AEMC

RULE

Australian Energy Market Commission

CONSULTATION PAPER

NATIONAL ELECTRICITY AMENDMENT (SYSTEM RESTART SERVICES, STANDARDS AND TESTING) RULE 2019

PROPONENTS

Australian Energy Market Operator
Australian Energy Regulator

19 SEPTEMBER 2019

INQUIRIES

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ABOUT THE AEMC

The AEMC reports to the Council of Australian Governments (COAG) through the COAG Energy Council. We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the COAG Energy Council.

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

The Australian Energy Market Commission (AEMC or Commission) has received two rule change requests relating to System Restart Ancillary Services (SRAS):

- On 29 July 2019, the Australian Energy Market Operator (AEMO) submitted a rule change request seeking to incentivise the provision of both system restart and restoration support capabilities from a range of different technologies. AEMO's rule change request is also intended to facilitate more extensive testing to verify the viability of system restart paths, increasing the level of assurance that system restoration will succeed. AEMO's rule change request proposes changes to four key aspects of the existing regulatory framework for SRAS, including the:
  - definition of the services that fall within the scope of SRAS
  - way SRAS is procured by AEMO
  - framework for ongoing testing of SRAS
  - technical access standards which must be met by new connecting generators.
- On 6 September 2019, the Australian Energy Regulator (AER) submitted a rule change request seeking to provide greater clarity and transparency about the roles and responsibilities of parties involved in responding to a major supply disruption, particularly in respect of information provision and communication protocols relating to SRAS, and to ensure rigorous process approval for each step of the system restart process.

Given the common subject material and close interactions between the two rule change requests, the Commission has decided to consolidate them under section 93 of the NEL. This means that the Commission will consider the issues raised in both rule change requests through the same process, which will allow for any interactions to be effectively captured. More information on the Commission's approach to consolidation is provided in Chapter 4.

1.1 Purpose of consultation paper

This consultation paper has been prepared to facilitate public consultation on the rule change requests and to seek stakeholder submissions.

This paper:

- sets out a summary of, and a background to, the rule change requests
- identifies a number of questions and issues to facilitate the consultation on the rule change requests
- outlines the process for making submissions.

The Commission welcomes submissions on this consultation paper, which are to be provided by 17 October 2019. Further information regarding the process for making submissions is provided in Chapter 6. Stakeholders are also invited to contact us if they would like to discuss this consultation paper or related issues. All enquiries on this project should be addressed to Mitchell Shannon on (02) 8296 0639 or mitchell.shannon@aemc.gov.au.

1.2 Structure of consultation paper

The remainder of this consultation paper is structured as follows:

- Chapter 2 sets out background information relevant to these rule change requests
- Chapter 3 summarises the rule change requests
- Chapter 4 sets out the proposed assessment framework for consideration of the rule change requests
- Chapter 5 sets out a range of issues for stakeholder comment in relation to the rule change requests
- Chapter 6 sets out how stakeholders can respond to this consultation paper.

2 BACKGROUND

2.1 Current SRAS framework

This chapter provides an introduction to System Restart Ancillary Services (SRAS).

SRAS are an integral part of the ability of the power system to recover from high impact, low probability events. As such, they contribute to the overall resilience of the power system. SRAS enhance resilience by enabling recovery of the power system following a major disturbance, where large parts of the power system have collapsed to a "black system" condition. During a black system event, large numbers of generators trip off the system, potentially resulting in large numbers of customers losing their supply of energy.

This section provides an overview of the existing SRAS frameworks, and explores how SRAS fits into the overarching NEM frameworks for resilience.

2.1.1 What is SRAS and why is it needed?

System Restart Ancillary Services (SRAS) are procured by AEMO in order to mitigate the economic costs of a major supply disruption. SRAS provides the capability to restart the power system if there has been a major loss of power across large parts of the power system, or if the power system has collapsed to a "black system".[1]

In the history of the NEM, there have only been two black system events. The most recent of these occurred on September 28, 2016, in South Australia.[2] It has been estimated that the event came at a total cost to South Australian businesses of approximately $367 million, and affected approximately 800,000 customers.[3] While rare, the severe impact of these events is such that the procurement of a specific number of SRAS is critical to the resilience of the system, as it enables restoration of supply following a black system event.

SRAS is currently provided by generators with the capability to start, or remain in service, without electricity being provided from the grid. These generators must be capable of delivering electricity to a connection point within specified timeframes and be able to control frequency and voltage. Not all generators currently have this capability, given the additional cost involved to equip generating plant with this capability.

Once an SRAS provider has restarted its own plant, it provides energy to restart other generators and commence the processes required for system restoration. This typically involves re-energising parts of the transmission system to restart subsequent generators, followed by blocks of customer load being brought on to stabilise the voltage and frequency of the electricity in the grid. The number of generators and blocks of customer load brought on are gradually increased until the full electricity system is restored.

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1 A black system is defined in Chapter 10 as "the absence of voltage on all or a significant part of the transmission system or within a region during a major supply disruption affecting a significant number of customers."

2 The other event occurred in the Northern subregion of Queensland in 2009 and was less severe than the South Australian event of 2016.

3 AEMO, *Integrated final black system incident report*, March 2017, p. 5.

Importantly, the NER currently define SRAS only by reference to the capability to provide a black start service, being the ability to start without taking electricity from any part of the network. As discussed in further detail below, the ability to black start is only one of the services needed during the process of system restoration. This current definition of SRAS as providing black start capability only is central to AEMO's proposal to expand the range of services that may be procured as SRAS.

2.1.2 How does AEMO procure SRAS?

During normal NEM operation AEMO is responsible for procuring SRAS to meet the requirements of the System Restart Standard (SRS), which is determined by the Reliability Panel and sets out a number of requirements relating to SRAS.[4] These requirements include the length of time within which defined volumes of load need to be restored in a region, following a black system event. The SRS also sets out specific requirements as to the reliability of the restart services.

In procuring SRAS, AEMO is also required to comply with the SRAS Procurement Objective, which is: to use its reasonable endeavours to acquire SRAS to meet the system restart standard at the lowest cost.[5]

AEMO currently acquires SRAS from generators with black start capability as part of its power system security responsibilities.[6] Examples of generating units that could potentially provide SRAS include:

- selected hydro generating units, gas turbines or diesel generating units that have the equipment necessary to restart without drawing supply from the network
- large thermal (coal or gas) generating units with a trip to house load (TTHL) scheme, designed to reduce the unit's output to match its auxiliary load when it is tripped from the network during a major supply disruption, thus being able to remain in operation and available to re-energise the network when required.[7]

AEMO's procurement processes for SRAS are set out in its SRAS Guideline.[8] The NER provide that the SRAS Guideline must include guidance on the factors that AEMO must take into account when making a decision to follow a particular type of procurement process to acquire SRAS to meet the SRAS Procurement Objective.[9] The SRAS Guideline currently states that AEMO may procure SRAS through an open competitive tender process or by making a direct request for an offer to provide SRAS to one or more generators. Generators may also submit expressions of interest to provide SRAS to AEMO at any time. AEMO can amend the SRAS Guideline at any time, subject to consultation with stakeholders.[10]

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4 Reliability Panel, *The System Restart Standard*, July 2018. Available at: https://www.aemc.gov.au/regulation/electricity-guidelines-and-standards. The system restart standard is described in more detail later in section 1.1.4 of this paper.

5 NER, clause 3.11.7(a1).

6 NER clause 4.3.1(p)

7 Most generating units are designed to shut down when the power system frequency is collapsing during a major power system incident. However, some generating units have the capability to remain operating and supplying their auxiliary loads following a system frequency collapse, referred to as trip to house load.

8 AEMO, *SRAS Guideline*, 15 December 2017. Available at: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Ancillary_Services/SRAS-Guideline-2017.pdf.

9 NER, clause 3.11.7(d)(5).

AEMO procures SRAS by entering into an SRAS Agreement with the service provider.[11] This SRAS Agreement requires contracting generators to provide restart services on instruction by AEMO and demonstrate their restart capability through regular testing.

The Commission understands that AEMO last completed a round of SRAS procurement over the 2017-18 financial year, the contracts for which are due to expire on 30 June 2021.[12] The Commission understands that AEMO will therefore be seeking to commence its next round of SRAS procurement in late 2020, so that SRAS Agreements with the relevant providers are finalised by 1 July 2021. To enable this next round of procurement, any revisions to AEMO's SRAS Guideline would need to be completed to reflect any relevant rule changes, prior to this procurement process commencing.

2.1.3 When might SRAS be utilised?

SRAS currently acts as a fail-safe or 'back up' service that is intended to provide a dependable 'restart' capability. Under this current formulation, SRAS is only expected to be required infrequently, following a major supply disruption and/or a black system.

A series of events resulting in a black system could occur at any time and in any range of network outage, demand and supply conditions.

Given this risk, in consultation with transmission network service providers (TNSPs), AEMO prepares system restart plans, incorporating the SRAS contracted by AEMO, to cover the most plausible alternative paths (generally two to four) that could be used to progressively restore supply and stabilise load in each NEM region.

If there is zero voltage in the transmission network, power to restart tripped generators can be drawn from:

- an unaffected part of the transmission network (including interconnectors)[13]
- an isolated pocket of generation and load that remained operating within the affected region.

Where supply is not readily available from unaffected parts of the network or otherwise within an affected region, power to restart the affected system needs to be provided from SRAS.

The most recent incident involving the attempted utilisation of SRAS occurred during the South Australian black system event on 28 September 2016. The details of this are set out in Box 1.

10 NER, clause 3.11.7(e).

11 NER, clause 3.11.9(a).

12 AEMO, *Non-market ancillary services cost and quantity report 2017-18*, September 2018. Available at: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Data/Ancillary_Services/2018/NMAS-Cost-and-Quantities-Report-2017-18.pdf.

13 In the South Australian black system event of 28 September 2016, the Heywood interconnector between South Australia and Victoria was used as the primary source of energy to begin the process of restoring the South Australian region, due to the fact that both sources of SRAS within the South Australian region failed to operate as intended.

BOX 1: UTILISATION OF SRAS DURING SOUTH AUSTRALIAN BLACK SYSTEM EVENT

During restoration of the South Australian network following the black system event on 28 September 2016, neither of the two local SRAS providers were able to contribute to the restoration process.

Following the black system event, AEMO and ElectraNet agreed on a restoration strategy. One of the two SRAS generators in South Australia, Synergen's Mintaro power station, was declared unavailable prior to the restoration process due to their emergency generator tripping,[1] most likely caused by lightning.[2] The restoration strategy therefore involved using the other SRAS capable generator in the region, Origin's Quarantine Power Station (QPS), and to import electricity from Victoria through the Heywood interconnector. However, QPS also failed to deliver its contracted SRAS when called upon by AEMO.

