who can provide it	Stanwell, Forum
13	SRAS provider should agree to the size of network elements and load blocks to be restored	ERM Power
	Black start services	
14	Provide more guidance on specified minimum period to maintain output	MEA Group, Forum
15	Clarify reference to energy storage systems in Appendix A	MEA Group
16	Capability to be evaluated at the connection point rather than delivery point	Origin
17	Add flexibility for dynamic voltage control ranges	Stanwell
18	Acknowledge new technologies' ability to form an island	Tesla
	SRAS tests	
20	Requirements for additional high speed measurement data should not require installation of new equipment	Hydro Tasmania, Stanwell
21	Consider requiring use of suitable existing NSP equipment to provide measurement data	Hydro Tasmania, Stanwell

22	Additional assessment criteria or materiality threshold for SRAS equipment changes requiring re-testing after maintenance, and provision for waiver of test	Stanwell
23	SRAS testing after maintenance only if involving installation of new capital equipment	Origin
24	Define connection point transformer in Appendix A	Stanwell
	System restart tests	
26	Further guidance on how AEMO considers minimisation of impact to non-test parties and market participants when establishing system restart test programs	AGL, ERM Power, CS Energy
27	Selection process and timing of notification of parties who need to participate in system restart testing	ERM Power
28	More frequent testing of individual segments of system restart paths to minimise risk associated with more extensive test	AGL
29	Consider the use of NSP monitoring equipment in tests if available	Stanwell, CS Energy
30	Accountabilities for system restart tests between SRAS provider and TNSP/AEMO	Hydro Tasmania
31	Only require system restart test if AEMO assesses a change may compromise integrity of restart path, and report on assessment process	ERM Power
32	Confirm contract outcome for an SRAS provider if an extended system restart test fails	Stanwell
33	Market notices to be issued ahead of system restart tests	CS Energy
35	Requirements for additional high speed measurement data in Appendix B should not require installation of new equipment	Hydro Tasmania
	Modelling and assessment	
36	Allow alternative data to be provided for modelling purposes	ERM Power
-	Model validation using test results	AEMO
	Procurement process	
37	Ongoing process of modelling SRAS requirements should include robust consultation with industry participants and relevant equipment manufacturers	Tesla
	Queensland sub-networks	
38	A combined sub-network may result in degraded restoration services.	Origin, CS Energy, Forum
39	Cost benefit analysis required for Queensland sub-network combination	ERM Power, CS Energy
40	Hybrid approach to Queensland sub-network (like NSW) not recommended	CS Energy
41	Retaining sub-networks without SRAS being procured to send market signals	CS Energy
42	A combined sub-network does not reflect natural breakpoint	CS Energy
43	Clarification on the role cost-reduction plays in subregion combinations	Forum
44	Need for sources in both central and southern Queensland	Powerlink, Forum

A detailed summary of issues raised by Consulted Persons in written submissions, together with AEMO's responses, is contained in **Appendix B**. Presentation slides and notes from the 24 June 2020 virtual industry forum have been published on AEMO's website.

4. DISCUSSION OF MATERIAL ISSUES

This section 4 provides AEMO's assessment of the material issues identified in the first stage of consultation on the draft Guidelines. For detailed submissions and responses please refer to **Appendix B**.

4.1. SRAS procurement objective

4.1.1. Issue summary and submissions

The definition of the SRAS procurement objective was changed in the Amending Rule to require AEMO to procure SRAS to meet the system restart standard at the lowest **long-term** cost, on a reasonable endeavours basis. The Amending Rule also added a requirement for the Guidelines to provide 'guidance on how AEMO will achieve the SRAS procurement objective' (new clause 3.11.7(d)(5A) of the NER).

AEMO proposed new sections 6(c) and 6(d) of the draft SRAS Guideline to explain how AEMO interprets the new 'long-term costs' aspect of the SRAS procurement objective, noting the AEMC's statement in its final determination on the Amending Rule that: 'Practically speaking, this change will make it clear that AEMO can enter into long-term SRAS contracts, or procure specific combinations of services, if it considers that this will result in the lowest long-term costs for consumers'.

The Issues Paper noted that AEMO is expected to balance long-term and short-term costs to minimise expenditure. The ability to focus on longer-term procurement requires AEMO to focus less on a deterministic assessment of the SRS, and instead take more of a risk-based approach, where the benefits of new entry, technological advances and longer-term coordinated resource planning must be offset against the risk that AEMO might, in theory, be acquiring more services than might strictly be required for the power system as configured at the time of procurement. The Issues Paper also noted the procurement risk arising from the possibility that some system services, like restoration support services, might in future be remunerated with future market designs.

AEMO asked stakeholders to consider whether the factors described in section 6(c) and (d) of the draft SRAS Guideline were appropriate, or to suggest additional or alternative factors that could be readily applied for a range of future scenarios to meet the SRAS procurement objective. AEMO also invited views on potential contractual structures suitable for a wide range of SRAS and consistent with the objective.

The key observations, concerns and suggestions raised in submissions on this aspect of the draft SRAS Guideline were as follows:

- Of the submissions that commented on the SRAS procurement objective, the majority broadly supported the amendments, but suggested additional considerations.
- AGL suggested that long-term contracting could have negative as well as positive contracts, by discouraging new technology development or locking in poor performing sources. AGL proposed the SRAS Guideline should expressly limit contract duration to five years. CS Energy also noted the importance of appropriately balancing longer-term contracts with inadvertently creating barriers to entry or technological advances.
- MEA Group thought the Guideline could be more explicit about the reference period and sources AEMO would use for 'forecast power system development' when considering SRAS procurement.
- ERM Power suggested a temporary contract facility to mitigate the risk of a contracted source becoming unavailable for a temporary but extended period.
- Origin thought the examples of AEMO's considerations in the draft Guideline did not give enough guidance to providers on how to prepare their bids, and should be supplemented with principles.

4.1.2. AEMO's assessment

With regard to the limitations of long-term contracts, AEMO agrees there is an important balance to be struck between the advantages of incentivising investment in new capability or preserving low-cost capability with ongoing viability, and the potential drawbacks of shutting out or deferring the development of new sources or technology improvements. However, one of the AEMC's specified aims in amending the SRAS procurement objective was to make it clear that AEMO has the ability to enter into long-term contracts[4]. Limiting the SRAS contract period in the Guideline may prevent AEMO from achieving the objective, and is therefore not appropriate.

With regard to additional guidance on the period and sources AEMO will use when considering SRAS that are appropriate with regard to forecast power system development, AEMO agrees that it may be helpful to include some additional general guidance on this aspect. However, as already noted, achieving the lowest long-term cost objective will require AEMO to balance variable factors in many different current and future scenarios, and the SRAS Guidelines need to remain principles-based rather than prescriptive. SRAS should be viable both for current power system needs and, as far as can reasonably be anticipated, for the duration of the period for which it is contracted. The level of certainty (or uncertainty) in anticipated future power system conditions will be one of many factors relevant to determining an appropriate contract period, making it impractical to provide meaningful guidance on an appropriate outlook period. However, the SRAS Guideline can indicate the types of forecast changes that will be relevant to SRAS procurement, such as expected network development projects and expansion or retirement of scheduled generation capacity.

With regard to temporary contracting, conceptually AEMO agrees this would be a positive development, but it may not be economically feasible or meet the SRAS procurement objective for commercial reasons. Noting that the SRAS Guideline does not need to prescribe this type of arrangement for it to be implemented, AEMO proposes to further consider its feasibility, potentially in conjunction with an improved expression of interest register under section 8 of the Guideline. AEMO wishes to clarify that, other than reasonable cost considerations, the SRAS procurement objective does not prevent AEMO from seeking substitute services, either for part of an existing contract period or following its early termination.

With regard to proposed additional principles to guide SRAS offers, AEMO considers that the non-exhaustive list of considerations in the draft Guideline do not lend themselves to further prescription, because they will influence procurement decisions in a wide range of ways, and depend on conditions and circumstances that are inherently uncertain. Attempting to further specify how suppliers should offer services in the SRAS Guideline for all circumstances will reduce the discretion and flexibility that is critical to achieving the SRAS procurement objective. Specific considerations and requirements that may be relevant to individual procurement processes would be provided for in AEMO's tender documentation.

4.1.3. AEMO's conclusion

AEMO will add a note to section 6(d)(i) of the SRAS Guideline for additional guidance on the type of power system developments that will be taken into account in considering the SRAS required to meet emerging needs.

4.2. Expanded SRAS definition

4.2.1. Issue summary and submissions

The Issues Paper explained the proposed changes to the SRAS Guideline to incorporate the expanded definition of a *system restart ancillary service* in the Amending Rule. These changes cover a description of

[4] AEMC, System restart services, standards and testing, Rule determination, 2 April 2020, page (iv). Available at: https://www.aemc.gov.au/sites/default/files/documents/system_restart_services_standards_and_testing_-_final_determination.pdf

new 'restoration support service' capabilities, updates to reflect the possibility of services being provided by facilities other than generating units, and a review of the required capabilities for black start services.

Most of the issues raised on these changes are addressed in separate sections of this Draft Report, for restoration support and black start services respectively. However, a few submissions and feedback from the industry forum indicated some confusion about the ability for SRAS to be provided by a combination of facilities, including where they may be owned or operated by different participants.

- MEA Group asked AEMO to confirm the application of the requirements for restoration services to different generation technologies, or a mix of generation and load, connected at a single connection point.
- Stanwell requested clarification of the SRAS provider definition in the SRAS Guideline, and whether NSPs could also provide restoration support services. Stanwell noted its understanding from the industry forum that a combination of restoration support services and black start services, potentially owned or operated by different participants, could be captured as one generating system under a single SRAS agreement.

4.2.2. AEMO's assessment

The Amending Rule states that an SRAS can be provided by a combination of plant and facilities and does not limit the number or type of facilities that can provide an SRAS. The possibility of combined facilities under different ownership providing a service to a defined delivery point is already recognised in the existing SRAS Guideline, which acknowledges SRAS third party assets. AEMO has historically contracted a single service involving more than one power station, or SRAS provided using equipment owned by different parties.

For contract purposes, however, there are some limits to what is practical. For example:

- AEMO can only contract with a single provider, but this does not prevent a provider from negotiating arrangements with operators of other facilities (including network elements or other generators) that might be needed in combination with the provider's plant to supply, for example, a black start service at an ultimate delivery point.
- Each SRAS must have a defined delivery point. A service can be provided by a combination of two power stations with separate network connection points, but there must be a single agreed delivery point at which technical attributes are assessed and contractual performance is measured.
- Black start and restoration support services will be contracted as separate services (although they may be covered in the same contract document if provided by a common SRAS provider). Although black start facilities are expected to have capabilities that could be offered as restoration support, each type of SRAS serves a different purpose. Restoration support services will only be needed in parts of the network if AEMO considers that capabilities necessary to meet the SRS will not be inherently available given expected power system performance, including from black start sources.
- As the Guideline cannot consider all potential combinations of plant or facilities in all locations that could provide a service, it will be for the SRAS provider to describe how the proposed facilities will be able to deliver the capabilities required.

While NSP equipment could be part of SRAS equipment, the AEMC's final determination on the Amending Rule concluded that NSPs could not themselves be SRAS providers.[5]

[5] AEMC, System restart services, standards and testing, Rule determination, 2 April 2020, pages 47-48.

4.2.3. AEMO's conclusion

AEMO will correct the definition of an SRAS provider in the SRAS Guideline to refer to any registered participant, rather than only a generator. AEMO will also add a new section 3.1(c) to the draft SRAS Guideline, to clarify that individual SRAS can be provided by combinations of facilities, including under separate ownership.

Minor drafting amendments will also be made in section 3.5 of the draft Guideline to reflect the potential for differences between the connection point and SRAS delivery point, for both types of service, and ensure providers are aware of the need to have suitable arrangements with network service providers at those points.

4.3. Restoration support services

4.3.1. Issue summary and submissions

To meet the requirements of the Amending Rule, AEMO proposed a new section 3.4 of the draft SRAS Guideline, outlining the technical capabilities for restoration support services providing various attributes. These may be required in future to sustain the stable energisation of generation and transmission sufficient to facilitate restoration and maintenance of power system security during restart following a major supply disruption. AEMO does not expect that many (if any) restoration support services will be required in the short term.

General requirements for all restoration support services were set out in section 3.4.1 of the draft SRAS Guideline, with requirements for specific capabilities in section 3.4.2, including any two of self-starting, voltage or reactive power control, frequency control, provision of stabilising load, and fault current contribution.

AEMO asked stakeholders to consider whether the draft SRAS Guideline provided adequate guidance on the technical requirements for restoration support services, or were under or over prescriptive. AEMO noted the need to appropriately balance detail with the flexibility to adapt to changing network conditions and emerging technologies.