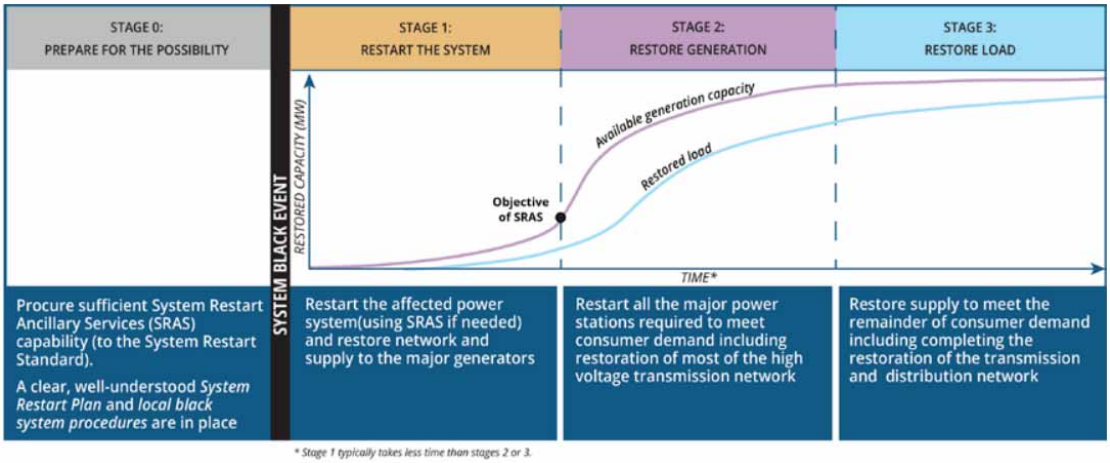
QPS was unable to deliver SRAS due to the switching configuration used by ElectraNet to start the generator, which caused the protection settings at QPS unit 5 to trip. ElectraNet had a different switching arrangement for QPS in its System Restart System Switching Program (SSP) (which utilised a hard start) to those it used in QPS's SRAS tests (which involved a soft start). Origin and AEMO did not know that the System Restart SSP had a different switching arrangement for Quarantine to that set out in the SRAS test system switching plan.[3]

In the AER's view, QPS' failure to provide SRAS highlighted that the communication protocols that were in place to facilitate the exchange of information in the implementation of the system restart plan were not sufficiently clear or comprehensive enough. The AER found that that Origin's failure to provide SRAS as requested delayed auxiliary supply to Adelaide's main generators, requiring AEMO to rely solely on the Heywood interconnector for restart, which ultimately delayed overall restoration of load in South Australia for approximately one hour. The framework governing these communication protocols are a key focus of the AER's rule change request.

Note: 1. The emergency diesel generator provides power supply to all auxiliaries of the main generating unit that supplies the SRAS. The main generating unit at Mintaro cannot start without these auxiliary supplies.
Note: 2. AEMO, *Integrated Final Report SA Black System 28 September 2016*, 2017.
Note: 3.AER, *The black system compliance report*, December 2018, p. 103.
Note: 4. Ibid, p. 102.

Figure 2.1 illustrates the stages in preparing for and responding to a major supply disruption using SRAS.

Figure 2.1: Preparation for and response to major supply disruption



2.1.4 What other governance arrangements currently apply to SRAS?

System Restart Standard

The Reliability Panel's key responsibility within the SRAS frameworks is to review and determine the SRS. The SRS is the key document that guides AEMO's procurement of SRAS. Clause 8.8.3(aa) of the NER sets out the matters that must be included in the SRS, which currently includes the maximum timeframes for restoration of a given level of supply in each sub-network, the aggregate reliability of restart services, and guidance on boundaries of electrical sub-networks and the diversity requirements for SRAS. Given the requirements set out in clause 8.8.3(aa) of the NER, the current SRS includes the following:

- Restoration timeframes: The SRS requires AEMO to procure SRAS sufficient to restore generation and transmission in each electrical sub-network to a specified level within a specified timeframe. The restoration timeframe represents the 'target time-frame' to be used by AEMO in the SRAS procurement process. It is not a specification of any operational requirement that should be achieved in the event of a major supply disruption.
- Aggregate reliability of SRAS: Aggregate reliability is the probability that the generation and transmission in a sub-network is expected to be restored to the specified level within the specified time. The SRS provides detail regarding the aggregate reliability for procured SRAS in each electrical sub-network, which is to be determined by AEMO having regard to the combination of the individual reliabilities of the SRAS procured in that electrical sub-network, together with an assessment of the impact of potential points of failure. AEMO will determine the manner in which reliability will be assessed in accordance with the requirements in the NER.

- Guidance for the determination of electrical sub-networks: The SRS defines the matters that AEMO must consider when establishing electrical sub-networks, including the length and strength of transmission corridors between areas and generation centres.
- Guidance for specifying diversity and strategic location of services: The SRS defines the matters that AEMO must consider in order to maintain a degree of independence between the various restart services that it procures, including electrical, geographical and energy source diversity in procured SRAS. AEMO is required to procure SRAS and develop its SRAS Guidelines on the basis of meeting the requirements of the SRS and the NER.

Table 2.1 provides the time, level and reliability standards for restoring the generation and transmission capacity in each electrical sub-network determined by the Reliability Panel in the SRS.

Table 2.1: **System Restart Standard - Time, Level and Aggregate Reliability by Electrical Sub-Network**

1. ELECTRICAL SUB-NETWORK[1]	2. LEVEL OF RESTORATION (MW)	3. RESTORATION TIME[2] (HOURS)	4. REQUIRED AGGREGATE RELIABILITY
North Queensland	825	3.5	90%
South Queensland	825	3.0	90%
New South Wales	1500	2.0	90%
Victoria	1100	3.0	90%
South Australia	330	2.5	90%
Tasmania	300	2.5	95%

Source: Reliability Panel, *The System Restart Standard*, July 2018.

Note: 1. The electrical sub-network boundaries are defined in AEMO's 2014 SRAS Guideline.

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

SRAS testing

SRAS agreements between AEMO and SRAS providers include provisions that require testing of the SRAS equipment. In addition, the SRAS Guideline states that an SRAS test will generally be required by AEMO:[14]

- within the 6 months prior to the intended commencement date of the SRAS agreement, unless exceptional circumstances apply[15]

14 SRAS Guideline, clauses 4.3.1 and 4.3.2.

15 The existence of exceptional circumstances will be determined by AEMO.

- within 20 business days after maintenance causing any major component of the SRAS equipment or SRAS transmission components to be out of service for seven days or more[16]
- at one additional date and time per year, to be nominated by AEMO on no less than five business days' notice to the SRAS provider (termed a "short notice test").

The SRAS Guideline also provides that AEMO can request an SRAS test if AEMO has reasonable grounds to believe that SRAS equipment may not be capable of delivering contracted services.[17] SRAS providers are required to submit test reports to AEMO detailing the steps in, and results of, such tests.

NSPs are not parties to SRAS Agreements but have obligations under the rules to negotiate in good faith with a prospective SRAS provider and participate in, or facilitate, testing of SRAS proposed to be provided by a prospective SRAS provider.[18] The NER do not expressly set out requirements relating to NSPs' involvement in the ongoing testing of SRAS. This current limited involvement of NSPs in SRAS testing is relevant to both the AEMO and AER rule change requests.

SRAS reporting

The NER require AEMO to report annually on:[19]

- whether it has met the SRS in each sub-network and, if not, the reasons why the SRS was not met
- what processes it has followed to procure SRAS in each sub-network
- the total cost of SRAS in each sub-network.

Local Black System Procedures

Complementing AEMO's obligation to prepare a system restart plan is the requirement for each generator and NSP to develop Local Black System Procedures (LBSPs).[20] LBSPs are an important set of documents used by AEMO to develop its regional restoration options. The rules require LBSPs to:[21]

- provide sufficient information to enable AEMO to understand the likely condition and capabilities of plant following any major supply disruption, such as a black system event, so that AEMO is able to effectively co-ordinate the safe implementation of the system restart plan, and
- appropriately incorporate any energy support arrangements to which a generator or NSP may be a party.

16 The SRAS provider schedules this test with the network service provider, subject to AEMO's approval.

17 SRAS Guideline, clause 4.3.3 (c). This is not a short notice test. The SRAS provider arranges this test with the network service provider.

18 NER, clause 3.11.9(i)(2)-(3).

19 NER, clause 3.11.10.

20 NER, clause 4.8.12(d).

21 NER, clause 4.8.12(f).

AEMO has an obligation to develop and publish guidelines for the preparations of LBSPs and is responsible for approving LBSPs submitted by generators and NSPs.[22] The LBSP Guidelines set out the information to be provided to AEMO covering the technical requirements and limitations in a restart environment regarding generation and network plant.[23]

The Commission identified in the issues and approach paper for its *Review of the System Black Event in South Australia on 28 September 2016* that, based on the findings of the AER's investigation into the event, there is currently some uncertainty regarding the role and function of LBSPs.[24] Under the NER, there is an obligation for LBSPs to be consistent with SRAS agreements and there is an obligation for NSPs and generators to comply with their LBSP as quickly as practicable.[25]

Recently, the AER considered that this provision indicates that LBSPs were intended to encompass procedures such as the actions generators (including SRAS Providers) and NSPs will undertake when a major supply disruption is declared at their local level.[26] AEMO however consider the LBSP Guidelines focus on eliciting information to identify the conditions and capabilities of power system assets after a total loss of supply and are not, in fact, procedures. The purpose of the LBSP is to inform AEMO of the likely capability of the asset in re- energising and maintaining a stable operating state on a potential restart path.[27]

Consistent with the principles for effective governance, the Commission considers that arrangements should have clearly defined objectives and provide adequate operational scope to meet those objectives within the overarching governance framework. Arrangements should also include accountability mechanisms such that participants are kept accountable for how they have met their objectives. The Commission considers that the role and function of the LBSP should be clarified and the integrity, consistency, and completeness of the information being provided by generators and NSPs in their LBSPs should be subject to clear obligations. The Commission previously intended to consider this issue in its *Review of the System Black Event in South Australia on 28 September 2016*. However, this matter is relevant to the issues these rule change requests are seeking to address. The assessment of the rule change requests will therefore include consideration of the role and function of LBSPs and how this is dealt with in the NER.

22 NER, clause 4.8.12(g).

23 AEMO, *Guidelines for preparing Local Black System Procedures*. Available at: https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Power-system-operation.

24 AEMC, *Review of the System Black Event in South Australia on 28 September 2016* - issues and approach paper, April 2019. Available at: https://www.aemc.gov.au/markets-reviews-advice/review-of-the-system-black-event-in-south-australi.

25 NER, clauses 4.8.14(b) and 4.8.12(d).

26 AER, *The black system compliance report*, December 2018, p. 192.

27 Ibid.

3 DETAILS OF THE RULE CHANGE PROPOSALS

This chapter summarises the issues raised by AEMO and the AER, the proposed solutions and the costs and benefits identified by the rule change proponents. The Commission encourages readers to review the copies of the rule change request published on the AEMC website.[28]

These two rule change proposals address some overlapping issues, most notably the role and function of NSPs in the process of testing SRAS and planning for system restoration. Both also draw, to some extent, on the learnings from the black system event that occurred in South Australia on the 28th of September 2016. Where relevant, this paper therefore draws out the key details of the issues that were identified in through the various reviews that have occurred since the 28th of September 2016. The AEMC is currently progressing its review of the South Australian black system event of 28 September 2016. The issues and approach paper for that review provides a more detailed summary of the circumstances during the period of system restoration on 28 September 2016. Stakeholders who are interested in the detail of these circumstances should refer to the issues and approach paper, which is available on the Commission's website at www.aemc.gov.au.[29]

3.1 AEMO rule change proposal

AEMO has identified a number of issues that it considers either present a barrier to, or do not adequately incentivise or facilitate, the provision and testing of new sources of system restart and restoration support capability. This section sets out the specific issues identified, as well as the rule changes proposed by AEMO to address them.

3.1.1 Issues identified

Decline of effective SRAS sources and supporting resources

AEMO's rule change request suggests that it has become apparent during recent SRAS procurement cycles that there are fewer traditional sources of SRAS in some NEM regions, and those that remain are potentially less capable of reliably restoring generation and transmission to a point from which load can ultimately be restored within a reasonable timeframe.[30]

According to AEMO, this is due to a number of factors, including:[31]

- the increasing penetration of asynchronous, intermittent grid-connected generation with no black start capability and currently no active capability to support grid stability during restoration
- the declining reliability and availability of synchronous generating plant that has historically been assumed to be available and ready to be energised as required to

28 Available on the AEMC website project page for ERC0278. See: https://www.aemc.gov.au/rule-changes/system-restart-services-standards-and-testing.

29 For more information see: https://www.aemc.gov.au/markets-reviews-advice/review-of-the-system-black-event-in-south-australi

30 AEMO, *System restart services, standards and testing* - rule change request, p. 4.

31 Ibid.

provide the black start capability and system support needed to continue the restoration process after initial restart

- fewer static loads (i.e. loads not connected via power electronic inverters) being available for grid stabilisation, combined with a very high uptake of distributed energy resources, make it increasingly difficult to restore supply in a stable manner.

AEMO also note that the planned withdrawal of thermal plant from the NEM over the next three to four years could further exacerbate these challenges.[32]

Lack of incentives for alternative sources of restart and support

AEMO considers that stronger incentives are needed for generators, energy storage providers and other types of plant to invest in black start capability, as the incentives available through the existing SRAS contract market are not sufficient to facilitate such investment.[33]

In addition, AEMO contends that the NER imposes limitations on the scope of SRAS services because the definition of SRAS prescribes that:[34]

- SRAS is currently only capable of being provided by generating units
- the service is limited to the delivery of electricity to (or energisation of) a particular point on the network.

Alternative sources of system restart capability

One approach highlighted in the rule change request to facilitate the development of new sources of system restart services would be for AEMO to underwrite the development of new SRAS capability by contracting for SRAS in advance.[35] However, AEMO considers that the SRAS Procurement Objective currently poses a barrier to this occurring in practice because existing sources of SRAS will generally remain the lowest cost options of meeting the system restart standard. This would mean that AEMO would be obliged to continue to acquire only those existing sources of SRAS in order to satisfy the SRAS Procurement Objective, potentially depriving developers of new generation of incentives to invest in new system restart capability.

AEMO also suggests that the SRAS Procurement Objective limits its ability to take into account non-cost related factors when choosing between existing sources of SRAS. In particular, AEMO asserts that it would currently be required to procure a combination of SRAS that just meets the System Restart Standard's aggregate reliability requirement ahead of a slightly more expensive combination that would deliver a much higher level of confidence in the services.[36]

The rule change request notes that 'grid-forming' inverter technologies, which exhibit similar performance to that of a synchronous generator from a system restoration perspective and could be capable of restarting the power system, are currently being developed and deployed

32 Ibid.
33 Ibid.
34 Ibid, p. 9.
35 Ibid, p. 4.
36 Ibid, p. 10.

by some battery manufacturers.[37] However, almost all existing asynchronous generation has a 'grid-following' inverter type that cannot establish its own voltage source and may require a sufficient number of synchronous generators nearby before stable operation can be established. AEMO suggests that the existing SRAS framework does not provide incentives for asynchronous generators to invest in grid-forming inverters, as it perceives the SRAS Procurement Objective as limiting its ability to procure new, more expensive, sources of SRAS. AEMO also notes that technologies using grid-forming inverters have successfully demonstrated black start capability both in Australia and overseas.[38]

Alternative sources of system restoration support

In addition to being capable of providing system restart services, asynchronous generation has the potential to provide other services such as voltage support (i.e., the provision of reactive power to stabilise system voltage) or frequency control, which could support the progressive restoration of the power system. However, the rule change request suggests there is currently no requirement on, or incentive for, asynchronous generators to enable or maintain this capability, which requires modifications to generator settings and controls.[39] AEMO asserts that the capability to provide such system restoration support services is currently neither required nor valued under the NER, given that:

- the definition of SRAS currently only encompasses black start capability and does not refer to other support services, meaning AEMO is unable to procure such services for the provision of SRAS
- even if AEMO could procure system restoration support services under the SRAS framework, there is no explicit requirement that generators be capable of providing these services.

AEMO notes that these circumstances are because these services are inherent properties of large synchronous generating units and have therefore not needed to be valued historically.[40] While inverted-connected generators may be capable of providing these services during normal system operation, they do not inherently do so under conditions associated with a major supply disruption (i.e. when there is little synchronous generation online). AEMO considers that changes are therefore necessary to ensure this restoration support capability remains available as the generation mix continues to evolve.

AEMO also suggests that, even where asynchronous generators are capable of providing system restoration support services, there is no basis for AEMO to test the effectiveness of such capabilities under extreme operating conditions as they are not captured by the current definition of SRAS and are therefore not subject to the existing SRAS testing requirements under the NER.

37 Ibid, p. 5.
38 Ibid.
39 Ibid.
40 Ibid.

AEMO notes that inverter-based resources have already been used to support system restoration in international grids, including Ireland, Denmark and the UK.[41]

Insufficient testing of restart paths

AEMO suggests that existing generator level testing carried out on contracted SRAS sources cannot be used to validate the interactive and inter-dependent response of the SRAS source and the wider network to which it is connected, as current testing is only sufficient to validate the simulated response of SRAS generators to deliver electricity to a defined point and sustain stable output for a specified period.[42]

Further, AEMO considers that modelling alone is insufficient to establish whether the SRAS acquired by AEMO is effective for system restart due to the ongoing transformation of the power system and emerging phenomena which can reduce the level of confidence in modelling outcomes unless validated against actual test results involving the wider network.[43]

AEMO notes that while some TNSPs have voluntarily conducted a limited amount of more extensive network testing, the coordination between multiple parties which is required to facilitate this means that a continuation or expansion of such testing in the future is unlikely without clear regulatory obligations to support this process.[44]

The rule change request refers to network level system restoration capability within and between a number of interconnected power grids in Europe in recent years, which yielded a range of benefits in relation to the verification of system restart paths, identification of faults or shortcomings and other system restart processes.[45]

In respect of the existing NER requirements regarding SRAS testing, AEMO notes that:[46]

- NSP participation in testing is only expressly dealt with in relation to the requirements for testing of prospective SRAS providers as part of AEMO's procurement process. No reference is made to NSP participation in testing of established SRAS providers.
- Physical testing of SRAS cannot be mandated beyond the stable delivery of electricity to a particular point on the network.

The NER do provide that AEMO may require a contracted SRAS provider to demonstrate its capability to provide its contracted SRAS to AEMO's satisfaction, according to "standard test procedures". These procedures are not defined in the NER.[47]

3.1.2 Proposed rule changes

1. SRAS definition

41 Ibid, p. 6.
42 Ibid.
43 Ibid.
44 Ibid, p. 7.
45 Ibid, p. 8.
46 Ibid, pp. 6, 11.
47 NER, clause 3.11.9(f).

The current definition of SRAS is limited to facilities with black start capability. This is defined as a capability provided by generating units to deliver power to a connection point, or to a point in the network that allows power to be supplied to other units.[48] As such, the definition does not encompass other ancillary services beyond black start capability, which may be provided by facilities other than generators.

AEMO is proposing that the definition of SRAS be amended to:[49]

- remove the limitation that it can only be provided by generation, to allow for the possibility that alternative technologies or plant combinations might provide that capability in the future
- include additional ancillary services that can support system restart in the conditions expected in the early stages of a system restoration process, allowing AEMO to acquire such services in addition to black start capability, again from a range of potential facilities. AEMO point to a high level range of such potential new ancillary services for restoration, including the provision of reactive support or frequency control.[50] AEMO's rule change request proposes that these services be specified by AEMO in the SRAS Guideline, rather than being set out in the NER, on the basis that the nature of the services can be expected to change over time and between SRAS sub-networks.[51]
- remove unnecessary duplication of the concept of supplying energy to a connection point in order to restart other generating units. This is already captured by the reference in the definition to black start capability. AEMO propose to more clearly tie the definition to the intended outcomes of AEMO's power system security responsibilities (i.e. facilitating the restoration and maintenance of power system security).

AEMO also suggested that the Commission may want to consider whether the commercial contracting framework for SRAS should be amended to provide for SRAS to be acquired from NSPs.[52]

2. SRAS Procurement Objective

In order to address the perceived barrier the SRAS Procurement Objective poses to the development of new SRAS and the acquisition of a combination of services that delivers the best value in terms of reliability, AEMO proposes that the concept of the SRAS Procurement Objective be removed from the NER.

AEMO instead propose that AEMO's procurement of SRAS instead be expressly guided by the NEO.[53] AEMO suggests that this would ensure a focus on efficient operation in the long term interests of consumers with respect to price, reliability and security of supply.

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48 Black start capability is defined in full in chapter 10 of the NER as: A capability that allows a *generating unit*, following its disconnection from the *power system*, to be able to deliver electricity to either: (a) its *connection point*; or (b) a suitable point in the *network* from which *supply* can be made available to other *generating units*, without taking *supply* from any part of the *power system* following *disconnection*.

49 AEMO, rule change request, p. 12.

50 Ibid, p. 5.

51 Ibid, p. 12.

52 Ibid, p. 12.

53 Ibid.

3. SRAS testing

AEMO's proposed rule seeks to clarify that NSPs are required to participate in and facilitate the ongoing testing of SRAS once those services have been contracted by AEMO, in addition to testing of prospective SRAS, and are entitled to recover the costs of such testing from the SRAS provider.[54] An explicit requirement for NSPs to comply with the SRAS Guideline is also proposed.