Several questions, issues and proposed changes for restoration support services were raised in submissions and the industry forum. Material issues were:

- AGL, CS Energy and forum participants suggested that the requirement to provide two or more attributes was unduly restrictive. It may exclude sources that can provide only one attribute (e.g. voltage control), in circumstances where that attribute may be particularly important.
- Forum participants and Stanwell questioned the potential role of major industrial loads in the provision of restoration support services, in particular whether there was any opportunity for them to offer stabilising load capability.
- AGL proposed that under section 3.4.2(c) of the Guideline, multiple units comprising a restoration support service be expressly permitted to settle on local island natural frequency (i.e. droop control), to eliminate complicated and expensive control systems.
- ERM Power suggested modifications to the general restoration support requirements under 3.4.1(b) and (c) to specify that the size of load blocks and network elements to be restored will be agreed between AEMO and the SRAS provider.

4.3.2. AEMO's assessment

It is important for potential providers of restoration support services to understand that there may be very limited need for restoration support services in the short term. Based on general submission themes and discussions in the 24 June forum, AEMO agrees that the SRAS Guideline should provide further explanation

of the circumstances in which AEMO may procure restoration support services. The Guideline should be clear that:

- AEMO will only procure a restoration support service where assessment indicates that restoration of minimum restart paths in a sub-network may not be able to achieve the SRS, given local power system and load characteristics and performance expectations. The inherent capabilities and expected behaviour of facilities that might otherwise be capable of offering restoration support services is included in this assessment.
- If follows that AEMO will not consider contracting for a capability or attribute that is expected to be present in any event. For example, a major industrial load on a minimum restart path would not be contracted to provide stabilising load simply by returning to operation as it normally would during system restoration.
- The need for stabilising load is most likely to arise if distribution feeders traditionally used for load pickup will not provide reliable load as a result of significant rooftop solar and other distributed energy resources. Uncontrolled load variations typically associated with rooftop photovoltaics may critically undermine restoration capability. In those circumstances, and to the extent needed to meet the SRS, AEMO may seek to procure a stabilising load service that would not be available unless contracted.

On other recommendations made by participants in their submissions, AEMO considered the following:

- AEMO agrees that a restoration support service providing only one attribute in a minimum restart path in an electrical sub-network may be valuable as the situation dictates. As an example, voltage control could support restoration of long transmission corridors during a restoration event, even if not providing any other attributes. Naturally, if multiple attributes are required to meet the SRS, facilities able to offer more than one of these attributes will be more highly valued.
- In considering this change, AEMO concluded that self-start capability alone cannot qualify for consideration as a restoration support service, since it is not a primary attribute to be delivered to the network for restoration support. Rather, it is a capability that may facilitate or speed up delivery.
- AEMO understands that some potential restoration support services comprising multiple generating units (such as hydro), may have challenges in providing a coordinated frequency raise and lower capability (i.e. distributed speed control), and would prefer to settle on the natural island frequency that standard governor droop settings would provide. However, AEMO concluded that the draft SRAS Guideline does not prevent this outcome. In particular, the current wording does not exclude the services AGL describes, recognises droop control as a valid form of frequency control, and does not mandate coordinated speed control.
- With regard to the size of network elements and load blocks to be restored, AEMO notes that the ability to energise network elements and restore load blocks is effectively incorporated in the new SRAS definition in the Amending Rule. To simplify the SRAS Guideline, AEMO therefore proposes to remove sections 3.4.1(b) and (c). This capability would be assessed as part of the modelling and assessment process, described in section 5 of the draft Guideline.

4.3.3. AEMO's conclusion

Based on forum discussions and recommendations received by participants in their submissions, AEMO has modified section 3.4 of the draft SRAS Guideline to:

- Clarify when AEMO may procure restoration services under section 3.4.1, including the need for facilities offering such services to provide incremental capability beyond what is inherently expected in existing operation.

- Remove sections 3.4.1(b) and (c), relying on the Amending Rule's inherent requirement for a restoration support service to be provided during energisation of network elements or restoration of load blocks.
- Reduce the multiple-attribute requirement for restoration support services from two to one under section 3.4.2, noting that self-start capability alone will not qualify for consideration.
- Modify the stabilising load description (section 3.4.2(d)) to clarify when AEMO would consider this attribute as a restoration support service.

4.4. Black start services

4.4.1. Issue summary and submissions

The Amending Rule expanded the definition of black start capability to allow it to be provided using a generating unit or other facility or combination of facilities. This required section 3.3 and Appendix A of the SRAS Guideline was updated to be technology neutral, except where generation output is a requirement and for trip to house load schemes.

As for restoration support services, AEMO asked participants to consider whether the proposed amendments provide adequate guidance on the technical requirements for restoration support services or were under or over prescriptive. AEMO noted the need to appropriately balance detail with the flexibility to adapt to changing network conditions and emerging technologies.

The key observations, concerns and suggestions raised in submissions on this aspect of the draft SRAS Guideline were as follows:

- MEA Group suggested further elaboration could be provided in relation to how AEMO would determine the 'specified minimum period' for SRAS equipment to sustain a level of generation at a Delivery point.
- MEA Group requested clarification on whether the proposed Appendix A1, item 11 (maintenance test for energy storage systems) covered both large scale battery storage system and systems to support auxiliary loads (e.g. UPS).
- Stanwell recommended further clarification on the dynamic voltage control requirement, indicating it was beyond the typical range of an Automatic Voltage Regulator (AVR) and at an unspecified location. Stanwell suggested such matters would be best subject to agreement with AEMO rather than a fixed range in the Guideline.
- Tesla recommended that AEMO define an automatic island control capability or through centrally directed manual switching.
- Origin proposed that the SRAS delivery point for a black start service should be the same as the facility's defined connection point to the network, as proposed for restoration support services.

4.4.2. AEMO's assessment

AEMO notes that the submissions addressing this area of the draft Guideline broadly supported the proposed amendments. On the specific matters raised by participants, AEMO considered the following:

- AEMO recognises that technology types, fuel sources, control systems and other considerations can all limit the time that a black start facility can either operate at zero export or supply a certain level of energy output. At the same time, the time for which those capabilities may need to be sustained after a major supply disruption can vary dramatically. This is particularly dependent on the location of an SRAS source relative to other facilities on the restart path, and the respective attributes and ability of those other facilities to 'replace' the output of the original source while continuing stable restoration

to meet the SRS. AEMO would need to assess this on a case-by-case basis during a procurement process. For this reason, the SRAS Guideline cannot provide prescriptive requirements on what might be an acceptable minimum period to either operate at zero export or sustain MW output, recognising the factors involved:

  - For remaining at zero export, a minimum period is unlikely in any circumstances to be less than 30 minutes, but could often be far longer.
  - For supplying a certain MW output, the time could vary from under an hour to several hours. This will depend on the needs of each electrical sub-network and the proximity and restart requirements of non-SRAS generators to be restarted by the SRAS source.

- AEMO agrees that the SRAS test for maintenance of energy storage systems in Appendix A (item 11) could have been clearer. AEMO has updated this parameter to clarify the intent is to evaluate any energy storage systems that may be used to support SRAS auxiliaries (including to start a diesel auxiliary generator), controls or other systems such as relays and communications. This test parameter is not relevant where the primary SRAS facility is a battery energy storage system (BESS) providing either a black start service or self-starting restoration support service.
- AEMO agrees that dynamic voltage control systems may be limited to a voltage range other than 90% to 110%, and it is appropriate for this range to be agreed with AEMO, in line with other parameters.
- AEMO understands Tesla's recommendation related to provision of black start (or self-start capability) of a battery energy storage system (BESS) through an automatic islanding function. With clarification from Tesla, it was understood that following a major supply disruption, a BESS may have the ability to automatically form a small AC island, isolated from the network, similar to trip to house load (TTHL) operation in thermal units. AEMO agrees that the SRAS Guidelines should recognise this possibility.
- In proposing to align the SRAS delivery point to a generator's connection point, Origin commented that generators would need to negotiate terms with the TNSP to provide a service to a delivery point located on the network side of their connection point. AEMO notes that black start capability, by definition, requires an ability to energise up to a point from which supply can be made available to other generating units. Black start services are potentially diverse, and the connection point will not always represent such a point. It is a fundamental assumption in the NER that SRAS providers must liaise with their NSPs (who are in turn required to cooperate) to facilitate the provision of SRAS. Any additional costs of doing so should be considered by the provider in its decision to offer.

4.4.3. AEMO's conclusion

AEMO has amended the draft SRAS Guideline to:

- Provide limited guidance on the minimum timeframe that a black start service may be required to operate at zero export (section 3.3(d) footnote), and clarify factors that AEMO will consider in determining a reasonable minimum period for a black start service to supply a certain level of generation (section 3.3 (e) footnote).
- Replace the 90% to 110% voltage range requirement in section 3.3(g), to an agreed voltage range. As a similar requirement was included for restoration support services, section 3.4.2(b) has consequently been updated in the same manner.
- Clarify Appendix A, item 11 (maintenance of energy storage testing) relates only to energy storage equipment that supports SRAS auxiliaries (including start-up of diesel auxiliary generators), controls or other systems.
- Update sections 3.3 and 3.4 to incorporate other island-forming facilities which can remain in operation after disconnection from the power system, in addition to TTHL.

4.5. SRAS Tests

4.5.1. Issue summary and submissions

Please note this section of the Draft Report relates to the testing of SRAS only, i.e. the provision of a service up to its nominated delivery point. Section 4.6 of the Draft Report discusses proposed Guideline amendments to incorporate system restart tests, as contemplated in the Amending Rule.

AEMO's first stage consultation draft of the SRAS Guideline updated the SRAS testing requirements in Appendix A to provide more information and remove existing ambiguity on some aspects, clarify the application of test requirements to black start and restoration support services respectively, and include relevant service records where appropriate. Draft section 4 was also amended to include additional guidance on:

- Measures to ensure understanding of the differences between SRAS test conditions and real major supply disruption processes.
- Test frequency, specifically to make post-maintenance tests more relevant.
- The role of NSPs in testing and reporting.

Stakeholder feedback on SRAS testing covered data and measurement requirements, triggers for re-testing following maintenance, and questions on terminology.

- Stanwell acknowledged the need for measurement devices to be in place for testing, but noted there may be efficiency gains if NSPs were obliged to share data from their existing measurement devices to form part of the data collected for SRAS tests.
- Hydro Tasmania considered the additional data requirements in the draft SRAS Guideline were too extensive for post-test analysis, and that many generating units would not have existing capability to monitor some values, such as three phase instantaneous waveforms for voltage and current. To address concerns about the cost and difficulties involved in installing new permanent or temporary high-speed monitoring equipment, Hydro Tasmania proposed the Guideline should only require the most detailed data that is reasonably available in respect of each item.
- Both Stanwell and Hydro Tasmania suggested adding a discretionary element or materiality threshold to section 4.3.2(b), allowing consideration of the need for testing or alternatively other supporting information based on advice on the nature of the intrusive work. Origin, however, recommended that an SRAS test after maintenance should only be required following the installation of new capital equipment.
- Given the expansion of SRAS testing steps in Appendix A, Stanwell asked for clarification on the definition of the connection point transformer, which may have different meanings for different parties.

4.5.2. AEMO's assessment

With regard to the need to install measurement equipment to record the parameters to be reported for an SRAS test, AEMO understands this may come at a cost to SRAS providers. To the extent that appropriate measurement equipment does not already exist to capture the quantities specified in Appendix A, particularly if required at generating unit terminals, AEMO considers the additional cost to arrange and install that equipment is unlikely to be material in the context of a contracted service, and can be considered by a provider in its SRAS offer if necessary. In terms of broader value, the use of this data for modelling verification may also minimise the need for more complex and costly system restart tests.

AEMO agrees with Stanwell's suggestion that NSP-owned high speed monitoring devices, if appropriately located and capable of meeting the requirements outlined in Appendix A, should be used in preference to installing new equipment.

With regard to SRAS tests after maintenance, AEMO agrees with Stanwell and Hydro Tasmania that the requirement for testing should be based on an assessment of the potential for material impact on the performance or delivery of SRAS. The purpose of the original change in the first stage consultation draft was to move away from the assumption that extended periods of maintenance will necessitate a test, towards more qualitative criteria. This would not be consistent with Origin's suggestion to restrict re-testing based on new capital equipment installation. As noted by Hydro Tasmania, even changes that can be undertaken quickly (e.g. protection relay settings) can have a dramatic impact on the ability of a plant to provide SRAS. This type of change, although potentially significant, may not necessarily be considered 'intrusive', as that term is open to different interpretations. AEMO will therefore update the draft Guideline to provide more discretion to test (or not) after maintenance based on the materiality of its potential impact on SRAS performance. AEMO also recognises the need for appropriate criteria to limit the potential for multiple annual tests or assessments after equipment changes.