The rule change request also proposes the addition of a new clause in the NER which would set out the circumstances in which AEMO can require a system restart test, and the resulting obligations of the NSP and other registered participants in relation to such testing. This includes requirements relating to:

- notification of a system restart test to the TNSP by AEMO
- the preparation of a test program by the TNSP in consultation with AEMO and affected participants
- the timing of system restart tests
- the obligations of affected participants to participate in, and bear their own costs associated with, such tests.

AEMO has suggested that the proposed changes relating to the coordination, participation and costs for system restart tests have been modelled on the existing clause 5.7.6, which allows NSPs to require tests of generating units for power system modelling or performance assessment purposes.

AEMO has also proposed that the scope of the system restart communication protocols be expanded to cover these tests.

4. Generator access standards

Under AEMO's proposed rule, the generator technical performance standards would be expanded upon the commencement of the final rule to address the capability of new connecting generating units to provide active and reactive power in system restart conditions.[55] In particular, the technical access standards in the NER would be amended to include new minimum and automatic access standards in relation to restoration support services:

- the proposed minimum access standard would require generating units to have the capability to provide at least one of the restoration support services specified in the SRAS Guideline
- the automatic access standard would apply where the capability of the generating unit extends to all of those restoration support services.

The proposed changes focus on restoration support services and would not mandate black start capability for generating units. The rule change request identifies a number of indicative

54 Ibid, p. 13.
55 Ibid.

requirements for the proposed SRAS capabilities, which AEMO proposes would be set out in the SRAS Guidelines. These are set out in Table 3.1.

Table 3.1: Indicative requirements for proposed SRAS capabilities[1]

TYPE OF SRAS	INDICATIVE REQUIREMENT
Black start capability	• Energise a delivery point without external supplies. • Operate stably with auxiliary supplies only or with network loads in a power island. • Maintain nominated MW supply level for a nominated period, generally at least 4 hours. • Ability to perform at least two, and preferably three or more sequential start-ups. • Provide steady-state and dynamic voltage control, including under the conditions supplying its auxiliary loads. • Provide steady state and dynamic frequency control when supplying a nominated MW supply level. • Energise sections of transmission network so as energise auxiliaries of sufficient non-black start generating systems (to collectively provide a minimum restart path to load restoration). • Provide sufficient fault current for correct operation of protection systems for the minimum restart path. • Response not adversely impacted by other generation or network elements.
Initial restoration support service	• Energise sections of transmission or distribution network so as to energise auxiliaries of other non-black start generating systems under specified system conditions. • Provide steady-state and dynamic voltage control including under the conditions supplying its auxiliary loads. • Provide steady-state and dynamic frequency control when supplying its nominated MW supply level. • Provide sufficient fault current for correct operation of protection systems in its restoration path.

Note: 1. AEMO, rule change request, p. 15.

AEMO's proposed rule change also includes consequential changes to:

- include the new access standard as an AEMO advisory matter
- include a reference to the new performance standard in clause 5.3.9 of the NER where a generating system is modified, meaning a generator would need to meet the requirements of that clause where it proposes an alteration to equipment that would affect its ability to provide restoration support services.

3.1.3 Proponent's expected costs and benefits

AEMO has not sought to specifically quantify the costs and benefits of the proposed rule changes.

Costs of proposed changes

The anticipated costs of the proposed changes in the short to medium term identified in the rule change request include:[56]

- Increased costs to AEMO in relation to the procurement of SRAS, including restart support services. AEMO considers that the costs of such services is likely to vary considerably in practice. AEMO also notes that the potential expansion of the pool of SRAS providers may result in lower costs in the medium-long term due to increased competition. It is worth noting that the costs of SRAS are passed through by AEMO to generators and market customers, on a regional basis, as per arrangements defined in the NER. Any change in SRAS costs due to the rule change proposal will therefore ultimately be borne by customers and generators.
- Increased costs to NSPs as a result of the proposed requirements relating to extended network testing.
- Increased costs to generators affected by extended network testing, particularly non-SRAS generators. AEMO notes that the proposed rule includes a requirement that the operational and commercial impacts on participants involved in such tests be minimised.

AEMO considers that the proposed changes to the generator technical performance standards is not likely to impose significant costs on existing or new generators, as most current inverter connected generation technologies are capable of providing reactive power response at low or no active power output and these capabilities can be expanded with modifications to control systems.

Benefits of proposed changes

The rule change request suggests that it is difficult to quantify the benefits of the proposed changes, given the extreme and rare circumstances in which SRAS is used. Potential benefits identified by AEMO include:[57]

- facilitating service enhancements to alleviate the risk that there may be insufficient (or insufficiently effective) SRAS in some regions in the future to meet the system restart standard or enable restoration of all load following a black system event
- facilitating restart path testing sufficient to verify the feasibility and timing of selected restart paths and identify unforeseen issues that cannot be modelled and could delay or prevent a successful restoration
- incentivising enhanced control capabilities for inverter-connected generating systems which could detect a loss of significant nearby synchronous generation and respond to provide support, which could significantly reduce the risk of the system collapsing

56 Ibid, p. 17.
57 Ibid.

- supporting the development of inverter-connected technologies of a grid-forming type, which would automatically meet many of the automatic access standards for connection and, by their nature, would not cause adverse system strength impacts requiring costly system strength remediation schemes (e.g. installation of synchronous condensers).

3.2 AER rule change proposal

This section sets out the specific issues identified in the AER's rule change request and the rule changes proposed by the AER to address these issues.

The AER's rule change request has been informed by the conclusions of its report on stages 1, 3 and 4 of the black system event in South Australia on 28 September 2016.[58] In particular, the AER notes that the circumstances surrounding the provision of SRAS by Origin Energy's Quarantine Power Station (QPS) during the black system event highlighted a number of issues relating to communications between the South Australian TNSP, ElectraNet, and AEMO which had a material effect on QPS' inability to deliver SRAS when required, which ultimately delayed restoration to South Australian generators by one hour.[59]

Origin was contracted to provide SRAS in South Australia utilising QPS at the time of the black system event in 2016. QPS' capability to provide the SRAS it was contracted for was subject to annual testing. Separately, ElectraNet was required to develop a System Restart System Switching Program (SSP) which would facilitate the switching necessary for QPS to attempt system restart. The AER's investigation found that the System Restart SSP was different to the switching process used during QPS' annual SRAS testing.[60] Specifically, ElectraNet's switching arrangement for QPS in its System Restart SSP utilised a 'hard' start, while the switching arrangement used in QPS's SRAS tests involved a 'soft' start. When system restart was attempted with QPS, the use of a hard start was incompatible with the generator settings and caused the generator to trip, ultimately rendering it unavailable.

The AER notes that Origin and AEMO were not aware that the System Restart SSP had a different switching arrangement for QPS to that set out in the SRAS test SSP.[61] In the circumstances, only ElectraNet was in the position of being able to identify and act upon this discrepancy.

The AER's rule change proposal seeks to address the issues which may arise due to a lack of coordination and communication between parties involved in the procurement, testing and provision of SRAS by more clearly and expressly setting out these parties' obligations in the NER, with the aim of formalising the operational practices that these participants should already have been implementing.

3.2.1 Issues identified

NSP role in SRAS

58 AER, *The Black System Event Compliance Report*, December 2018. Available at: https://www.aer.gov.au/wholesale-markets/compliance-reporting/investigation-report-into-south-australias-2016-state-wide-blackout.

59 Ibid, p. 108.

60 AER, rule change request, p. 3.

61 Ibid, p. 2.

The AER considers that the central role of TNSPs in relation to the procurement, verification of capability, and effective delivery of SRAS in the event of a major supply disruption is not adequately reflected in the NER.[62]

The AER notes that, in relation to SRAS, the NER currently only explicitly require TNSPs to:[63]

- assess the capability of a SRAS to meet the SRS
- participate in, or facilitate, testing of, proposed SRAS
- assist a prospective tenderer of SRAS to identify and resolve issues pertinent to the delivery of SRAS.

The AER's rule change request also notes broader obligations imposed on TNSPs under the NER which are relevant to SRAS,[64] including obligations on NSPs to use reasonable endeavours to exercise their rights and obligations in relation to their networks so as to cooperate with and assist AEMO in the proper discharge of AEMO's power system security responsibilities[65] The AER considers that, while this obligation was complied with by ElectraNet on the day of the black system event, it was not sufficient to prevent the issues observed in relation to the provision of SRAS by QPS.[66] The AER suggests that the existing obligations imposed on NSPs under the NER do not create a comprehensive, seamless legislative framework which mirrors their involvement in SRAS delivery.[67]

The rule change request also identifies differences of opinion between ElectraNet and AEMO about the scope and details of ElectraNet's obligations under the SRAS Guideline in respect of SRAS testing.[68] In particular, AEMO considered that a TNSP would necessarily be involved in the planning and operation of SRAS testing, as this typically involves disconnection from the network of the generating unit to simulate black system conditions.[69] However, ElectraNet considered that it was only required to develop an SSP to enable the SRAS testing and that other actions—such as developing or endorsing the test procedure—was outside its role as TNSP.[70]

The AER suggests that these issues should be addressed by:

- amending the NER to explicitly set out the roles and responsibilities of all relevant parties in delivering SRAS
- extending the obligations of NSPs to apply not just to "prospective" SRAS Providers—as is currently defined in the NER—but also to SRAS already the subject of an SRAS Agreement
- ensuring that the overarching obligations for AEMO are explicitly included in the NER.

62 AER, rule change request, p. 4.
63 NER, clause 3.11.9(i).
64 AER, rule change request, p. 5.
65 NER, clause 4.3.4(a).
66 AER, rule change request, p. 5.
67 Ibid, p. 5.
68 Ibid, p. 6.
69 AER, *The Black System Event Compliance Report*, December 2018, p. 125.
70 Ibid, p. 126.

The AER considers that, while some of the services provided by a TNSP benefit the contracted SRAS Provider, aspects of those services (such as the preparatory steps for operationalising system restoration paths and implementing these in the event of a major supply disruption) are a core part of a TNSP's regulated responsibilities.[71] The AER's rule change request suggests that strengthening the way the processes relating to the procurement, testing and provision of SRAS apply to NSPs will ensure that NSPs prioritise and resource these roles appropriately.[72]

SRAS testing

As discussed above, the AER has found that a key contributing factor to QPS being unable to deliver SRAS during the black system event was the incompatibility of ElectraNet's System Restart SSP with QPS' protection settings.[73] Both AEMO and Origin were not aware that the System Restart SSP had a different switching arrangement for QPS to that used in QPS' SRAS tests. ElectraNet's System Restart SSP utilised a hard start, whereas the SRAS test SSP utilised a soft start. When system restart was attempted with QPS, the use of a hard start caused the generator to trip, ultimately rendering it unavailable. The AER's rule change proposal notes that ElectraNet was the only party in a position to be able to identify the discrepancy between the System Restart SSP and the SRAS test SSP, and raise the issue with AEMO and/or Origin.[74]

The AER notes that AEMO has since amended the SRAS Guideline to address this scenario. However, the AER considers that the NER should be amended to explicitly require the SRAS Guidelines to mandate that SRAS testing include an element of comparison between test arrangements and those planned to be used in the event of a major supply disruption to mitigate this risk.[75]

Communication protocols

The AER's rule change proposal suggests that the AER's investigation into the black system event identified that the lack of clarity surrounding roles and responsibilities—including in relation to the dissemination and verification of information—was the main contributing factor to the failure of QPS5 to deliver SRAS services on the day of the black system event.[76]

Specific issues identified by the AER in this regard include:

- ElectraNet did not have a shared understanding with AEMO as to what constituted the "communication protocols" required to be jointly developed by AEMO and NSPs under clause 4.8.12(j) of the NER. While both parties maintained communication during the system restoration period, there was no single specific written document detailing intended communication between parties, nor did ElectraNet assess that the NER required such a document.