AEMO agrees that the reference to a 'connection point transformer' in a test step could be unclear, and will amend Appendix A1 item 6 to refer to the energisation of transformers up to the SRAS delivery point.

4.5.3. AEMO's conclusion

AEMO remains committed to capturing an expanded data set that can be used to both verify in-field performance and to model accuracy, without imposing an unreasonably high cost burden. AEMO therefore does not propose to reduce the data captured during testing from that reflected in the first stage consultation draft.

Amendments will be made to the draft SRAS Guideline to reflect:

- Use of existing high speed network measurement devices where available and suitable to capture data otherwise required from the SRAS Provider, under Appendix A.
- Evaluation of the requirement to test based on the potential for equipment maintenance or alteration to materially change the performance or delivery of SRAS, under section 4.3.2(b)(i).

Noting the feedback received, AEMO also proposes to include information on how AEMO will apply test data and results to validate existing SRAS modelling. This is discussed further in section 4.7.

4.6. System restart tests

4.6.1. Issue summary and submissions

The introduction of new provisions allowing AEMO and TNSPs to test the viability of system restart paths was a major feature of the Amending Rule. A system restart test will verify what happens after an SRAS energises a transmission network delivery point, to confirm continued stable energisation further into the network, or identify unexpected interactions which can then be addressed.

AEMO proposed new sections 4.5 and Appendix B in the draft SRAS Guideline to provide the guidance required by the Amending Rule in relation to:

- Factors that would lead AEMO to decide a system restart test is required (section 4.5.1).
- How restart test participants should develop system restart test procedures (section 4.5.2).
- Test data and evidence to be measured, recorded and produced (section 4.5.3 and Appendix B).

These proposed additions attracted several comments and suggested changes from participants. Key concerns included the need for further detail on how testing will be coordinated amongst participants, how

testing will be communicated to the market and minimise market impacts, and the appropriateness of the expanded measurement requirements:

- AGL, ERM Power and CS Energy made similar comments underlining the importance of well-coordinated testing and communication channels both for direct test participants, and participants who may be indirectly impacted by testing on the live system.
- ERM Power and CS Energy were concerned that the draft SRAS Guideline did not specify in sufficient detail how the market impacts of a system restart test would be minimised. CS Energy also recommended that market advice be provided when a system restart test occurs.
- AGL agreed with the list of factors that may require a test, but suggested an approach focused on testing individual segments of the restart path more often rather than conducting large scale tests, to reduce the duration and risk to in-service plant during testing.
- ERM Power suggested qualifying the list of changes to a system restart path that could trigger the need for a system restart test, by requiring AEMO to have assessed the relevant change as one which may compromise the integrity of the regional restart plan. ERM Power also proposed that the Guideline include a requirement for AEMO to report on its assessment as part of the annual report under NER clause 3.11.10.
- Similar to SRAS testing, Stanwell acknowledged the need for measurement data but suggested that efficiencies can be gained by placing an onus on the NSP to provide measurement data during a test, should the NSP already have appropriate facilities in place.
- Hydro Tasmania agreed with the logic of incorporating an annual SRAS source test within the broader system restart test but, for contractual and operational clarity, suggested the Guideline should provide clear accountabilities and transition from an SRAS test (under the direction of a contracted SRAS provider) to the broader restart test under AEMO's direction. On a related theme, Stanwell requested clarification that if an SRAS provider delivers at its delivery point, but the system restart test fails beyond that point, the test should not be a fail for purposes of compensation under an SRAS agreement.
- Similar to its submission on SRAS test measurements, Hydro Tasmania also raised concerns about the extent of the data reporting requirements for participants involved in the testing of system restart paths. Hydro Tasmania considered this requirement may create a significant imposition on those participants, particularly if the data is mandatory.

4.6.2. AEMO's assessment

Clause 4.3.6 of the NER, to be included by the Amending Rule, addresses the scheduling, coordination and development of test programs for system restart tests in detail. Importantly, the Amending Rule requires AEMO to minimise market and system impacts of a system restart test.

AEMO considers that further detail in the SRAS Guideline is not appropriate because the scope and conditions of all potential system restart tests is vast, and the inclusion of specific criteria in a relatively static guideline may limit the considerations and actions that AEMO may reasonably need to factor in for each unique test. In relation to CS Energy's suggestion for broader notice to the market in advance of a system restart test, the need for an appropriate level of information would be accommodated within existing outage notification processes, based on its expected level of impact.

AEMO assessed the other changes proposed in submissions as follows:

- AEMO would in practice apply engineering judgment to assess the materiality and likely impact of the change(s), and only propose a restart test if there was evidence of that the efficacy of the system restart plan had been compromised. This is already indicated in the draft SRAS Guideline, and AEMO will make minor drafting adjustments for added clarity. AEMO notes that the extent to which it can

publicly report on its considerations in any meaningful way is limited by the sensitivity of the system restart plans, including SRAS sources and associated paths. AEMO therefore does not propose to expand on its NER 3.11.10 reporting obligations in the SRAS Guideline.

- Ideally, a system restart test will replicate conditions that could be seen after an actual black system as realistically as possible. NER clause 4.3.6 includes many requirements and controls to appropriately manage the risk to participants' facilities, and these will effectively limit the effect of limiting the extent of any restart path that can practically be tested. Therefore AEMO does not propose to mandate a segmented testing approach in the Guideline that could further limit the flexibility to test further if necessary and if conditions allow.
- AEMO understands that a system restart test could impact in-service facilities that are not participating in the test (for example by temporarily removing a fuel source shared with a test participant facility). AEMO agrees that it should be required to consult with other registered participants whose facilities are directly impacted in a similar way, so as to minimise disruption.
- With regard to the transition between an SRAS source and the extended network during a system restart test, this will occur at the contracted SRAS delivery point. If the test successfully demonstrates all the parameters to be met in an SRAS test, the test will pass. If it demonstrates that the SRAS cannot meet its contracted performance levels, the SRAS will be considered unavailable. This is consistent with existing standard SRAS contract terms, and AEMO has not identified a need to change the SRAS Guideline. However, AEMO will need to consider what should happen if a significant issue is discovered in the network that makes the SRAS ineffective in practice. Contractually the SRAS would remain available for payment purposes, but if the issue could not be rectified within a reasonable time AEMO cannot legitimately continue to acquire that SRAS indefinitely. AEMO intends to reflect this principle in the draft Guideline and in the terms of the standard SRAS agreement.
- The point raised by Hydro Tasmania highlights the key purpose of a system restart tests, which is to identify unknown issues or interactions not evident from individual performance tests or plant modelling. AEMO considers it would be appropriate for the SRAS Guideline to include a requirement for registered participants to take reasonable steps to address any issues that may have manifested during a system restart test, and for which they are accountable, as soon as practicable. It will be clear in the draft Guideline that this does not create an obligation to incur material expense in respect of a matter that a participant is not otherwise responsible for under the NER or any other law.
- AEMO's expectations of data and reporting requirements for system restart tests are set out in Appendix B of the draft SRAS Guideline. As each test will be different and may require more, less, or different measurements, the test program will need to cover the specific requirements. During the test consultation and planning process, AEMO expects that the availability of measuring and monitoring devices would be a specific consideration, and that the TNSP and other test participants will provide all reasonable assistance to facilitate those matters efficiently and effectively. As is the case for SRAS testing, suitable high speed monitoring devices in NSP networks should be used wherever possible, and this will be clarified in the draft Guideline.

Independently of participant submissions, on further review of the system restart test provisions in the first round consultation draft of the SRAS Guideline, AEMO has identified the need for updates to:

- Correct the list of data items to be captured by high-speed monitoring (Appendix B) to include RMS current and current waveform measurements at key locations. This is an important quantity to be captured for the model validation necessary for system restart studies, which could reduce the need for further system restart tests.
- Include provisions corresponding with those applicable to SRAS tests, to ensure test conditions reflect how facilities will operate following a real major supply disruption as far as practically possible, and otherwise to identify the differences.

4.6.3. AEMO's conclusion

AEMO has modified the draft SRAS Guideline to provide for:

- Modification of clause 4.5.1(b) to confirm that, in the case of a change that may trigger a system restart test, AEMO will assess the potential for the change to adversely impact the system restart plan.
- As part of the test planning process and in addition to the requirements of the Amending Rule, AEMO to consult with registered participants whose facilities are directly impacted by, but are not part of, a system restart test (section 4.5.1(d)).
- A new section 4.5.2(c) providing for participants to confirm the extent to which the system restart test reflects the expected operation of their facilities following a real major supply disruption.
- A new section 4.5.4 addressing the need for test participants to take reasonable steps to rectify any issues that may have manifested during a system restart test for which they are accountable.
- Clarifications and updates of Appendix B, including a new section B2.1 to confirm appropriate NSP equipment should be used to provide data for system restart tests where available, and system restart test participants (other than SRAS providers) are not obliged to install new equipment to measure values not captured in normal operation.

4.7. Modelling and assessment

4.7.1. Issue summary and submissions

AEMO proposed amendments in part 5 of the first stage consultation draft SRAS Guideline to harmonise modelling and assessment requirements with the additional restoration support services category, and to reflect changes made in other relevant instruments. In particular, AEMO amended the draft Guideline to link modelling information requirements to the Power System Model Guidelines, Power System Design Data Sheets, and Power System Setting Data Sheets (PSMG documents), which came into effect in July 2018. The PSMG documents are primary instruments specifying modelling data requirements, and AEMO considered it was appropriate to remove duplication and ensure consistency.

Only one submission commented on the changes in this part of the draft SRAS Guideline. ERM Power did not support the removal of section 5.2(b) in the current Guideline, which allowed the provision of alternative modelling data.

In addition, AEMO has identified that it may be helpful for the SRAS Guideline to explain that the process of model validation, using data from SRAS tests and system restart tests, may require SRAS providers to update their plant models.

4.7.2. AEMO's assessment

The removal of section 5.2(b) of the existing SRAS Guideline allows the PSMG documents to be the single source of modelling requirements without duplication or inconsistency. They set out in-depth requirements on modelling information to be provided (including for SRAS), but also include an exemption process that allows for the provision of alternative data in circumstances where the PSMG requirements cannot reasonably be met. This appears to address the concern raised by ERM Power.

As a general observation, the need to provide detailed modelling information of SRAS plant and facilities is increasingly important in a changing power system, combined with testing to verify existing assumptions that may no longer be valid. For SRAS purposes, access to detailed modelling information, ideally verified by high-quality in-field data during testing, can help to minimise the number and complexity of extended system restart tests required in future.

AEMO has decided to include additional provisions in the draft SRAS Guideline to explain that AEMO may use test results to validate the modelling data provided to AEMO and used for the purpose of SRAS modelling and assessment. In the event that validation identifies a discrepancy between measured data and the modelling data provided in respect of SRAS equipment, AEMO may require the SRAS provider to update and resubmit its model in accordance with the Power System Model Guidelines.

4.7.3. AEMO's conclusion

AEMO does not propose to reinstate old section 5.2(b) of the draft SRAS Guidelines, as they are now consistent with the information requirements and exemption process in the Power System Model Guidelines.

New provisions in sections 5.1 and 5.2 of the draft SRAS Guideline have been included in the Guideline to address the validation of modelling data and associated updates to be provided if required.

4.8. Procurement process

4.8.1. Issue summary and submissions

Tesla recommended that the standard practice of SRAS modelling requirements includes industry consultation with participants and relevant equipment manufacturers. AEMO understands, following further discussion with Tesla, that this recommendation more broadly relates to transparency in the procurement process, which includes modelling and assessment. This can be a particular issue for a variety of different and new technologies which may not have participated in SRAS procurement previously. Tesla's submission noted this recommendation is intended to promote avoidance of incumbency lock-in and drive efficiency in SRAS provision going forward, also reflecting technology advances.

4.8.2. AEMO's assessment

The existing SRAS Guideline incorporates alternative SRAS procurement processes, including an open competitive tender, direct request for offer or provision for unsolicited offers (sections 7 and 8). The level of prescription in those provisions is deliberately low, to allow AEMO to adapt its processes to changing system and market conditions, within the limits of the NER and SRS and the principles in the SRAS Guideline. The requirements and principles for AEMO's modelling and assessment of SRAS capability in section 5 also apply to any type of SRAS regardless of technology.

As such, AEMO considers that the SRAS Guideline does not limit or exclude any existing or new technology from participating in the SRAS procurement process.

In recent years AEMO has actively sought to contact developers of both new synchronous generation (with a high potential for significant SRAS capability) and has sought interest from inverter based technology developers and equipment manufacturers to include additional SRAS capability in future models. To further encourage and assist prospective new SRAS providers to submit unsolicited offers under section 8(c), AEMO will consider creating a sample expression of interest (EOI) form.

4.8.3. AEMO's conclusion

AEMO will not make any further change to the draft SRAS Guideline regarding the procurement process.

4.9. Queensland boundaries of electrical sub-networks

4.9.1. Issue summary and submissions

The SRAS Guideline incorporates AEMO's determination of the boundaries of electrical sub-networks for which SRAS is procured (under NER clause 3.11.8). Other than Queensland, all sub-networks are currently

aligned with the NEM regional boundaries. As part of this consultation, AEMO considered whether to consolidate the existing two Queensland electrical sub-networks that apply under the NER and SRS, for SRAS procurement purposes.

The Queensland region is currently divided into two electrical sub-networks, with the north-south boundary located just north of South Pine and Tarong. As a natural 'breakpoint' in the Queensland power system, this has historically been considered an appropriate boundary for SRAS procurement purposes.More recently, AEMO has re-examined this assumption and shifted its thinking, noting that there is an important difference between separation and system restoration.

Recent SRAS procurement rounds have confirmed that almost all generation capable of restarting and supporting the restoration of supply to meet the SRS is located in central and southern areas of the Queensland region. Maintaining separate sub-networks creates a requirement to identify distinct and separate restoration paths for each sub-network, each with SRAS procured to serve only one of those sub-networks.

Consolidating the sub-networks could enhance the overall restoration capability by allowing more options for generation, network and load restoration. This would provide more confidence that a restoration plan will work in an actual black system event, regardless of the extent of the network requiring restoration. Combining the sub-networks should also help to maximise the available stabilising load required for the SRAS units, potentially facilitating a faster rebuild of transmission corridors.

Submissions received on this matter generally did not support combining the two regions:

- Origin said that removing the North-Queensland sub-region could lessen the impetus to supply SRAS in that region and make it less likely for participants to invest in SRAS capabilities.
- Origin and CS Energy argued that the natural network breakpoints and propensity for natural disasters led to the need for a sub-region north of the Halys-Calvale cut-set, and that a combination that ignored this breakpoint will result in longer restoration times.
- ERM Power and CS Energy recommended a detailed cost-benefit analysis ahead of any consideration of a combination of sub-regions, where the analysis should clearly evaluate the cost of a delayed restoration.
- Noting the expanded definition of SRAS, ERM Power suggested and therefore, where previously there were limited option in central and northern Queensland, this definition change has the capacity to unlock more sources to provide the service in those areas.
- CS Energy thought that the hybrid outcome for New South Wales was not ideal, and subsequently clarified its view that it produced effectively the same outcome as having two sub-networks. CS Energy also considered the previous three-zone Queensland region (i.e. including northern Queensland) should have been retained, despite the absence of sufficient capability in northern Queensland. CS Energy suggested this would provide a clear signal to the market that SRAS capacity is required in that part of the network.
- In the SRAS forum, Powerlink was concerned that combining the sub-networks would not be desirable unless it could adequately address the geographical limitations within the network, extremely long transmission lines and load restoration obligations. Powerlink noted these factors require that black-start facilities are located in both the southern and central areas of the region.

4.9.2. AEMO's assessment

In the submissions received on this issue, AEMO identified a common, incorrect assumption that AEMO could, or would, reduce the quality or restoration capability of SRAS sources procured in a combined sub-network. This seems to have led to concerns that, for example, AEMO would only contract sources in

the southern part of the Queensland region, effectively ignoring restoration needs in central and northern areas.

It may not have been clear enough in the Issues Paper that these are neither expected nor intended outcomes of combining the existing sub-networks. Within the limits of the SRAS procurement framework, the ability to restore supply to as much of the power system as possible as quickly as possible in a worst-case black system scenario is of paramount importance to AEMO.

After the most recent SRAS procurement, subsequent to the last revision to the SRAS procurement objective and the 2016 changes to the SRS, AEMO started to re-examine the assumption that the 'natural breakpoint' within Queensland was relevant when considering how to efficiently restart and restore all or part of the power system *after* a black system had occurred. The network might well separate along that boundary, if a major supply disruption results from events in the north of the region. However, the point of separation is not determinative of the extent of a black system. AEMO considers that this potential breakpoint should not be a limiting factor for the options procured to restore any part of the network that actually goes black (whether north, south, a smaller island or the entire region).

The SRS will determine, after appropriate cost-benefit analysis and consultation by the Reliability Panel, the amount of MW to be restored in a specified time to a specified reliability in a sub-network. The SRS also requires diversity and location factors to be considered in AEMO's procurement process. Therefore, the number and location of SRAS sources (specifically black start facilities) needed to meet the SRS will be determined first and foremost by the inherent characteristics of the Queensland power system. To the extent possible, AEMO also takes account of energy support arrangements and the restoration of sensitive loads and stabilising loads in developing the restart plan. Consistent with AEMO's power system security responsibilities, these are also relevant considerations for AEMO when procuring SRAS.

For these reasons, under current system conditions, AEMO expects the restoration capability of SRAS sources contracted in a combined Queensland sub-network to be of the same or higher quality as recent procurement rounds. Acknowledging the Reliability Panel is yet to determine a combined standard, at least one source would have to be located in central Queensland to meet the diversity requirements of the SRS in any event.

AEMO understands the desire for greater certainty that restart capability will not be degraded by combining the sub-networks. AEMO will continue discussions with the Reliability Panel, Powerlink and other key stakeholders in Queensland to assist the Panel in its determination of an SRS that appropriately addresses any residual issues. In this regard, AEMO notes the hybrid approach adopted in 2016 for the New South Wales standard could also be applied to Queensland. This would confirm that SRAS sources in both south and central Queensland (e.g. "north of Bundaberg") will continue to be procured.

While this approach would preserve the perceived benefit of retaining two sub-networks by prescribing specific locational diversity requirements, it also allows the benefits of combining the sub-networks to be realised. As outlined in section 4.9.1, combining the sub-networks will increase efficiency, optionality and therefore confidence in the system restart plan (and achieving the SRS). Recognising that a black system could cover most or all of the region or a large or small island within it, removing the procurement boundary could be expected to deliver the following benefits:

- Allowing each SRAS source to be procured and planned optimally, for use to energise suitable paths to its north and/or south as required.
- Maximising the available stabilising load required for the SRAS units, potentially facilitating a faster rebuild of transmission corridors.
- Facilitating restoration path flexibility, which may need to adapt as distribution feeders become increasingly less stable for load pick-up on clear days.

AEMO notes the observation by some participants that maintaining smaller sub-networks within Queensland, irrespective of current SRAS capability, could provide market signals for potential providers to develop or improve those capabilities. While there may be merit in this suggestion, which could perhaps be considered further by the Reliability Panel, it is not an issue AEMO can readily address. AEMO observes that the value of a procurement standard in encouraging new development must be balanced against the likelihood of achieving the desired response in current and reasonably foreseeable conditions. It seems undesirable to set a standard there is little prospect of meeting.

4.9.3. AEMO's conclusion

AEMO's draft determination is to consolidate the north and south Queensland electrical sub-networks into a single sub-network, aligning with the NEM regional boundary for Queensland. If this remains AEMO's final decision, however, it will not take effect unless and until the Reliability Panel determines a revised SRS for the sub-network. AEMO will work with the Reliability Panel and other key stakeholders to address any residual concerns.

5. OTHER MATTERS

In further reviewing the draft SRAS Guideline, in addition to the changes discussed in section 4 of this Draft Report, AEMO has made a number of other minor drafting improvements, clarifications and error corrections. These are marked up in the version published with this Draft Report and include:

- For transparency given the potential for new providers to be offering restoration support services, confirmation that suitable data communication facilities will be required (section 3.2). For generators, these are the same standards as required by the NER.
- Update to section 3.5 recognising the possibility that restoration support services may not necessarily have their delivery point directly on a transmission network, while black start services to be delivered at the transmission network could include SRAS equipment connected at the distribution level.
- Addition of historical performance measure for restoration services without self-start capability in section 3.6.3.
- Clarification of some test measurement and data requirements in the appendices.

6. DRAFT DETERMINATION

AEMO has considered the matters raised in written submissions on AEMO's Issues Paper and at the industry forum on 24 June 2020, and had subsequent discussions with some individual participants to clarify their concerns. Following consideration of all these matters, AEMO's draft determination under rule 8.9(g) of the NER is to:

- Amend the SRAS Guideline in the form published on AEMO's website with this Draft Report.
- Subject to consideration and determination of the Reliability Panel, revise the boundaries of electrical sub-networks (included in the SRAS Guideline) by combining the two existing sub-networks in Queensland to make one sub-network equivalent to the Queensland region.

Appendix A. **GLOSSARY**

Term or acronym	Meaning
AC	Alternating current
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator Limited
Amending Rule	The National Electricity Amendment (System restart) Rule 2020 No. 6.
BESS	Battery energy storage system
Black start service	An SRAS procured for its 'black start capability', as defined in the Amending Rule
DC	Direct current
DER	Distributed energy resource
EMT	Electromagnetic transient
NEM	National Electricity Market
NER	National Electricity Rules
NSP	Network Service Provider
PSMG	Power System Model Guidelines
PV	Photovoltaic
QLD	Queensland
Restoration support service	A service with the capability to sustain the stable energisation of generation and transmission in a system restoration.
RMS	Root mean square
SRAS	System restart ancillary service
SRAS Guideline (or Guideline)	The guideline made by AEMO in accordance with clause 3.11.7 of the NER.
SRAS procurement objective	The objective to be met by acquiring SRAS. Under the Amending Rule, this is to meet the system restart standard at the lowest long-term cost.
SRS	The system restart standard made by the AEMC Reliability Panel
SVC	Static VAR compensator
TNSP	Transmission Network Service Provider
TTHL	Trip to house load
UPS	Uninterruptable power supply
VAR	Volt-Amp reactive

Appendix B. SUMMARY OF SUBMISSIONS AND AEMO RESPONSES

B.1 Summary of submissions on the SRAS procurement objective

No.	Consulted party	Issue / Recommendation	AEMO response
1	AGL	If the ultimate driver is to facilitate new entrant capacity, then there are risks that new types of untested technology may not perform as well as initially expected. If contracted under SRAS, these contracts may still remain in place but will consequently require additional supplementary SRAS procurement to meet the shortfall in SRAS requirements. Furthermore, once a long-term contract is in place, this will likely discourage new types of generation becoming SRAS capable. This may therefore prevent technologically superior and cheaper SRAS providers from becoming available. We propose AEMO can manage these risks under the guideline by limiting the duration of long-term contracts by no more than five years. We also consider the factors outlined in section 6(d) of the guideline should better reflect both the positive and negative impacts of long-term contracting. For example, the section could be amended to state "the potential to facilitate, or create barriers to, investment, development, maintenance and availability of capabilities required to achieve the SRS…".	AEMO will not put a limit on the duration of contracts for Black Start or System Restoration Services in the SRAS Guideline. In appropriate circumstances, long-term contracts may encourage new entry, innovation and investment and should be retained as an option. The AEMC recognised this possibility in its final determination on the Amending Rule, at page iv. To realise these outcomes and achieve the SRAS procurement objective going forward, contract duration may not necessarily be the same across the NEM or even within electrical sub-networks. Within the limits of the system restart standard, a portfolio approach may become more appropriate as the power system transforms. Equally, AEMO is cognisant of the possibility that the system restart standard may change over time, although the essential restart need remains and SRS changes should not restrict the duration of contracted SRAS assessed to have long-term benefit. AEMO acknowledges the risk that an SRAS procured may not perform as expected. Equally though, it may prove very useful and cost effective. Performance risks managed contractually. Ultimately, AEMO will always retain the right to terminate an SRAS agreement for under-performance, and would then seek replacement services. The factors listed in section 6(d) are not specific to long-term contracting, but to SRAS procurement generally. Contract duration is one of many considerations relevant to AEMO's procurement decision. In particular with regard to sub-paragraph (v), the potential to facilitate or accelerate future capabilities will be assessed and valued according to the level of that potential and the associated costs (naturally including risk) and benefits. AEMO considers that expressing the counterfactual is unnecessary and would not represent the objectives of procurement.
2	CS Energy	CS Energy broadly supports the factors described in sections 6(c) and (d) of the SRAS Guideline in meeting the requirements of the SRAS procurement objective with the inclusion of long-term SRAS contracts in the mix. However, CS Energy would encourage AEMO to	Noted. AEMO agrees this is an important balance and has sought to retain flexibility in the Guideline to strike that balance in a range of current and future circumstances.