71 Ibid, p. 7.
72 Ibid, p. 7.
73 AER, *The Black System Event Compliance Report*, December 2018.
74 AER, rule change request, p. 7.
75 Ibid, p. 8.
76 Ibid, p. 8.

- There is no obligation that the protocols be in writing. While there is an advantage of flexibility with non-written protocols, this comes at the price of certainty and clarity.
- The AER considers the purpose of the communication protocols - to facilitate the exchange of all relevant information regarding the roles of participants during the implementation of the System Restart Plan - to be too narrow, as it should also encompass the exchange of information in the preparation of the System Restart Plan.
- The protocols are only limited to AEMO and NSPs and do not capture any other parties necessary to system restart that may have crucial information which should be shared in a timely and efficient manner.
- The protocols are not binding.

The AER suggests that improvements to the communication protocols would assist all participants involved in a system restart and that any changes in this regard should fully reflect participants' obligations and align with the finding that NSPs should be required to facilitate ongoing SRAS testing.[77]

3.2.2 Proposed rule changes

1. **Roles and obligations of participants in relation to SRAS**

The AER has proposed the following amendments to the NER to clarify the roles and responsibilities of NSPs and AEMO with respect to SRAS:[78]

- changes to AEMO's power system security responsibilities to clearly define the actions AEMO should take to prepare for and respond to a major supply disruption - these changes are intended to highlight what the AER considers to be key steps that need to be carried out to ensure an efficient response to a major supply disruption, while acknowledging AEMO's discretion in determining any additional steps that are required
- the inclusion of explicit obligations on NSPs to use reasonable endeavours to assist AEMO in the preparatory steps required to ensure SRAS is capable of delivering as required - this extends the responsibility of NSPs beyond assisting a prospective SRAS provider to assisting in all stages of system restart where required.

2. SRAS testing

The AER acknowledges that the SRAS Guideline currently contains provisions for comparing the procedures used in SRAS testing with those used in response to a major supply disruption. However, the AER also considers that any misalignment between the two procedures may present significant challenges when seeking to restore the power system. As such, the AER has proposed mandating in the NER that the SRAS Guideline include a process for comparing testing procedures with deployment procedures to ensure that any discrepancies will not pose a barrier for SRAS deployment in response to a major supply disruption.[79]

77 Ibid, p. 9.
78 Ibid, p. 12.
79 Ibid, p. 13.

3. Communication protocols

The AER has proposed that the communication protocols AEMO and NSPs are required to develop under the NER in relation to the implementation of the system restart plan be explicitly required to be in written form in order to increase the clarity surrounding the type and timing of information to be disclosed between all relevant parties. Additional rules have also been proposed by the AER to:[80]

- ensure that AEMO and NSPs are bound by the communication protocols (where reasonable to do so) to ensure the timely and efficient dissemination of all relevant information
- ensure that AEMO and NSPs have access to any relevant information required to assist in system restoration.

The AER's rule change proposal acknowledges that increasing the scope of the communication protocols may in practice expand them beyond matters relating only to communication and that consideration could therefore be given to re-framing them as information sharing and responsibilities protocols.[81] The AER also notes that the protocols should consider how any confidential information would be exchanged between parties.[82]

3.2.3 Proponent's expected costs and benefits

The AER has not sought to specifically quantify the costs and benefits of the proposed rule changes.

Costs of proposed changes

The AER does not consider that the proposed rule changes will result in significant costs for market participants on the basis that:[83]

- the proposed rule seeks to clarify and formalise the existing practices and processes of NSPs and AEMO regarding SRAS into enforceable obligations and should therefore not result in any significant changes to, or reduction in flexibility of, their operations
- the inclusion of an explicit requirement that the SRAS Guideline include a process for identifying discrepancies between SRAS testing procedures and deployment procedures is consistent with the existing provisions of the SRAS Guideline
- the AER anticipates that the proposed changes in relation to the SRAS communication protocols would involve an initial period of activity to implement the new protocols, which would then be incorporated into business-as-usual processes.

Benefits of proposed changes

The rule change request identifies a number of suggested benefits of the proposed changes, including that the proposed rule would:[84]

80 Ibid, p. 13.
81 Ibid, p. 14.
82 Ibid, p. 14.
83 Ibid, pp. 15-16.
84 Ibid, pp. 15-16.

- provide a single, clear point of reference as to the roles and responsibilities of AEMO and NSPs, which would mitigate against misunderstandings which could delay the provision of SRAS
- clarify the standard of involvement required by all parties involved in system restart
- provide a clear standard against which to test compliance with obligations relating to SRAS
- provide a clear standard for understanding any gap between SRAS testing and deployment procedures
- require the use of written communication protocols which clearly sets out the timing of and manner in which information will be exchanged between parties, both in preparation for and during a major supply disruption
- broaden the scope of the communication protocols to include all parties involved in the system restart process to ensure that AEMO has access to any relevant information when preparing for, and coordinating a response to, a major supply disruption
- ensure that NSPs have information they need in order to convert the system restart plan into actionable procedures which are consistent with the capabilities of plant connected to their network.

4 ASSESSMENT FRAMEWORK

4.1 Achieving the NEO

Under the NEL the Commission may only make a rule if it is satisfied that the rule will, or is likely to, contribute to the achievement of the national electricity objective (NEO).[85] This is the decision making framework that the Commission must apply.

The NEO is:[86]

> to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to -
>
> (a) price, quality, safety, reliability and security of supply of electricity; and
>
> (b) the reliability, safety and security of the national electricity system.

Under the Northern Territory legislation adopting the NEL, the Commission must regard the reference in the NEO to the "national electricity system" as a reference to whichever of the following the Commission considers appropriate in the circumstances having regard to the nature, scope or operation of the proposed rule[87]:

(a) the national electricity system

(b) one or more, or all, of the local electricity systems[88]

(c) all of the electricity systems referred to above.

4.2 Making a more preferable rule

Under section 91A of the NEL, the Commission may make a rule that is different (including materially different) to a proposed rule (a more preferable rule) if it is satisfied that, having regard to the issue or issues raised in the rule change requests, the more preferable rule will or is likely to better contribute to the achievement of the NEO.

4.3 Rule making in the Northern Territory

The NER, as amended from time to time, apply in the Northern Territory, subject to derogations set out in regulations made under the Northern Territory legislation adopting the NEL.[89] Under those regulations, only certain parts of the NER have been adopted in the Northern Territory.[90]

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85 Section 88 of the NEL.

86 Section 7 of the NEL.

87 Section 14A of Schedule 1 to the *National Electricity (Northern Territory) (National Uniform Legislation) Act* 2015 (referred to here as the NT Act), inserting section 88(2a) into the NEL as it applies in the Northern Territory.

88 These are specified Northern Territory systems, defined in schedule 2 of the NT Act.

89 The regulations under the NT Act are the National Electricity (Northern Territory) (National Uniform Legislation) (Modifications) Regulations.

90 The version of the NER that applies in the Northern Territory is available on the AEMC website.

As some of the proponent's proposed rule changes relate to parts of the NER that apply in the Northern Territory, the Commission will assess whether to make a uniform or differential rule (defined below) under Northern Territory legislation.

Under the NT Act, the Commission may make a differential rule if, having regard to any relevant MCE statement of policy principles, a different rule will, or is likely to, better contribute to the achievement of the NEO than a uniform rule. A differential rule is a rule that:

- varies in its term as between:
  - the national electricity system, and
  - one or more, or all, of the local electricity systems, or
- does not have effect with respect to one or more of those systems

but is not a jurisdictional derogation, participant derogation or rule that has effect with respect to an adoptive jurisdiction for the purpose of s. 91(8) of the NEL.

A uniform rule is a rule that does not vary in its terms between the national electricity system and the local electricity systems, and has effect with respect to all of those systems.[91]

4.4 Proposed assessment framework

The Commission has determined that AEMO and the AER's rule change requests be consolidated under section 93 of the NEL, as it is desirable that the two requests be dealt with together for the purpose of the draft decision. The two rule change requests have overlapping scopes and speak to the same issues, namely the existing frameworks and governance arrangements applying to SRAS. Therefore, it is considered appropriate to consolidate the rule change requests and publish a single draft determination. It is also considered that consolidating the rule change requests will make it easier for stakeholders to engage with the consultation process for the requests.

The Commission is seeking stakeholder views on its proposed assessment framework which includes criteria to assess whether the proposed rules are likely to promote the NEO, particularly the impact the proposed rules would have on:

- efficient price and investment outcomes
- reliability
- governance arrangements
- flexibility of the framework
- administrative and implementation costs.

We will also consider the SRAS rule changes in the context of overall system resilience.

These principles are discussed in more detail below.

Efficient investment and operation

91 Section 14 of Schedule 1 to the NT Act, inserting the definitions of "differential Rule" and "uniform Rule" into section 87 of the NEL as it applies in the Northern Territory.

Price signals are central to driving the efficient use, operation of and investment in electricity services. There is typically a relationship between prices and levels of investment over time, with an efficient outcome occurring where prices reflect costs yet drive sufficient investment to meet consumers' long term needs. We will assess whether changes to the SRAS framework are expected to lead to more efficient price and investment outcomes.

Security and reliability

The security and reliability of electricity supply underpins national economic activity and investment decisions. However, there is a trade-off between a secure and reliable supply, including the risk it will be lost, and the cost of providing it. Changes to the SRAS frameworks should consider this trade-off. However, making such an assessment is not straightforward. We will consider how such trade-offs are implemented in practice, including the regulatory and administrative costs of these arrangements, and whether the associated decision-making is clear and understandable to market participants.

Governance arrangements

In the SRAS frameworks, organisational roles and responsibilities drive operational and regulatory outcomes. Clearly defined governance arrangements avoid conflicts of interest as well as foster confidence in the governance arrangements. Governance arrangements also encompass the opportunity for stakeholders to be consulted and the transparency of the decision-making. These rule changes raise a number of issues regarding the appropriate oversight of SRAS frameworks, coordination between participants involved in the procurement, testing and provision of SRAS and transparency in decision-making. In assessing these rule changes we will consider the extent to which the proposed governance arrangements are expected to lead to efficient outcomes versus the cost of providing them.