No.	Consulted party	Issue / Recommendation	AEMO response
		ensure it seeks the appropriate balance between the duration of such contracts and inadvertently creating barriers to entry by excluding the benefits of new entry and technological advances that can meet the requirements of an evolving technical envelope of the NEM power system from a SRAS perspective. Such an outcome would impact on the delivery of the lowest long-term cost and value to the consumer.	
3	MEA Group	MEA Group supports the amendment to the SRAS procurement objective. To the extent that AEMO can reasonably determine long-term value for money for consumers, section 6(d)(i) of the Paper could be more explicit and better define the reference period and sources for "forecast power system development". For instance, nominating a common long-term planning horizon which may already be common amongst AEMO and Network Service Providers (e.g. annual planning time horizons or the ISP).	Noted, but the nature and role of SRAS mean the need for certainty of operation makes it impractical to apply comparable forecast outlooks to those in longer-term planning reports. The intent of the Amending Rule is for AEMO to consider the contracts and combinations it considers will result in the lowest long-term costs for consumers (requiring in fact an assessment of both short and long-term costs). This can't be limited to any specific assumptions, such as the prevailing ISP forecast, but AEMO agrees that the SRAS Guideline could indicate the type of power system development or changes that would be part of AEMO's considerations. These would include major generation and transmission network asset retirements or augmentations that could impact restart paths and can be predicted with reasonable certainty (e.g. notified generator closure years, announced and committed retirements or development projects).
4	Origin	The draft guideline uses examples to demonstrate how AEMO would meet its new long-term procurement objective. However, these do not provide clear guidance for proponents to prepare their bids. Suggest that these examples are supplemented with principles that AEMO would use when assessing which SRAS to procure. This will provide guidance on what AEMO is looking for in assessing the bids it will receive. • Providing capability to meet the system restart standard at minimum cost considering the actual and forecast availability and reliability of facilities with black start capability.	Proposed sections 6(c) and 6(d) highlight the possibility that the amended SRAS procurement objective may require services to be acquired using a less deterministic, more risk based approach. The non-exhaustive list of considerations in the draft Guideline do not lend themselves to further prescription, because they will influence procurement decisions in a wide range of ways, and depend on conditions and circumstances that are inherently uncertain. By attempting to further specify in the SRAS Guideline how suppliers should offer services for all circumstances, we would inevitably reduce the discretion and flexibility that the AEMC intended to provide and which is essential to achieve the SRAS procurement objective. The Guideline is intended to be capable of application to all SRAS procurements on an ongoing basis. While seeking to provide reasonable certainty to potential providers on SRAS requirements, expectations and obligations, it must remain flexible enough to adapt to a range of variable future scenarios. Restricting this

No.	Consulted party	Issue / Recommendation	AEMO response
		• Procuring services consistent with forecast power system development, including consideration of when restoration support services may be needed to supplement black start services.	flexibility may exclude procurement solutions that best meet the objective, and are consistent with the national electricity objective. Please note that any specific considerations and requirements relevant to individual procurement processes for a sub-network would be provided for in AEMO's tender documentation.
5	Stanwell	Stanwell considers that factors described in section 6(c) and (d) of the Guidelines as broadly appropriate considerations in meeting the SRAS procurement objective; to acquire system restart ancillary services to meet the system restart standard at the lowest cost. Noting that a procurement process and objective developed to achieve the greatest net benefit for both consumers and generators would be preferential.	Noted.
6	ERM Power	ERM Power is supportive of the proposed amendments to the SRAS procurement objective. With regards to potential contracting frameworks, we believe there may be value in introducing a "temporary procurement contract" which would allow AEMO to quickly put in place a time limited contract in the event of the temporary but extended unavailability of a currently contracted SRAS or part of the system restart path that could impact the SRAS from providing the restart service if required. AEMO would be allowed to contract this capability from a known but currently uncontracted SRAS provider.	Conceptually AEMO agrees this could be a positive development, but may not be economically feasible for commercial reasons. AEMO is generally aware of all black start capable sources in the NEM, and can identify suitable alternatives immediately if they exist. The SRAS procurement objective does not prevent AEMO from seeking substitute services, either for part of an existing contract period or following its early termination. However, if suitable backup contracts could be negotiated in advance and maintained as ERM Power suggests, significant time savings could result. Such arrangements may not be possible within the SRAS procurement objective. This is a high risk where there are very limited alternatives able to materially contribute to the SRS, as is currently the case for black start services in most regions. Providers have previously told AEMO that they require non-trivial payments to maintain SRAS capability for such an eventuality. The resources involved in assessing, testing, negotiating and maintaining backup SRAS also need to be factored in. As it is not necessary for a panel arrangement or other temporary contract mechanism to be prescribed in the Guideline, AEMO will give further thought to its feasibility, potentially in conjunction with an improved expression of interest register under section 8 of the Guideline.

B.2 Summary of submissions on the expanded SRAS definition

No.	Consulted party	Issue / Recommendation	AEMO response
7	Stanwell	Under clause 1.3.1 the definition of an SRAS Provider specifies that only a Generator can be an SRAS Provider. Given the intention of the rule changes, Guidelines and forum discussion, the definition needs to be updated to include restoration support service providers. Clarification about eligibility and how a network service provider (NSP) could provide restoration support services is also recommended if the intention is to broaden the scope of SRAS Providers in this manner.	AEMO agrees that an SRAS Provider is not limited to a Generator and has corrected this oversight in the Guideline. On the question of whether NSPs can be SRAS providers, the AEMC's final determination concluded that they could not (AEMC, System restart services, standards and testing, Rule determination, 2 April 2020, pages 47-48).
8	Stanwell	It was acknowledged by participants during the SRAS forum on 24 June 2020 that SRAS Agreements need to reflect the intention of the rule changes and SRAS Procurement Guidelines. For example, a combination of restoration support services and black start services, potentially owned or operated by different participants, could be captured as one generating system under a single SRAS agreement.	It has always been possible to combine facilities to offer a single service meeting the capability requirements for an SRAS. The owners and operators of those facilities must negotiate all arrangements necessary to offer that service to AEMO. AEMO has proposed a new section 3.1(c) to make this explicit in the Guideline. Black start and restoration support services will be contracted as separate services (can be under the same contract if a single SRAS provider). Although facilities providing a black start service are expected to have capabilities that could be offered as restoration support, each type of SRAS serves a different purpose. Restoration support services will only be needed in parts of the network where AEMO considers that capabilities necessary to meet the SRS are unlikely to be inherently available given expected power system performance, including from black start sources.
9	MEA Group	MEA Group supports the addition and description of restoration support services described in section 3.4 of the Paper. The description of technical requirements provides an appropriate level of detail to contemplate the provision of services with asynchronous plant. However, unique cases, such as multiple generators with a mixture of synchronous and asynchronous	The Amending Rule defines restoration services as a subset of system restart ancillary services, without limiting the plant or facilities (or combination of plant and facilities) that can provide those services. There is no limitation on the number or type of plant or facilities that may combine to provide a service. However, given the number of possible plant combinations and the range of potential system requirements, it is impractical for the Guideline to explain how AEMO might apply the requirements to any given service offer.

No.	Consulted party	Issue / Recommendation	AEMO response
		technologies behind a connection point, may prove more complex in meeting the descriptions provided. During a system black event, these generators may have distinct technical attributes. In such instances where multiple generating (and load) units exist at a single connection point, we encourage AEMO to advise how they will apply the requirements for restoration services and how these requirements can be distinguished per generating (or load) unit.	Instead, AEMO would need to rely on the potential restoration support service provider to describe how their plant or facilities can meet the capability requirements set out in the Guidelines, either individually or as a set.

B.3 Summary of submissions on restoration support services

No.	Consulted party	Issue / Recommendation	AEMO response
10	AGL, CS Energy	Under AEMO's proposed amendments, section 3.4.2 requires a Restoration Support Service to be capable of providing two or more of the attributes listed in sub paragraphs. We do not consider the 'two or more' requirement is necessary and should be removed to provide the option of procuring a support service with only one of the attributes listed. This may be particularly valuable in circumstances where one of the support services is particularly needed for the restart path. For example, AEMO may be predominantly concerned with the voltage levels of a restart path. Windfarms, solar farms and any other inverter based technology may be best placed to provide this voltage/reactive support but unable to provide further support without significant investment. _____ CS Energy sought to understand the rationale for the requirement for a Restoration Support Service to be capable of two or more of the attributes described in	AEMO agrees that if a facility can provide only one of the restoration support attributes, it can still be valuable in sustaining stable energisation of generation and transmission to meet the SRS. Section 3.4.2 has been updated to replace the 'two or more attribute' requirement with only a 'one or more' requirement noting: • If a service is self-start capable, it must also provide one or more of the other 3.4.2 attributes; self-starting alone willnot meet the new SRAS definition (sustain the stable energisation of generation and transmission) or assist in meeting the SRS. • Restoration services will be procured where there is an identified need on the Minimum Restart Path. That is, where AEMO expects that restoration might not achieve the SRS in an electrical sub-network, given available characteristics of the power system. AEMO also notes that where there is identified need to procure services for more than one of the attributes in an electrical sub-network, services that provide more than one of the Section 3.4.2 attributes may be more highly valued.

No.	Consulted party	Issue / Recommendation	AEMO response
		section 3.4.2 of the SRAS Guideline, as it may preclude AEMO from procuring a legitimate service. For example, a Participant's non-synchronous generating system that incorporates a synchronous condenser would exclude the synchronous condenser from being eligible for consideration as a Restoration Support Service under the proposed guidelines, as it can only provide voltage control. CS Energy suggests that section 3.4.2 of the SRAS Guideline be amended by replacing the requirement for "two or more of the attributes" with "one or more of the attributes".	
11	AGL	With regard to the proposed section 3.4.2 (c) of the guideline, we propose that multiple units operating as a SRAS provider be allowed to settle on the natural frequency of the islanded network. This will eliminate the need for complicated and expensive control system changes, and also allow for a much larger combination of units to be used in the SRAS restart path. We note that with a black start capable station that consists of many individual units (such as Hydro) it is difficult to provide dynamic frequency control, that is the control systems and other factors do not easily allow the group of generators to change the frequency. Frequency control is left to the natural governor and droop response when operating as a group	AEMO understands AGL is referring to a challenge specific to the behaviour of particular plant. AEMO notes that section 3.4.2(c) is not a mandatory requirement for restoration support services, and that once connected to the system under restoration, droop control from a restoration support service still provides value in maintaining frequency standards. AEMO does not propose any changes to 3.4.2(c), as it does not exclude the service described from being considered for procurement as a restoration support service.
12	Stanwell	Based on discussions during the SRAS forum on 24 June 2020, it was evident that both traditional and new technology participants would welcome more explicit guidelines as to when restoration support services in section 3.4.2 would be required and how they would be valued. For example, it is unclear from the Guideline how loads might provide 'stabilising load' as restoration support services. The basis for	AEMO agrees that further clarification is required on how stabilising loads would provide a support service. Section 3.4.2 (d) of the Guideline has been updated to provide further information on when a Stabilising load would be required and considered as a restoration support service. The requirement that the support service must provide two or more services has been changed to one or more service as noted in the previous issue. This means that a load (for example, but not limited to pumped Hydro, battery energy

No.	Consulted party	Issue / Recommendation	AEMO response
		and operation of the requirement in clause 3.4.2 that a restoration support service must provide two or more of the specified attributes would also be informative	storage systems) can offer to provide a Stabilising load, without the need to provide additional attributes.
13	ERM Power	ERM Power offers the following comments with regards to the proposed technical requirements for restoration support services; 3.4.1 (b) -during energisation of network elements (including transformers, lines) **of an agreed size**; and 3.4.1 (c) -during restoration of load blocks of an **agreed size** For clarity, a restoration support service should only be required to support the restoration of transformers or lines or restore load blocks to a size as agreed between AEMO and the service provider	In considering this suggestion, AEMO has concluded that 3.4.1(b) and (c) of the draft Guideline are inherent characteristics in the new NER SRAS definition and do not need to be referred to explicitly in the Guideline. They will be removed. AEMO also notes that during procurement each SRAS will be assessed on capability to energise (or in the case of support service assist energise) network elements and load blocks as dependent on the surrounding network. This assessment is required for AEMO to evaluate if the prospective services can meet the SRS, and as such a specific size need not be referenced in the Guideline.

B.4 Summary of submissions on black start services

No.	Consulted party	Issue / Recommendation	AEMO response
14	MEA Group	MEA Group generally supports the amendments to the definition of black start services, as described in section 3.3 of the Guidelines. However, further definition or elaboration could be provided for the "specified minimum period", as described in 3.3(f), and how this period is determined for a Delivery Point capable of meeting the other technical requirements of section 3.3. For example, outlining the process by which this is determined and the relationship to the restoration times necessary to meet the SRAS requirements for each electrical sub-region. This aspect is most pertinent to those developing energy	The minimum periods for maintaining zero export or sustaining a certain level of generation are deliberately left open because these requirements will vary widely depending on the location of a source relative to other facilities on a minimum restart path and the attributes of those other facilities (e.g. fast start). Footnotes have been added in the Guideline to convey the relevant factors in this assessment, and to confirm that they would be specified in the SRAS agreement if awarded. In the case of maintaining zero export, the footnote suggests the minimum period is unlikely to be less than 30 minutes, noting that it could still be considerably longer.

No.	Consulted party	Issue / Recommendation	AEMO response
		storage systems with limited discharge duration capacities.	
15	MEA Group	If Appendix A.1, item 11 is proposing to cover both storage systems to support auxiliary loads (e.g. UPSs) and large scale battery storage systems, it should be detailed and tested separately. If this is not to be addressed in the Guidelines, then it should be specifically addressed during the development of the detailed test program, for the avoidance of doubt (e.g. not exceeding an agreed upon number of tests per annum).	Appendix A, item 11 applies to where energy storage equipment or systems are used to support SRAS auxiliaries (including to start a diesel auxiliary generator), control or other systems (for example relays, comms). This test is only applicable where energy storage systems are installed to supply these auxiliaries, controls or other systems in the event of an emergency and for SRAS provision. AEMO agrees that this was not clear in the first stage draft of the Guideline. Appendix A has been updated to clarify the application of this aspect of the test.
16	Origin	The draft guidelines require black start generators to provide capability up to a delivery point on the network. We consider that instead the guideline should set out for each generator a level of service relating to its connection point, as is used for system support generators. Generators are only capable of providing a service up to its connection point. For generators to provide service to a delivery point they need to negotiate terms with the TNSP. Such agreements can be costly and there is often not a guarantee of service level	This is a long standing requirement consistent with the NER. All SRAS must be able to energise or support energisation up to and into a transmission network. For black start services, the SRAS delivery point must therefore represent the closest point on a transmission network that can be re-energised, and from which there is reasonable confidence of energising other auxiliaries. This may be the connection point, or not. Note that AEMO does not exclude distribution-connected sources from providing SRAS - in that case the delivery point would typically be at the transmission level. It is a fundamental assumption in the NER that SRAS providers must liaise with their NSPs (who are required to cooperate) to facilitate the provision of a service. Any additional costs of doing so must be considered by the provider in its decision to offer.
17	Stanwell	Stanwell considers that the amendment of the SRAS Description and black start service capability, along with new clauses 3.3 (f) to (k) of the Guidelines are appropriately prescriptive of the characteristic of the service. However, further clarification about clause 3.3 (g) could be provided. Clause 3.3 (g) refers to a specific voltage range of 90 per cent to 110 per cent which is beyond the range of typical Automatic Voltage Regulators (AVR). The location at which this range is applicable is not specified. It would be preferable for the range and location to be flexible, and left subject to agreement with AEMO.	AEMO agrees that dynamic voltage control may be limited to a lower range than was specified in the first stage consultation draft. Sections 3.3 (g) and 3.4.2 (b) (ii) have now been updated to allow the range to be subject to agreement with AEMO, in line with other specified parameters.

No.	Consulted party	Issue / Recommendation	AEMO response
18	Tesla	For self-starting services, Tesla can activate its grid-forming mode. However, to ensure desired service outcomes can be achieved, we recommend AEMO define an island control automatically, or through a centrally directed manual switching (as per AEMO's current approach). The resynchronisation with the power system can then be performed either automatically, or manually – enabling transition back to PQ mode (grid-following) with precise voltage and frequency control maintained throughout.	AEMO understands this point relates to provision of black start (or self-start capability) of a battery energy storage system (BESS) through an automatic islanding function. Such that following a major supply disruption a BESS has the ability to automatically form a small AC island. This is similar to TTHL operation, which does not require restart of generating units. IAEMO agrees that minor clarification can be included in 3.3(b) and 3.4.2(a) to refer to island forming facilities that do not need to start up, in a similar way to TTHL.
19	CS Energy	CS Energy considers that the proposed changes to the definition of SRAS and black start capability in the SRAS Guideline provides adequate guidance on the technical requirements for a black start service. AEMO appears to have achieved the appropriate balance between the requirements while remaining, to the extent possible, technology-neutral.	Noted.

B.5 Summary of submissions on SRAS tests

No.	Consulted party	Issue / Recommendation	AEMO response
20	Hydro Tasmania, Stanwell	Hydro Tasmania noted one of the major differences in the technical requirements in the proposed SRAS guideline … is the significant increase in data requirements from the existing 2017 SRAS guideline to the proposed 2020 SRAS Guideline… …While the data requirements in the existing guideline, for generating units, generally align with the Generator Performance Standards requirement for Remote Monitoring (S5.2.6.1), the requirements in the proposed SRAS Guideline are substantially increased. Many generating units for instance do not have the existing capability to 'monitor the three phase instantaneous waveforms for voltage and	AEMO notes that new generating systems connecting to the grid are required to have high speed monitoring capabilities with attributes like those described in Appendix A for compliance monitoring purposes (whether it is an SRAS provider or not). However, plant under previous versions of generator performance standards may not have been subjected to such requirements. AEMO does not agree that if a key location or quantity as specified in Appendix A is not currently monitored, that it should be left unmonitored during a test. The high speed data collected as part of testing forms an important input into validating the EMT models used for SRAS studies. Greater confidence in these models leads to improved and more accurate system restart studies, reducing the burden on all parties to participate in complex tests. AEMO considers it is appropriate for the necessary monitoring equipment to be installed by SRAS providers if it is not already present, and this should not represent an

No.	Consulted party	Issue / Recommendation	AEMO response
		current at unit terminals and other points of interest'. This monitoring capability would then either need to be installed permanently at substantial cost, (in the order of tens of thousands of dollars per point) or alternatively temporary monitoring equipment would need to be set-up for a particular test. In particular, for a short-notice test (5 business days), a temporary set-up requiring specialist resources and equipment would be difficult to expedite at such short notice, and would not be part of, and indeed would complicate, the normal operational arrangements for an SRAS test. Noting that this high speed data is for post-test analysis, not for operational use, Hydro Tasmania requests AEMO consider amending the additional new data requirements, to require the most detailed data that is reasonably available, in line with the general data requirements that AEMO has outlined. _____ Stanwell supports the clear separation between SRAS testing and System Restart Path testing requirements and procedures. Recommendations for improvements and clarification in relation to testing include: ... - Appendix A, table A1 item 2a potentially requires the installation of high-speed transient monitoring equipment that may not exist at some facilities but, maybe covered by similar equipment in adjacent NSP facilities. It is recommended that this should be acknowledged as a substitute.	unreasonable imposition on an SRAS provider in the context of a contracted service. However, in line with Stanwell's submission, AEMO does agree that it is efficient to use existing monitoring facilities (e.g. at the connection and delivery points) which may be owned by the NSP, provided that those facilities meet the requirements of the Guideline. Sections A1.1 and B2.1 have been added to reflect this.
21	Hydro Tasmania, Stanwell	Hydro Tasmania notes the change in 4.3.2(b) Testing of contracted SRAS, from a requirement to test following maintenance of relevant equipment being out of service for 7 days or more, to a requirement to test following intrusive work on relevant equipment.	AEMO agrees with Hydro Tasmania that the potential impact of work or plant alterations on the capability to deliver SRAS is the key factor in determining whether a test is needed. AEMO also agrees that a full SRAS test is often unnecessary for work that may be considered intrusive from a whole of plant

No.	Consulted party	Issue / Recommendation	AEMO response
		The proposed change appears more appropriate, as impact on the performance not duration of the outage should be the key consideration. A change of a setting in a relay for instance may be undertaken relatively quickly, but the impact may be significant. It is suggested however, that a discretionary element be included in this clause, with an SRAS Provider to advise AEMO of the nature of the intrusive work, and AEMO to either require an SRAS test to be conducted or other supporting information to be provided. It can be foreseen that particularly if an SRAS consists of a number of elements, that this clause may be triggered a number of times in a year. To provide this flexibility may provide a better balance between the disruption of additional testing and the verification of SRAS functionality, for instance intrusive work that only affects normal on-line operation could be verified by return to service testing, whereas other work that affects functionality, such as Black Start capability, would reasonably require an SRAS test. _____ Stanwell suggested that a materiality threshold in clause 4.3.2(b)(i) for work on SRAS equipment that would require a test should better equip existing and new participants to understand obligations and costs of providing services.	perspective but is unlikely to impact SRAS, such as routine like-for-like replacement of major generating unit parts used in normal operation. Please note that standard SRAS contracts already give AEMO the discretion to waive a test requirement, but it is important for the requirement to be triggered so there can be due consideration. AEMO will update section 4.3.2(b)(i) of the draft Guideline to provide more discretion to test (or not) after maintenance based on the materiality of its potential impact on SRAS performance.
22	Stanwell	Stanwell supports the clear separation between SRAS testing and System Restart Path testing requirements and procedures. Recommendations for improvements and clarification in relation to testing include: ... - Including a provision that would allow for AEMO and the SRAS Providers to agree to waive a test based on materiality of the maintenance work undertaken and the potential implications on market	AEMO proposes no changes. Detailed testing requirements will be in the SRAS Agreement, while the SRAS Guideline gives indicative information to potential providers about what they can expect in terms of maximum potential testing (to decide whether to offer). Consideration of market conditions is provided for in 4.3.2(c) and partly also in NER 5.7.5.

No.	Consulted party	Issue / Recommendation	AEMO response
		conditions. Stanwell acknowledges that clause 4.3.2(c)(ii) provides for reasonable request of the SRAS Provider and the TNSP in relation to scheduling to be considered. However, because clause 4.3.2(c)(iv) only requires a formal notice to be provided only to the TNSP 15 business days in advance of the test date, and a no less than 5 business days' notice to an SRAS Provider 4.3.2(b)(ii), the ability to make a reasonable request under 4.3.2(c)(ii) is diminished.	
23	Origin	In clause 4.3.2 the draft guidelines set out that SRAS providing generators will need to complete tests within 20 business days after "intrusive work". We consider that intrusive work should be defined so that it only covers the installation of new capital equipment. Additionally, where generators are undertaking a series of works over a period of weeks, they should be able to delay the re-test until all elements of the project are complete. Requiring too many tests after minor work will incur costs for the generator, along with the TNSP and AEMO.	Defining intrusive work for all possible scenarios for all plant types is impractical. Having such definitions within a relatively static guideline may also not capture valid re-testing scenarios that may arise with new technology types or novel restoration services. On further considering this issue, AEMO considers that 'intrusive' may be open to an interpretation that is too narrow in some cases and too wide in others. The essential criterion for testing is that a change has been made to the SRAS Equipment or its operation or control, that has the potential to materially impact SRAS performance. Therefore, in line with the issue raised by Hydro Tasmania, an amendment to clause 4.3.2(b)(i) has been made that allows for engineering judgement to be used when evaluating whether work has the potential to materially impact on SRAS performance.
24	Stanwell	Stanwell supports the clear separation between SRAS testing and System Restart Path testing requirements and procedures. Recommendations for improvements and clarification in relation to testing include: ... - Appendix A, table A1 item 6 refers to a "connection point transformer". Further clarification as to which transformer this is referring to is required.	AEMO notes the potential ambiguity in this terminology for different service providers and has changed the description to refer energisation of transformers up to the delivery point.
25	CS Energy	CS Energy agrees that it is highly likely that differences will arise between a test procedure and the actual restart procedures – as acknowledged in the SRAS Guidelines a test will never be able to mimic real event conditions. It is an imperative that the differences be identified and recorded with an appropriate level of detail to ensure that there is a	Noted.