Flexibility of regulatory framework

Regulatory arrangements must be flexible to changing market conditions. They should not be implemented to address issues specific to a particular time period or jurisdiction, or the prevailing technology or business model of the day. Regulatory frameworks should support the right mix of resources over time, encompassing technological developments and changes in behaviour. Markets with flexible and adaptable regulatory framework designs are characterised by:

- innovation, because business models are able to emerge without being unnecessarily restricted by regulatory frameworks and because participants face incentives to provide services in a least cost manner
- low barriers to entry and exit, because regulatory frameworks provide consistent signals for undertaking investment decisions.

When considering the proposed changes to the SRAS frameworks, the Commission will consider how these changes relate to the changing market environment and whether they are capable of supporting the dynamic efficiency of the NEM.

Administrative and implementation costs

Changes to regulatory frameworks come with associated costs. These costs include both those imposed to implement change and the ongoing costs associated with making the change. These costs result from necessary changes to equipment, information technology systems and other market process. Generally, costs should be attributed to the party who is best able to reduce the extent of the costs over time. However, where costs are imposed in implementation and cannot be mitigated through market mechanisms, these costs should be minimised relative to the benefits of the regulatory changes. The proposed changes set out in the rule change requests need to be assessed to ensure the most efficient implementation. This is necessary so that the implementation and ongoing costs, ultimately borne by consumers, do not exceed the benefits of making the relevant changes to the SRAS frameworks. The Commission will therefore consider both the implementation and ongoing costs associated with the proposed changes.

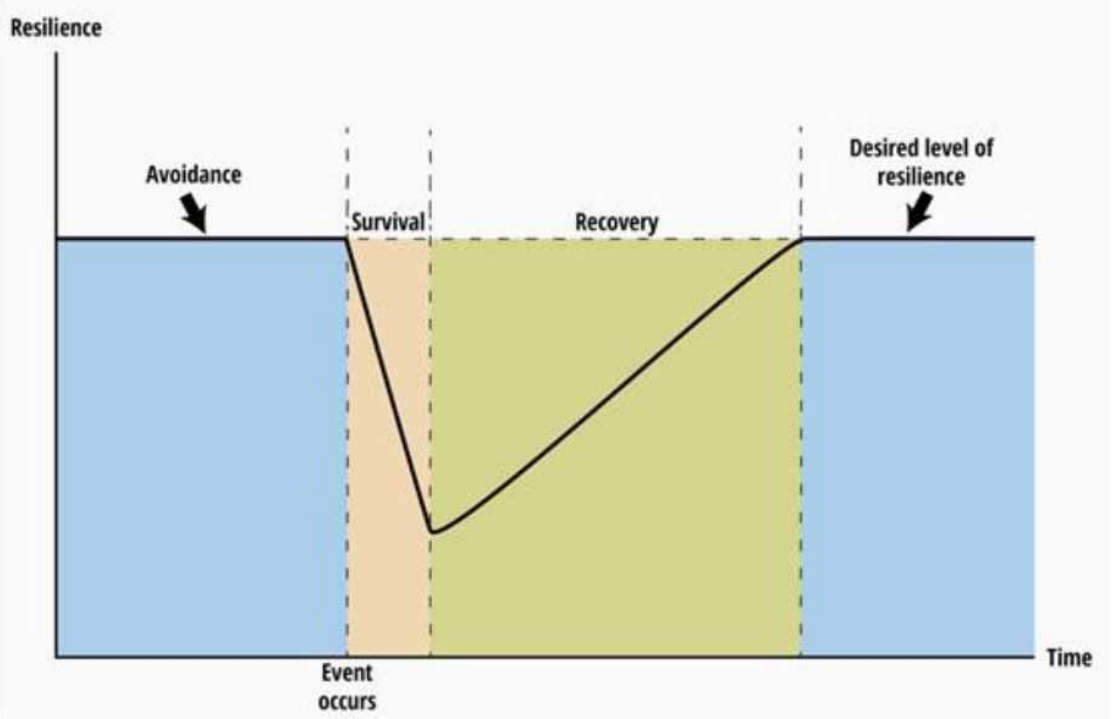
4.5 Resilience of the power system to high impact, low probability events

The Commission has previously characterised the resilience of the power system as its ability to avoid, survive, recover and learn from major disturbances, known as high impact, low probability events.[92] As the name entails, these events occur rarely, but can have major impacts on the supply of energy to consumers.

This concept of resilience is described in Figure 4.1 below.

92 AEMC, *Review of the System Black Event in South Australia, Issues and Approach paper*, 18 April 2019.

Figure 4.1: Resilience in the NEM - avoid, survive, recover



Source: AEMC, Review of the System Black Event in South Australia, Issues and Approach paper, 18 April 2019, p.52.

The resilience of the power system to HILP events can be delivered in a number of ways. Broadly speaking, this includes enhancing the:

- "Strength" of the system, being the services and capabilities inherent in the power system that enable it to manage the consequences of HILP events. Capabilities like inertia, fault current and reactive support are all examples of such "strengthening" capabilities, as is SRAS.
- "Interconnectedness" of the system, being the extent to which the meshed nature of the power system supports its ability to survive HILP events, by sharing resources across borders and increasing flow path redundancy.
- "Smartness" of the system, being a set of actions that improve the observability, controllability and operational flexibility of the power system to survive HILPs, such as by changing the operational profile of the system to prepare for an event, or by installing smart control schemes to manage an event.

In the AEMC's Review of the South Australian Black System event, these mechanisms for provision of resilience were mapped against the concepts of avoiding, surviving and recovering from a HILP event.

SRAS is a key way the system can be made *stronger,* so that it is better able to *recover* from a HILP event. Expanding and enhancing the SRAS frameworks as considered in the rule

change requests may enhance power system resilience in this manner. Similarly, by introducing better SRAS and system restoration communications protocols and processes, the system can also be made *smarter* and therefore more likely to recover from a HILP event.

In using this resilience framework, the AEMC will consider the SRAS rule changes in the following ways:

- What other mechanisms exist that can deliver enhanced resilience alongside SRAS, and what interactions and trade-offs should be considered between them. For example, the introduction of a primary frequency control service may help to *strengthen* the system, to *avoid* the worst consequences of a HILP event, which may reduce the need for SRAS at any given time. It is therefore important to consider how all potential resilience mechanisms may be combined, to enhance overall system resilience, and what trade-offs might need to be made between them.
- Equally, within the SRAS frameworks, it is necessary to consider the various trade-offs and interactions that are available to enhance resilience. For example, improving communication protocols may deliver materially improved resilience outcomes, by improving the likelihood that procured SRAS will operate as intended. This improvement in overall resilience may represent a "low hanging fruit", that is, it may achieve a material increase in resilience at a much lower cost than significantly increasing the type and volume of SRAS that are procured.
- Other positive resilience externalities may be enabled through an enhanced SRAS framework. As discussed in more detail in Chapter 5, the specific capabilities enabled through the procurement of a system restoration support service could also be applied more generally. For example, a voltage stabilisation restoration service could potentially be used on a regular basis, to manage over voltages from daily low line loadings. These additional use cases of the capability could act to enhance system resilience more generally, i.e., by helping to prevent voltage collapse were a HILP event to occur at those times it is activated.

QUESTION 1: ASSESSMENT FRAMEWORK

Do stakeholders agree with the proposed assessment framework? Alternatively, are there additional principles that should be taken into account?

5 ISSUES FOR CONSULTATION

Taking into consideration the proposed assessment framework described in Chapter 4, a number of issues have been identified for initial consultation. Stakeholders are encouraged to comment on these issues, as well as any other aspect of the rule change request or this paper, including the proposed assessment framework.

This chapter sets out issues for consultation in relation to:

- the expansion of the definition of SRAS
- the proposed changes to the SRAS procurement framework
- the testing of SRAS
- the proposed changes to the generator access standards
- the clarification of the roles and responsibilities of NSPs and AEMO in relation to SRAS
- the clarification of requirements relating to information provision and communication protocols in the context of SRAS.

Each issue raised for consultation is accompanied by questions for stakeholder consideration.

5.1 Expansion of the definition of SRAS

The definition of SRAS was most recently amended in 2015. In its final determination on the *System Restart Ancillary Services* rule change (2015 SRAS rule change),[93] the Commission agreed with a proposal by AEMO to remove the concepts of "primary restart services" and "secondary restart services" from the definition of SRAS.[94] The Commission considered that the removal of these definitions from the NER would:

- lower potential barriers to entry for new SRAS providers
- expand the range of potential restart services while maintaining adequate levels of reliability
- allow AEMO adequate flexibility to determine the optimal mix of restart facilities that will allow it to meet the requirements of the System Restart Standard (SRS) at lowest possible cost.

However, AEMO considers that the current definition of SRAS still imposes limitations on the provision of SRAS which do not reflect changes in technology. In particular, AEMO notes that the definition of SRAS refers to facilities with "black start capability", which is in turn defined as a specific physical capability possessed by a generating unit, being the capability to deliver electricity to either a connection point or a point in the network from which supply can be made available to other generating units, without taking supply from any part of the power system following disconnection.[95]

93 AEMC, *System Restart Ancillary Services* rule change - final determination, April 2015. Available at: https://www.aemc.gov.au/rule-changes/system-restart-ancillary-services.

94 Previously, the System Restart Standard specified primary SRAS as services with a reliability of 90 per cent, while secondary services were defined as those with a reliability of 60 per cent. AEMO was responsible for developing an approach for measuring the reliability of restart services.

95 NER, chapter 10.

AEMO argues that amending the definitions of SRAS and black start capability as proposed in its rule change request will:[96]

- allow for the possibility that alternative technologies or plant combinations (i.e. other than generating units) might provide black start capability in future
- allow AEMO to acquire system restoration support services, in addition to black start capability, from a range of potential facilities
- along with the proposed changes to the SRAS Procurement Objective, increase competition for the provision of SRAS by creating new incentives for generators to invest in this capability, which may lead to reductions in overall SRAS costs in the longer-term.

AEMO proposes to address these issues by amending the definition of SRAS that is included in Chapter 10 of the NER. In particular, AEMO propose to change this definition so that it would point to two sub-categories of service: black start capability (which would retain its current definition in Chapter 10) and restoration support services, being "the capabilities described in the SRAS Guideline to supply one or more services to sustain the stable energisation of generation and transmission".