No.	Consulted party	Issue / Recommendation	AEMO response
		clear understanding of the differences and their operational applicability by the key stakeholders to the process	

B.6 Summary of submissions on system restart tests

No.	Consulted party	Issue / Recommendation	AEMO response
26	AGL, ERM Power, CS Energy	AGL considers the verification of the System Restart paths are vital, however it comes at a risk of cost to multiple parties. AEMO and all parties involved need to be made aware of all aspects of the proposed tests and the risk to not only the plant involved in testing but also the existing in-service plant. Whilst the guideline make reference to the test development process, and the obligations of test participants, set out under cl 4.3.6 of the rules, the guidelines should provide further guidance as to how AEMO will consult when developing the test program. In particular with reference to cl 4.3.6(g) of the rules, the guideline should set out the factors AEMO will consider when determining an appropriate lead time before testing given the impact on test participants, and non-participants, and the risks they may face. The guideline should also set out when AEMO may consult with non-test participants to assess the impact on in-service plant along with central dispatch outcomes. _____ With regards to the actual testing of the system restart paths test, CS Energy notes comments from TNSPs at the Guideline Forum on 24 June which indicated that there are particular difficulties involved in testing restoration paths that cover large parts of the network and that the technicalities and costs are	AEMO understands that the issue raised is so that appropriate care is given to develop, coordinate and execute system restart tests to minimise the impact to the market, customers, and participants (both those directly and indirectly involved), particularly for complex tests or tests where indirect participants may be affected. AEMO has included an additional section 4.5.1 (d) in the Guideline, requiring AEMO to consider the reasonable requirements of registered participants that don't need to directly participate in the test, but whose facilities could be materially adversely impacted by it. On the remaining issues, AEMO notes that clause 4.3.6 (d) through (g) of the Amending Rule clearly places an onus on AEMO to: • Consult with test participants on the time and scope of the test, with appropriate minimum lead times • Base the wider test program on the participant- and NSP-submitted test procedures • Consider longer periods of time to receive submissions on test procedures • Have regard to maintaining system security, minimise central dispatch variations (for all participants), and minimise costs AEMO considers NER 4.3.6 to adequately cover the remaining concerns raised without being so specific as to limit flexibility for all potential testing scenarios across the NEM.

No.	Consulted party	Issue / Recommendation	AEMO response
		not insignificant and could severely constrain the market and interconnector. As market participants receive no compensation for market impacts either during or as a result of any system restart path test, we believe section 4.5 should include details of how AEMO will plan and co-ordinate both the timing and extent of any system restart path test. This should set out the framework to be followed by AEMO for discussion and consultation with TNSPs and market participants _____ CS Energy encouraged AEMO to identify the most effective SRAS test to the extent possible to ensure that it can best replicate how the SRAS is expected to be used in a real event without compromising good operating practice and minimising the impact on the market. CS Energy also suggested further detail is required in the SRAS Guideline in relation to the Restart Test Participant that includes: - selection process of the Restart Test Participant; - provision of advice by AEMO to the Restart Test Participant; - specification by AEMO to the Restart Test Participant detailing the requirements and expectations arising from the SRAS test; - provision for the Restart Test Participant to provide relevant input to the SRAS test; ...	
27	ERM Power	ERM Power believes this new section of the Guideline is deficient in the area of process for selection of registered participants required to participate in a system restart test. The Guideline should provide details of how registered participants required to participate in a system restart paths test will be	As indicated in section 4.5.1 of the Guideline, the system restart test will test a Minimum Restart Path, to the point it is necessary and feasible to do so. It follows that the selection of test participants will be based on the need for them to operate all or part in a particular way to allow that path to be tested, as

No.	Consulted party	Issue / Recommendation	AEMO response
		selected and the methodology which will be used by AEMO to advise the registered participant that they have been selected as a required test participant. We believe it would be helpful for AEMO to advise non-contracted market participants who may be required to participate in the system restart path test as soon as possible after the awarding of SRAS contracts.	indicated in NER 4.3.6(b). Given the range of possible conditions and electrical configurations, the Guideline cannot include more detail. AEMO and TNSPs will review and update regional system restart plans after procuring new SRAS, but the need for, and extent of, any system restart test will not be established at that point. Clause 4.3.6 provides for an extensive period of identification and engagement with test participants, at the point when a test is actually contemplated and engagement will therefore be meaningful for the prospective test participants. Please note AEMO does propose to add an additional requirement (at section 4.5.1(d) of the Guideline) to consider the reasonable requirements of registered participants that don't need to directly participate in the test, but whose facilities could be materially adversely impacted by it.
28	AGL	We agree with the factors outlined under section 4.5.1 of the guideline. In particular, in circumstances of material changes to facilities involved in the restart path, these tests will ensure facilities remain capable of meeting the restart path requirements. However as noted above, AGL is concerned with the increased risk to in-service plant during testing and also the period of these tests. AGL prefer an approach focussed on testing individual segments of the restart path more often rather than conducting large scale tests.	AEMO understands that any network testing brings a potential for increased risk to asset owners, and intends to conduct tests only when genuinely needed, based on consideration of the criteria outlined in 4.5.1 of the draft Guideline. A segmented approach as proposed by AGL may not be able to replicate the conditions and critical parts of the sequence that would be needed 'on the day' as realistically as an extended network test would. AEMO notes that NER clause 4.3.6 includes many requirements and controls to manage the risk to participants' facilities, and these will have the effect of limiting the extent of any restart path that can practically be tested.
29	Stanwell, CS Energy	Stanwell acknowledges the difficulty and potential impacts and hopes that these inclusions will facilitate more comprehensive and realistic testing. Stanwell considers that Appendix B adequately covers the requirement for physical restart path testing if the following recommendations are incorporated: ... Appendix B should recognise that high speed monitoring equipment may exist at either or both the participant's facility and NSP's facility. Installation of new equipment in existing facilities should not be mandated by the Guidelines. _____	AEMO agrees that it is efficient to use existing monitoring facilities which may be owned by the NSP, provided that the existing facilities meet the measurement requirements outlined in the Guideline. Sections A1.1 and B2.1 have been added to reflect this. The installation of new monitoring equipment will not be mandated by the SRAS Guideline for participants who are not SRAS providers (SRAS providers will be required to monitor aspects of the performance of their service). All registered participants are of course expected to have equipment that complies with their NER obligations. AEMO's expectations of data and reporting requirements for system restart tests are set out in Appendix B of the draft Guideline. As each test will be

No.	Consulted party	Issue / Recommendation	AEMO response
		CS Energy would encourage AEMO to identify the most effective SRAS test to the extent possible to ensure that it can best replicate how the SRAS is expected to be used in a real event without compromising good operating practice and minimising the impact on the market. Furthermore, further detail is required in the SRAS Guideline in relation to the Restart Test Participant that includes: ... - AEMO to specify data and reporting requirements to the Restart Test Participant; and - if the Restart Test Participant does not have the required data recording equipment, and if required, is this a legitimate third-party cost?	different and may require more, less, or different measurements, the test program will need to cover the specific requirements. In response to CS Energy's question on the cost of data recording equipment, AEMO notes that NER clause 4.3.6 provides a compensation mechanism for test participants who are not SRAS providers or NSPs. During the test consultation and planning process, AEMO expects that the availability of measuring and monitoring devices would be a specific consideration, and that the TNSP and other test participants will provide all reasonable assistance to facilitate those matters.
30	Hydro Tasmania	Whilst it is logical to incorporate the testing of a contracted SRAS source, (as one of its mandatory annual tests), within the broader System Restart Test, it is noted that these tests have different drivers and accountabilities. The contracted SRAS source is particularly the responsibility of the SRAS provider to arrange and undertake to meet particular contractual requirements and may be witnessed by AEMO. The foreshadowed System Restart test would presumably be the responsibility of and co-ordinated by AEMO with a broader operational focus. For both contractual and operational clarity, it would be valuable for the Guidelines to provide clear accountabilities and transition from an SRAS test (presumably under the direction of a contracted SRAS provider), verifying contractual conditions to a broader restart test under AEMO's direction.	AEMO agrees that system restart tests have different drivers and accountabilities from the regular SRAS tests. The latter are prescribed in the SRAS Agreement (by reference to the Guideline), to demonstrate the minimum contractual requirements up to the defined SRAS delivery point. If the SRAS test parameters have been successfully demonstrated at the delivery point, the test passes because that is the complete test for contract purposes. If adverse interactions or issues occur in a system restart test after that point (noting that the main objective of those tests is to identify such issues), we propose to include a new section 4.5.4 in the Guideline requiring relevant participants to address issues for which they are responsible. It will be clear in the draft Guideline that this does not create an obligation to incur material expense in respect of a matter that a participant is not otherwise responsible for under the NER or any other law. Although the SRAS would remain technically available, in the event of a critical failure that can't reasonably be remedied, it would be unreasonable for AEMO to continue acquiring that service and contract termination may be appropriate. AEMO will confirm this in the draft Guideline and review the standard SRAS contract accordingly.
31	ERM Power	ERM Power is generally supportive of the testing requirements as set out in section 4 of the Guideline.	AEMO is not required to schedule a system restart test in these circumstances (or any circumstances). While ERM Power's proposed amendment reflects the

No.	Consulted party	Issue / Recommendation	AEMO response
		We do however suggest an amendment to section 4.5.1 (a) (ii) with regards to scheduling of an out of schedule system restart path test as follows; "significant changes to generation or network conditions in the Minimum Restart Path within an electrical sub-network have occurred since the date of any previous test **which AEMO has assessed may compromise the integrity of the regional restart plan**, including:" Whilst changes may occur in generation or network conditions, these changes may have no detrimental impact on the integrity of the regional restart plan. Only where AEMO has assessed that a detrimental impact may have occurred due to a change should a new out of schedule system restart path test be scheduled. .... We recommend that the Guideline also set out that AEMO will provide details of the [system restart test] assessment process as part of meeting the clause 3.11.10 reporting requirements.	intended application of these provisions, this is already addressed by section 4.5.1(b). This confirms that a test will not be initiated unless AEMO's modelling and assessment indicates it would impact the system restart plan and power system security. There is no intent to carry out these tests more frequently than necessary and prudent. AEMO will update section 4.5.1(b) to confirm that the assessment would need to indicate a potential adverse impact, and also that it will consider the extent of testing needed. On reporting, the extent to which AEMO can publicly report on its considerations in any meaningful way is limited by the sensitivity of the system restart plans, including SRAS sources and associated paths. These issues were raised in consultation on the Amending Rule, and NER 3.11.10 is appropriately limited. For that reason, AEMO will not attempt to add specific reporting requirements in the Guideline that it may be unable to fully comply with.
32	Stanwell	Stanwell welcomes the proposed rule 4.3.6 allowing for compensation of third-party participants during test regimes and the introduction of a formal framework supporting the physical testing of restoration beyond the contracted SRAS delivery points. Stanwell acknowledges the difficulty and potential impacts and hopes that these inclusions will facilitate more comprehensive and realistic testing. Stanwell considers that Appendix B adequately covers the requirement for physical restart path testing if the following recommendations are incorporated: - A provision clarifying that a test in which an SRAS provider delivers at a delivery point, but which fails	Stanwell correctly summarises the position, but AEMO does not consider that any further clarification is necessary or appropriate in the Guideline. The parameters for an SRAS test are set out separately from system restart tests in the guideline and reflected in the SRAS Agreement. With regard to the transition between an SRAS source and the extended network during a system restart test, this will occur at the contracted SRAS delivery point. If the test successfully demonstrates all the parameters to be met in an SRAS test, the test will pass. If it demonstrates that the SRAS cannot meet its contracted performance levels, the SRAS will be considered unavailable. This is consistent with existing standard SRAS contract terms, and no change to the Guideline is needed. However, AEMO will need to consider what should happen if a significant issue is discovered in the network that makes the SRAS ineffective in practice. Although contractually the SRAS would remain available, if the issue could not be rectified within a reasonable time AEMO could not legitimately

No.	Consulted party	Issue / Recommendation	AEMO response
		beyond the SRAS delivery point, should not be deemed a failed test for purposes of compensation under an SRAS agreement.	continue to acquire that SRAS. AEMO will note this in the Draft Guideline and consider this question in reviewing and updating the terms of the standard SRAS agreement.
33	CS Energy	The SRAS Guideline does not make provision for advice to the market of AEMO's intention to conduct a SRAS Test, which under the proposed SRAS Guidelines will extend along the system restart path (to the extent possible) in contrast to the current arrangements which test to the delivery point. CS Energy recognises the challenge this may pose to AEMO to manage the balance of informing the market and maintaining the required level of confidentiality. CS Energy encourages AEMO to include in the SRAS Guidelines a requirement to provide some level of information to the market if testing along the system restart path.	AEMO has existing processes to inform the market of material impacts on the market including publication of: - planned transmission system outages, in the Network Outage Scheduler; - a list of all upcoming high impact outages; and - details of constraints used to manage power system security. A Market Notice identifying the date and window of a system restart test could be used to identify the SRAS source, when combined with other data that AEMO is required to publish. AEMO therefore does not propose to expand on its NER 3.11.10 reporting obligations in the SRAS Guideline.
34	MEA Group	MEA Group believes that due to the hastening level of change in the NEM, AEMO's ability to exercise prudent judgement with regard to 4.5.1(b) will be integral to ensure the new testing regime for existing and new SRAS providers is not too onerous.	Noted.
35	Hydro Tasmania	Hydro Tasmania is concerned about the extent of the data reporting requirements outlined in Appendix B (System Restart Test) for participants involved in the testing of system restart paths. Hydro Tasmania is concerned that this requirement may create a significant imposition on participants engaging in the test, particularly if the expectation is that this data is mandatory.	AEMO considers that for SRAS Providers, similar to Appendix A, key quantities as specified in Appendix B3 should not be left unmonitored during a system restart test. The high speed data collected forms important input into model validation for SRAS assessment. Greater confidence in these models leads to improved and more accurate System Restart studies, reducing the burden on all parties to participate in further system restart tests. The appropriate monitoring equipment must be made available for SRAS Providers, which can be provided through use of existing NSP equipment where appropriate. AEMO notes however, that other non-SRAS test participants are not obliged to install new equipment to measure values not captured in normal operation. This has been clarified in Appendix B5. Finally, as with Stanwell's submission, AEMO does agree that it is efficient to use existing monitoring facilities which may be owned by the NSP, provided that the

No.	Consulted party	Issue / Recommendation	AEMO response
			existing facilities meet the measurement requirements outlined. Appendix B2.1 has been added to reflect this.

B.7 Summary of submissions on modelling and assessment

No.	Consulted party	Issue / Recommendation	AEMO response
36	ERM Power	ERM Power supports the proposed changes to the definition of SRAS and black start capability. However, we do not support the removal of current section 5.2 (b) from the Guideline: *If the SRAS Provider is unable to give AEMO all Generator Modelling Data relevant to its offered SRAS, it must give AEMO:* *(i) a list of the missing data and the reasons why it could not be provided; and* *(ii) any alternative data or assumptions the SRAS Provider considers could be substituted for the missing data, and their source.* We believe where the provision of alternative data allows AEMO to satisfactorily complete its modelling requirements, that the provision of alternative data should remain permissible under the Guideline.	No change proposed. All registered participants must comply with the Power System Model Guidelines (PSMG) in respect of their equipment, the SRAS Guidelines now reference the PSMG to avoid duplication. If and to the extent that alternative data is provided for and acceptable under the PSMG, it can be used for SRAS modelling.

B.8 Summary of submissions on procurement process

No.	Consulted party	Issue / Recommendation	AEMO response
37	Tesla	Given the rapid pace of innovation being experienced in the energy technology sector, Tesla recommends AEMO ensure its standard practice of detailed modelling of SRAS requirements includes robust consultation with industry participants and relevant equipment manufacturers. This will avoid incumbency	After clarification with Tesla, AEMO understands that this submission more broadly relates to transparency in the SRAS procurement process, which includes modelling and assessment, for a variety of different technologies. The areas of modelling and assessment that will be considered for SRAS are already covered in Section 5 of the Guideline. AEMO also notes the Guideline includes various options for SRAS procurement in Section 7 and 8, including an open

		'lock-in' and drive the greatest efficiency in the provision of services going forward, appropriately reflecting technology advances whilst also minimising risk to power system operations.	competitive tender, direct request for offers and unsolicited offers. In this respect the Guideline does not limit or exclude technologies from participating in the SRAS procurement process, including technologies that may not have participated in the process previously. AEMO therefore considers that no further modifications are required to the Guideline. AEMO actively contacts developers of new synchronous generation with a high potential for significant SRAS capability, and has also sought to engage with renewable inverter-based generation developers to assess the prospects of including additional capability in future models. To encourage and assist prospective new providers to submit unsolicited SRAS offers under section 8(c) of the Guideline, AEMO will consider creating a sample expression of interest (EOI) form.

B.9 Summary of submissions on Queensland electrical sub-networks

No.	Consulted party	Issue / Recommendation	AEMO response
38	Origin, CS Energy	Origin does not support the merging of the two Queensland sub-regions. When the issue was last examined in 2016, the Reliability Panel was informed by AEMO that there was a "natural breakpoint" in Queensland between the South Pine -Palmwoods and Halys-Calvale transmission lines. The network has not altered since this concern was laid out and therefore the technical reason for the existing sub-region division remains. ... Removing the North-Queensland sub-region region could lessen the impetus to supply SRAS in that region and make it less likely for participants to invest in SRAS capabilities. This in turn will work against the goal of increasing the diversity of SRAS sources. If AEMO does choose to create a single Queensland sub-region, it should ensure that the quantity of the restoration service is not degraded from a reduction in the quantity of SRAS procured. We note that the level of restoration required in each sub-region is	Following its most recent SRAS procurement, which occurred after the last revision to the SRAS procurement objective and the SRS, AEMO started to challenge the perception that the 'natural breakpoint' within Queensland was relevant when considering how to efficiently restart and restore the power system *after* a black system had occurred – however much of the regional power system is black in any given event. Although the network might (or might not) separate along that boundary, the boundary should not be a limiting factor for the options procured to restore any part of the network that goes black (whether north, south, a smaller island or the entire region). CS Energy's conclusions on the consequences of combining sub-networks assume that a reduced number of sub-networks will inevitably result in a reduced quantity or quality of SRAS sources procured, hence reducing overall restoration capability. This is neither the intent nor the expected outcome of AEMO's proposal. AEMO acknowledges that the Reliability Panel will need to determine a new standard for QLD if combined, and is actively liaising with the AEMC and the Panel. The Reliability Panel will of course base its assessment on detailed cost benefit analysis, as noted in submissions. Noting the other requirements of the SRS, however, the number and location of SRAS sources required to meet the SRS will be determined in large part by the inherent characteristics of QLD

No.	Consulted party	Issue / Recommendation	AEMO response
		specified in the Reliability Standard by the Reliability Panel and is not directly under the control of AEMO. Therefore, any changes to the sub-regions should be accompanied by a recommendation to the Reliability Panel that the quantity of SRAS in the new Queensland sub-region should remain unchanged from the amount procured currently. _____ Consolidating the existing two electrical sub-networks in the Queensland region would potentially result in longer restart paths that would be challenging to test and be exposed to a higher probability of being adversely impacted by environmental factors that includes cyclones, floods and bushfires.	power system rather than how many sub-networks it is divided into. For this reason, unless and until there are fundamental changes in QLD power system and generation mix, AEMO expects that the quality and general location of sources procured will be consistent with recent rounds of procurements regardless of how many sub-networks are defined. To provide certainty to participants AEMO will consider with the Reliability Panel applying the approach adopted in NSW whereby the entire region is treated as one sub-network, however, SRAS at a particular location, e.g. North of Bundaberg, is prescribed.
39	ERM Power, CS Energy	ERM Power believes that before any decision is made to combine the two Queensland electrical sub-networks, a cost benefit analysis should be undertaken to understand the range of economic costs to Queensland of a delay to restoration of electrical supply to central and northern Queensland following a black system event compared to the potential costs savings in SRAS procurement from the proposed change. In addition, whilst previous SRAS procurement tenders has led AEMO to consider that most SRAS services are located in southern or central Queensland, this was prior to the recent rule change where the definition of a SRAS supply source was changed from a black start generating unit to black start service and restoration support service and additional new services may emerge post this change. In addition, confirmation that AEMO may contract for longer duration SRAS when this leads to the lowest overall costs may facilitate the development of new SRAS resources in the central and northern Queensland area.	Reiterating points highlighted in response to issue 38, the assumption that a reduced number of sub-networks will degrade the quality of restoration in the Queensland power system is not correct. It is also noted that a cost-benefit analysis will be undertaken by the Reliability Panel as part of determining the revised SRS to apply to a combined Queensland sub-network. Any final determination by AEMO to combine the sub-networks will be dependent on the determination of a new standard.

No.	Consulted party	Issue / Recommendation	AEMO response
		_____ A comprehensive cost benefit analysis coupled with a risk assessment of the network arising from a major supply disruption and the location of existing and desired SRAS providers would need be conducted before an informed opinion is formed on the appropriate number of electrical sub-networks for the Queensland region.	
40	CS Energy	The emergence of a hybrid outcome for the NSW region is not desirable as it ignores the compelling criteria for an electrical sub-network. This would equally apply to the Queensland region in the event of consolidating the existing two electrical sub-networks. ... Previously AEMO reduced the NSW region electrical sub-networks from two to one. However, the current System Restart Standard (SRS) for the NSW electrical sub-network requires AEMO to procure two components of SRAS, one for NSW and one for North of Sydney. Regardless of the terminology used, the outcome effectively represents two electrical sub-networks in NSW.	AEMO does not consider the NSW hybrid solution to be equivalent in effect to two sub-networks. The SRS requirement for a source north of Sydney provides some participants with the certainty they sought that overall restoration capability would not be degraded. However, reducing to a single sub-network affords greater flexibility and optionality for cranking paths. AEMO considers that this increases the level of confidence of meeting the SRS and reduces the artificial and inefficient process of having to allocate services uniquely to individual parts of a region when a range of restoration scenarios is possible. AEMO is considering that the approach applied in NSW could be adopted in Queensland (for example to require a source north of Bundaberg) whilst realising the benefits of combining the sub-networks.
41	CS Energy	The Queensland region previously consisted of three electrical sub-networks. AEMO reduced the number of electrical sub-networks from three to two when there were no SRAS offers received for the northern electrical sub-network. Arguably, the northern electrical sub-network should have been retained providing a market signal for SRAS.	Noted. While there may be merit in this suggestion, which could perhaps be considered further by the Reliability Panel, it is not an issue AEMO can readily address. AEMO observes that the value of a procurement standard in encouraging new development must be balanced against the likelihood of achieving the desired response in current and reasonably foreseeable conditions. It would be undesirable to set a standard there is little prospect of meeting. In the case of North/Far North Queensland, it is not practical to define a new sub-network when there are no capable sources in that part of the network.
42	CS Energy	CS Energy is concerned that the allocation of electrical sub-networks does not reflect the Queensland region from a transmission network	The number and boundaries of electrical sub-networks do not have a direct relationship with the number of SRAS sources required to meet the SRS in accordance with the SRAS procurement objective. Natural break points of the

No.	Consulted party	Issue / Recommendation	AEMO response
		perspective with natural break points that are likely to arise from a major supply disruption.	power system during normal power system operation have little relevance during system restoration where any or all sections of the regional power system could be de-energised. While the diversity requirements of the SRS would require AEMO to procure SRAS capable sources procured at the two sides of such natural break points (where available), defining these as sub-network boundaries could lead to detrimental restoration outcomes. Please also refer to response to issue 38.
43	Forum attendee	Is the reason to reduce [Queensland sub-networks] to a single network to save money?	Cost reduction is not motivating the proposal to combine the Queensland sub-networks. Rather, AEMO sees limited value in boundaries given the evolution of the network, the actual location of black start sources capable of contributing to the standard (currently only 4 in Queensland), and the safeguards of the diversity and reliability requirements in the system restart standard. Multiple sub-networks in all other regions have previously been combined without reducing geographic diversity. The aim of combining the sub-networks is to increase confidence the ability to in meeting the system restart standard at the lowest long-term cost. Flexibility to procure and plan restart paths across the existing artificial border should: • Allow each SRAS source to be procured and planned optimally, for use to energise paths to its north and south as required. • Maximise the available stabilising load required for the SRAS units, potentially facilitating a faster rebuild of transmission corridors. • Facilitate restoration path flexibility, which may need to adapt as distribution feeders become increasingly less stable for load pick-up on clear days.
44	Powerlink (SRAS forum)	QLD is a long and skinny network with the southern area quite far from central QLD. Powerlink thinks the pros of retaining the two sub-networks are: –Can restart two networks in QLD instead of one. –If only one sub-network is affected, the lines are quite long (with no load resulting in high voltages)and therefore require sources in the different sub-networks?	Reiterating points in response to issue 38, the assumption that a reduced number of sub-networks will degrade the quality of restoration in the Queensland power system is not correct. The SRS aggregate reliability, diversity and strategic location requirements effectively mean the inherent characteristics of QLD power system will drive the number and location of SRAS, rather than how many sub-networks it is divided into. To the extent possible, AEMO also takes account of energy support arrangements and the restoration of sensitive loads and stabilising loads in developing the restart plan. Consistent with AEMO's power system security

No.	Consulted party	Issue / Recommendation	AEMO response
		–There are sensitive loads in central QLD (aluminium smelter). Powerlink needs to consider re-supplying these loads fairly quickly if there is a chance they can reconnect. Powerlink concerns of combining the sub-networks: –Can't have two different starting sources to different areas (fictional boundaries). –Can't contract same number of generators for restart (particularly an issue where SRAS generators are out for maintenance). –There are very long lines to re-energise smelter from southern region. Powerlink raised AEMO's viewpoint on the benefits of combining the electrical subnetworks in giving flexibility to use different contracted services on the day. However, given QLD's geographic topology, it was noted that central sources will look after central part of the network and vice versa for the southern region.	responsibilities, these are also relevant considerations for AEMO when procuring SRAS. AEMO understands Powerlink's concerns and obligations, and is working directly with Powerlink on these matters.

ATTACHMENT 1 – DRAFT SRAS GUIDELINE

The draft SRAS Guideline is published with this Draft Report as a separate document