This proposal to define new services in the SRAS Guideline raise a number of issues to be considered in further detail. These include the following questions:

- What is the nature of these new, system restoration services? While AEMO has described, at a very high level, that these restoration support services might entail voltage and frequency stabilisation, the nature of these services is central to determining the cost of their provision.
- Who should decide what these services look like? This raises subsequent issues around the appropriate governance and allocation of roles and responsibilities. Under AEMO's proposal, it would have discretion to define these restoration support services through development of the SRAS Guideline. AEMO would also have increased discretion, under the proposed abolition of the SRAS Procurement Objective, to procure whatever volume or combination of these new services was needed to meet the System Restart Standard in order to meet the NEO.
- What is the necessary level of flexibility for AEMO? Questions also arise as to how much flexibility AEMO requires to be able to define and procure new services in a rapidly changing power system. AEMO has proposed a number of indicative requirements for such services in its rule change request. Defining these services in the NER would require the AEMC to assess the full suite of issues relating to these services and how they are characterised as part of this rule change process. In addition, a rule change process would be required each time these services are proposed to be modified or expanded. However, there is also some precedent for the definition of these kinds of services in the NER, such as is currently the case for frequency control ancillary services, and network support and control ancillary services.

In addition, the technologies that could provide restoration support services could also potentially be used to provide system support outside of a restoration period. For example,

96 AEMO, *System restart standards, services and testing* rule change request, p. 12.

an asynchronous unit providing voltage stabilisation during a restoration period could also potentially offer voltage stabilisation during other periods, such as to address overvoltages on transmission elements during low loading periods.[97]

The Commission therefore intends to consider the kinds of positive externalities that could be associated with definition and procurement of these new restoration services and how to fully exploit their potential.

The rule change request also notes that, under the current SRAS frameworks, there is no intention that AEMO acquire SRAS from regulated NSPs.[98] Although AEMO has not proposed any detailed or specific changes in this regard, it also notes that "the AEMC may wish to consider whether this needs to be addressed in the rule."

Procurement of SRAS from NSPs, or some other form of restoration support service, would represent a significant departure from the current design of the SRAS frameworks in the NER. A number of complex issues will arise in assessing this option, including the appropriate separation of the regulated and competitive components of the electricity supply chain. As such, we intend to consider these issues at a high level, noting that their resolution should not impede the delivery of more time critical reform to the SRAS frameworks.

Lastly, as noted in the assessment framework, the Commission considers that SRAS is currently a key mechanism to deliver enhanced resilience of the power system. Effective SRAS increases the speed at which the power system can recover from a high impact, low probability event. Changes to these frameworks to introduce new services therefore need to be considered not only in light of security and reliability outcomes, but also in terms of their capability to enhance the overall resilience of the power system.

Given the above, in assessing AEMO's proposed changes, the Commission will consider:

- whether the existing definition of SRAS limits AEMO's ability to acquire services that may be necessary to support system restoration
- whether AEMO's proposed changes to the SRAS definition will incentivise new investment and support competition in the provision of SRAS
- the nature of the new investment that would be required to provide various system restoration services, including voltage and frequency stabilisation
- the costs associated with the new investment needed to provide system restoration services
- what the appropriate allocation of roles and responsibilities are in terms of the definition and procurement of these new system restoration services
- whether the proposed changes would continue to provide AEMO and the market with sufficient flexibility, guidance and transparency regarding the types of services that may be procured

97 Overvoltages due to overnight periods of low demand have driven over-voltages on parts of the Victorian transmission network in recent years. For more information see: https://www.aemc.gov.au/market-reviews-advice/annual-market-performance-review-2018

98 Ibid, p. 12.

- whether the proposed changes may provide broader security, reliability and resilience benefits, beyond the immediate functions of SRAS
- whether AEMO should also be able to procure SRAS or system restoration services from NSPs, and what the implications of such a change may be.

QUESTION 2: DEFINITION OF SRAS

1. Is it appropriate and/or necessary to expand the definition of SRAS to include system restoration support services, as proposed by AEMO? Will this enhance levels of competition in provision of SRAS, and help to reduce SRAS costs for consumers?

2. If system restoration support services were to be included in the definition of SRAS:

(a) do stakeholders have views on the types of services which should be classified as system restoration support services?

(b) is it appropriate for these services to be prescribed in the SRAS Guideline as opposed to the NER?

(c) could this facilitate the development and future utilisation of these services for purposes other than SRAS and, if so, do stakeholders see benefits in such an outcome?

3. Do stakeholders have views on whether AEMO should be able to acquire SRAS from NSPs? What issues are relevant to consideration of this issue?

5.2 Changes to SRAS procurement framework

The NER prescribe two "objectives" for the SRAS frameworks, which relate to the Reliability Panel and AEMO, respectively:

1. Reliability Panel: The "SRAS Objective" provides that the objective for SRAS is to minimise the expected costs of a major supply disruption to the extent appropriate, having regard to the NEO. The SRAS Objective guides the Reliability Panel in its setting of the parameters of the System Restart Standard (SRS). It requires the Panel to consider all matters relevant to meeting the long term interests of consumers, which involves consideration of various economic factors, including the trade-offs that exist between the cost of procuring restart services against the short term costs of a loss of supply and the longer term costs of economic disruption.[99]
2. AEMO: the "SRAS Procurement Objective" is currently defined as a requirement that "*AEMO must use reasonable endeavours to acquire system restart ancillary services to meet the system restart standard at the lowest cost*".[100]

99 AEMC, *System Restart Ancillary Services* rule change - final determination, April 2015, p. 60.

100 NER, clause 3.11.7(a1).

The existing SRAS Procurement Objective, which applies directly to AEMO, was introduced by the *National Electricity Amendment (System Restart Ancillary Services) Rule 2015* as part of the Commission's final determination for the 2015 SRAS rule change.[101] In developing the SRAS Procurement Objective the Commission considered a number of issues which are relevant to AEMO's current rule change request, including:

- **Clarification of purpose**: The Commission considered that the existing requirement on AEMO to use reasonable endeavours to acquire SRAS should be preserved under the new SRAS Procurement Objective.
- **Focus on cost of SRAS**: The Commission considered that the broader assessment of economic costs relating to SRAS is better undertaken by the Reliability Panel when it develops the System Restart Standard (SRS) and that AEMO's focus should therefore be solely on procuring SRAS that matches the requirements of the SRS, at the lowest cost possible. This distribution of responsibilities between the Panel and AEMO was designed to deliver an efficient quantity of SRAS, at an efficient cost.
- **Consideration of net benefit**: The Commission considered that effective SRAS frameworks must provide a clear separation of organisational roles and responsibilities. The Commission noted that it is the sole responsibility of the Reliability Panel to consider all relevant economic factors, including the benefits of SRAS and the cost of sourcing those services, in order to determine the efficient level of restart service for each sub-network. The Commission considered that AEMO's focus should be procuring the required quantities of SRAS to meet the SRS, as defined by the Panel, and that AEMO should not be procuring any more SRAS, or any less, than is required to meet the SRS.
- **Inclusion of technical requirements in SRAS Procurement Objective**: AEMO suggested that the SRAS Procurement Objective should expressly recognise the technical requirements included in the SRAS Guidelines to ensure that it procured restart services that met the requirements of the SRAS Guidelines, not just those services which were the cheapest. The Commission considered that AEMO's key focus should be on meeting its rule obligations as set out in the SRAS Procurement Objective, to meet the SRS at the lowest cost, as this would help to clarify AEMO's key function within the SRAS frameworks and reduce the risk of any conflict between meeting multiple obligations.

AEMO's rule change request acknowledges that, at the time of the 2015 SRAS rule change, AEMO agreed with the Commission's intent of providing clear and distinct objectives for the Reliability Panel and AEMO in fulfilling their roles in the SRAS framework.[102]

However, AEMO considers that it has since become clear that the lowest-cost procurement objective does not allow AEMO to take into account non-cost factors that may lead to more efficient outcomes in the long term interests of electricity consumers. AEMO has argued that the existing definition of the SRAS Procurement Objective constrains its ability to underwrite new SRAS capability, or to take account of "non-cost factors" which may allow it to procure a combination of SRAS which is slightly more expensive but provides a higher level of

101 AEMC, *System Restart Ancillary Services* rule change - final determination, April 2015.
102 AEMO, *System restart standards, services and testing* rule change request, July 2019, p. 9.

confidence in its ability to meet the relevant reliability requirements.AEMO, rule change request, p.9.

To address this, AEMO has proposed that the concept of the SRAS Procurement Objective as a defined term be deleted and the existing requirement in clause 3.11.7(a1) of the NER be amended to state that "*AEMO must use reasonable endeavours to acquire system restart ancillary services to meet the system restart standard, having regard to the national electricity objective*". AEMO contends that this change would ensure that SRAS is procured in a manner which ensures a focus on the long term interests of consumers with respect to price, reliability and security of supply.

Replacing the least-cost procurement objective with a reference to AEMO being guided by the NEO when acquiring SRAS requires careful consideration, particularly given the Commission's reasoning in the 2015 SRAS rule change that AEMO and the Reliability Panel's functions in relation to SRAS should be clearly delineated, with AEMO focusing on procuring the quantity of SRAS required to meet the SRS at the lowest cost. In contrast, under its proposed rule AEMO would have greater flexibility and discretion in respect of its procurement process for SRAS. In acquiring SRAS from certain providers, AEMO would only need to establish that its procurement decisions are consistent with the NEO.

It is worth highlighting that when making the 2015 SRAS rule, the Commission removed the prescriptive framework for SRAS procurement previously set out in the NER. The purpose of so doing was to "allow AEMO to procure SRAS through whatever process it considers to be most appropriate, potentially expanding the range of restart services available to meet the requirements of the SRS."[104] The Commission has therefore previously indicated that the NER are intended to explicitly allow AEMO to utilise whatever process it considers appropriate to procure SRAS, which could include entering into long term contracts to underwrite new investment in SRAS capability.

A question for further consideration is therefore whether the NER themselves inhibit AEMO's ability to procure SRAS through various mechanisms, or whether this represents a particular interpretation of the NER by AEMO.

It will also be important to understand:

- the factors influencing levels of competition in SRAS markets and the incentives for generators to invest in the development and integration of SRAS capabilities in their plant
- the extent to which AEMO's proposed changes would increase those incentives.

The Commission is interested in stakeholders' views on these matters, given that AEMO has suggested that the potential expansion of the pool of prospective SRAS providers is one of the key benefits of its proposed changes.

104 AEMC 2014, *System Restart Ancillary Services, Draft Rule Determination*, 18 December 2014 ,Sydney, p.iv.

QUESTION 3: SRAS PROCUREMENT OBJECTIVE

1. Do stakeholders agree with AEMO's characterisation of the issues identified in the rule change request in relation to the SRAS Procurement Objective?

2. Would AEMO's proposed changes to the SRAS Procurement Objective result in stronger incentives for generators to invest in SRAS capabilities?

3. Do stakeholders have views on the potential costs associated with the proposed changes to the SRAS Procurement Objective?

4. Would replacing the lowest-cost objective with a reference to the NEO provide appropriate and clear guidance to AEMO in relation to the procurement of SRAS?

5.3 Testing of SRAS

As discussed in Chapter 2, the NER set out existing requirements applying to NSPs in relation to testing of prospective SRAS, while the SRAS Guideline expands on the requirements and processes applying to SRAS testing.

AEMO's rule change request suggests that there is a need to clarify the involvement of NSPs in the ongoing testing of SRAS and to facilitate extended system restart path testing.

Given the role of SRAS in facilitating the timely and effective restoration of the power system, it is important to have confidence in the integrity of restart paths and be aware of potential issues which may delay or impede restoration. It may also be argued that generators and customers ultimately benefit from SRAS testing if it improves the likelihood and speed of a successful system restoration. At the same time, the impacts on market participants and any associated costs must be taken into account when considering changes to the SRAS testing framework.

AEMO notes the increased costs NSPs and generators would face in relation to extended network testing and has proposed the inclusion of a requirement to minimise the operational and commercial impact on affected participants. However, the possibility remains that generators who are not SRAS providers will need to be involved in extended network testing and this could significantly impact on the operations of those parties. AEMO proposes that those participants would need to bear their own costs in relation to such testing.

The rule change request also suggests that NSPs could recover their efficient costs of extended network testing through prescribed transmission services.

AEMO acknowledges the reservations expressed by NSPs about the potential scope of its proposed changes and suggests that provision in the draft rule for the cooperative planning of SRAS testing between AEMO and NSPs would address these concerns.

Given the potential impacts of the proposed changes to the SRAS testing framework on a range of market participants, the Commission will take a number of factors into consideration when assessing this proposal, including:

- the potential benefits and costs associated with the proposed changes, including:
  - the extent of costs borne by other generators who are obliged to participate in extended testing, and what impacts this may have on wholesale price outcomes and
  - the extent of costs borne by NSPs and what impacts this may have on network charges for consumers
- whether the cost recovery framework proposed by AEMO in relation to SRAS testing is appropriate and efficient
- the governance arrangements which should apply to the proposed SRAS testing regime to ensure the obligations of different parties are transparent and appropriate
- whether risks are allocated to the parties best placed to manage them.

QUESTION 4: SRAS TESTING

1. Do stakeholders agree with AEMO's analysis of the issues in relation to the testing of SRAS in the context of a changing power system?

2. Would the proposed change address the issue raised by AEMO? If not, what alternative solutions are there?

3. Can stakeholders provide an indication of the costs associated with the proposed changes? How will these costs affect generators, NSPs and consumers, respectively?

4. Do stakeholders have views on whether the cost recovery arrangements for SRAS testing proposed by AEMO are reasonable and efficient?

5.4 Generator access standards

Under the connections framework in the NER, connection applicants are able to negotiate with a network service provider (who is advised on some matters by AEMO) on the level of performance for the equipment they are seeking to connect to the power system. For each technical requirement, the negotiation occurs within a range provided by an automatic access standard (where a connection cannot be denied access on the basis of that technical requirement) and a minimum access standard (below which a connection must be denied access) that are each set out in the NER.

The access standards for generators connecting to the power system relate to a wide range of technical requirements and are set out in Schedule 5.2 to the NER. These access standards can be viewed as the reference points used for negotiations between connection applicants, the network service provider and, where relevant, AEMO, to set the specific levels of technical performance of equipment that connects to the power system.

As discussed in Chapter 3, AEMO is proposing the addition of a new access standard addressing the capability of generating units to provide active and reactive power in system restart conditions. Under AEMO's proposed rule, the minimum access standard would require generating units to be capable of providing at least one of the restoration support services

specified in the SRAS Guideline, while the automatic access standard would apply where the generating unit can provide all of the specified restoration support services.

The new access standard under the proposed rule relates specifically to restoration support services and would not mandate black start capability. AEMO also suggests that:

- the system restoration support services required for a particular connection location would be dependent on the characteristics of that part of the network.[105]
- most current inverter connected generation technologies are already capable of reactive power response at low or no active power output, noting that this is already a requirement for generating units in South Australia[106]
- the new access standard be prescribed as an AEMO advisory matter - the NER allow AEMO to refuse to agree to a proposed negotiated access standard in relation to AEMO advisory matters if, among other things, the connecting equipment would adversely affect system security or the quality of power supply to other network users.

AEMO's recommended changes to access standards would impose additional requirements on connecting generators and could therefore present a challenge to the connection of certain generation types in certain circumstances. The Commission will consider whether AEMO's proposed access standard is reasonable and does not represent an unnecessary barrier to entry for new generation. In assessing whether AEMO's proposal is reasonable, any additional costs borne by connecting generators, and the technical and commercial practicality of complying with AEMO's proposed access standard will be taken into account.

When making the *Generator technical performance standard rule* (GTPS rule) in 2018.[107], the Commission considered similar issues related to introduction of new technical requirements through the access standards, including:

- the extent to which requiring new capabilities from connecting generators aligns with the concept of "shallow connection charging", whereby a generator can be only be required to bear costs associated with its own connection, and cannot be asked to incur increased costs to support the future connection of other generators
- the interaction between mandating a capability in the access standards, and the role played by market price signals in providing incentives to generators to include given capabilities when investing in new plant
- the meaning of the term "capability" can have implications for costs associated with compliance testing. The Commission considered that "capability" could be demonstrated on the basis of manufacturer design specifications.

Overall, the introduction of any new access standard requires careful consideration, in terms of the extent to which a new mandatory obligation imposes increased costs on all generators. These costs can potentially create barriers to new investment, or could have the effect of increasing wholesale energy costs for consumers. However, these costs need to be

105 AEMO, *System restart standards, services and testing* rule change request, p. 13.
106 Ibid.
107 AEMC, *Generator technical performance standards, rule determination*, 27 September 2018

considered in light of whether they are likely to support a material increase in the security and resilience of the power system.

Given the above, the Commission will also consider:

- the trade-off between setting generator access standards at an appropriate level and minimising costs to consumers
- any implications for existing and future alternative methods for delivering system security outcomes
- whether risks are allocated to the parties that are best able to manage them.

QUESTION 5: GENERATOR ACCESS STANDARDS

1. Do stakeholders agree with AEMO's analysis of the issues in relation to the proposed new access standard addressing the capability to provide active and reactive power in system restart conditions?

2. Would the proposed change address the issue raised by AEMO? If not, what alternative solutions are there?

3. Does the proposed change represent an unnecessary barrier to entry, having regard to the costs imposed by the change and the technical capabilities of different technologies?

4. Can stakeholders provide an indication of the costs associated with the proposed change?

5.5 Roles and obligations of participants in relation to SRAS

Both AEMO and the AER's rule change requests suggest that additional clarity and guidance regarding the roles of different participants in the SRAS frameworks would be useful. A key consideration is therefore whether it is possible to change the SRAS frameworks to improve the guidance they provide and, if so, how. The changes proposed by AEMO and the AER aim to facilitate improved certainty and confidence in the SRAS frameworks, thereby enhancing the effectiveness of SRAS testing processes and the ability to efficiently restore the power system in the event of a major supply disruption. The AER considers that its proposed changes would formalise existing practices and processes of AEMO and NSPs in relation to SRAS.

Clearly defining roles and responsibilities can assist different market bodies and market participants to exercise their functions efficiently, subject to clear accountability through transparent regulatory frameworks. In assessing these rule change requests the Commission will consider the extent to which:

- the proposed clarifications of the roles and responsibilities of AEMO, NSPs and other market participants in relation to SRAS are expected to enhance SRAS outcomes, having regard to any associated costs
- changes to the NER are required to clarify the role and function of Local Black System Procedures (LBSPs) and the obligations of NSPs and generators in relation to these

procedures, noting the inconsistent interpretations which were adopted by AEMO and the AER in the context of the South Australian black system event.

QUESTION 6: CLARIFICATION OF ROLES AND OBLIGATIONS OF PARTICIPANTS IN RELATION TO SRAS

1. Do stakeholders agree with the AER's analysis of the issues in relation to the need to clarify the specific roles and responsibilities of NSPs, AEMO and other market participants in relation to SRAS?

2. Would the proposed change address the issue raised by the AER? If not, what alternative solutions are there?

3. Do stakeholders have views on the role and function of LBSPs and whether this is adequately dealt with under the NER?

5.6 Information provision and communication protocols

The AER's investigation into the black system event in South Australia on 28 September 2016 concluded that deficiencies in communication between ElectraNet, Origin Energy and AEMO about the switching arrangements for Quarantine Power Station (QPS) ultimately resulted in QPS being unavailable to provide SRAS when required to contribute to the restoration of the power system.[108] SRAS plays a critical role in responding to a major supply disruption. Ensuring that all parties involved have access to comprehensive and transparent information and a shared understanding of how to facilitate the delivery of SRAS may reduce the likelihood of unforeseen issues arising during a power system restoration.

In assessing the AER's proposed changes to information provision processes and communication protocols, the Commission will consider the extent to which the changes would impose new requirements on market participants in this context and whether the relevant obligations have been assigned to the appropriate organisations. The Commission will also consider whether the proposed changes would achieve the stated objective of improving the clarity, transparency and accessibility of such information.

The Commission will also consider the interactions between these proposals for improved processes and the other elements of the rule change requests. This is important as improved communications protocols may represent a low cost way to materially improve the function of procured SRAS. These relatively low cost changes to increase the effectiveness of the overall system restoration process may therefore materially enhance the overall resilience of the power system, at a markedly lower cost than procuring new SRAS and restoration support services.

108 AER, *The Black System Event Compliance Report*, December 2018.

QUESTION 7: INFORMATION PROVISION AND COMMUNICATION PROTOCOLS

1. Do stakeholders agree with the AER's analysis of the issues in relation to the need to clarify the requirements applying to information provision processes and communication protocols in relation to SRAS?

2. Would the proposed change address the issue raised by the AER? If not, what alternative solutions are there?

3. Are enhanced communications protocols and other processes likely to deliver materially enhanced resilience of the power system?

6 LODGING A SUBMISSION

Written submissions on the rule change request must be lodged with Commission by 17 October 2019 online via the Commission's website, www.aemc.gov.au, using the "lodge a submission" function and selecting the project reference code ERC0278.

The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated.

Where practicable, submissions should be prepared in accordance with the Commission's guidelines for making written submissions on rule change requests.[109] The Commission publishes all submissions on its website, subject to a claim of confidentiality.

If you are not able to lodge submissions online, please contact us and we will provide instructions for alternative methods to lodge the submission.

All enquiries on this project should be addressed to Mitchell Shannon on (02) 8296 0639 or mitchell.shannon@aemc.gov.au.

109 This guideline is available on the Commission's website www.aemc.gov.au.

ABBREVIATIONS

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
Commission	See AEMC
LBSP	Local Black System Procedures
MCE	Ministerial Council on Energy
MW	Megawatts
NEL	National Electricity Law
NEO	National electricity objective
NER	National Electricity Rules
NSP	Network service provider
QPS	Quarantine Power Station
SRAS	System Restart Ancillary Services
SRS	System Restart Standard
SSP	System Switching Program
TNSP	Transmission network service provider