Electricity

Review of the licensing arrangements for generators in South Australia

Final decision

December 2019

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Table of contents

Glossary of terms

Term	Description
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AGL	AGL Energy Limited
CEC	Clean Energy Council
Commission	Essential Services Commission of South Australia, established under the ESC Act
Condition 9	Technical licence condition covering disturbance ride-through – voltage phase angle shift
Condition 11	Technical licence condition covering system strength
Condition 16	Technical licence condition covering system restoration
ElectraNet	ElectraNet Pty Ltd
ESC Act	Essential Services Commission Act 2002
MEA Group	Meridian Energy Australia Pty Ltd and Powershop Australia Pty Ltd
NEM	National Electricity Market
NSP	Network Service Provider, which in South Australia's case is either ElectraNet (transmission) or SA Power Networks (distribution)
Rules	National Electricity Rules
SRAS	System Restart Ancillary Services
Technical licence conditions	Refers to the model technical licence conditions adopted by the Commission in 2017, as summarised in Appendix A
this Review	This review of the technical licence conditions, which commenced with the release of a Consultation paper on 3 June 2019.
TNSP	Transmission Network Service Provider, which in South Australia's case is ElectraNet

1 Executive summary

The Commission's Final decision is to cease imposing 12 of the 15 model technical licence conditions for electricity generators. These were introduced following the Commission's 2017 Inquiry into the technical licence conditions applying to electricity generators seeking to connect to the South Australian power system. The three conditions to be retained are condition 9 (disturbance ride-through – voltage phase angle shift), condition 11 (system strength) and condition 16 (system restoration).

These changes only relate to the 15 licence conditions introduced in 2017 and are effective from the date of release of this Final decision. The changes apply for new generator licence applications from that date. Conditions on existing licences on that date will remain unchanged. Proponents of licence applications being processed at that date can choose whether to re-apply.

A statutory function of the Essential Services Commission (Commission) is to licence and set licence conditions for electricity generators in South Australia. This includes a power to vary (or add to) conditions that are imposed on any licence it has issued, subject to statutory procedural requirements.

Since 2005, the Commission has put in place additional technical licence conditions, dealing with system stability and support: initially for wind-powered electricity generators and (since 2017) for all electricity generators. It has done so on the basis that the prevailing national regulatory frameworks and arrangements do not deal adequately with the technical and system impacts of new electricity generation technologies in South Australia, particularly where those are intermittent or otherwise variable. At all times the Commission has been clear that, if national arrangements become sufficiently robust to protect South Australians from adverse power system security breaches, then it would be appropriate to cease imposing its State-based technical licence conditions.

Following reviews in 2005 and 2010, in August 2017 the Commission completed a third review of those technical licence conditions. That review found that the national regulatory frameworks and arrangements still did not adequately protect South Australians. As a result, the Commission introduced 15 new model technical licence conditions, applying from 17 August 2017. These were designed to require all new electricity generators to incorporate cost-effective features contributing towards a secure and resilient power system.

Over the past two years the electricity market has continued to evolve, with changes to the National Electricity Rules in areas relating to technical requirements for electricity generators. Given this, the Commission commenced this current (fourth) review of the technical licence conditions in June 2019, to assess the extent to which the 15 technical licence conditions introduced in 2017 remained necessary. A consultation paper was released at that time, accompanied by technical advice provided by the Australian Energy Market Operator (AEMO).

AEMO recommended no longer imposing the model technical licence conditions except conditions 9, 11 and condition 16 (being those that the Commission has determined should remain). Submissions were received from four stakeholders to the Consultation paper and two to the Draft decision released in October 2019. While opinion was divided as to whether those three conditions should remain, all stakeholders considered there were grounds to no longer impose all other conditions.

On balance, the Commission considers that maintaining these three licence conditions (9, 11 and 16) is in the interests of South Australian consumers at this time. This view is based on available evidence, consideration of AEMO's advice, and the fact that South Australia has the highest level of non-synchronous generation in the National Electricity Market (NEM) - which places its electricity network in a unique position from a stability and reliability perspective.

At the same time, the Commission continues to support national consistency, where possible seeking low barriers to entry for prospective generators and lowest overall cost for consumers, subject to maintaining the security and reliability of the South Australian power system. In this regard the Commission notes the NEM will continue to evolve and subsequent developments may result in the decision to cease imposing these remaining three licence conditions.

2 Introduction

The Essential Services Commission (**Commission**) performs a range of functions across the different industries it regulates. These include pricing, licensing, performance monitoring and reporting, compliance and scheme administration.

The Commission has a licensing function under the Electricity Act 1996 (**Electricity Act**), which includes a power to vary (or add to) conditions that are imposed on any licence it has issued. Specifically, under section 27 of the Electricity Act, the Commission has the power to vary an electricity generation licence at any time, subject to statutory procedural requirements, including providing a licensee with reasonable notice of a proposed variation and allowing it the opportunity to make representations on that variation.

There are a broad range of factors that might be potential "triggers" for the Commission to consider varying an electricity generation licence or adding new conditions. These include factors both external and internal to a licensee, and may include (without limitation):

- material changes in market operations, outcomes or structures
- changes to the National Electricity Rules (**Rules**) or the Electricity Act
- other relevant statutory, legislative or policy changes
- the findings of a formal inquiry undertaken by the Commission
- substantive changes to electricity infrastructure or operations which would have a genuine connection to or impact on the operations authorised under an electricity generation licence
- an application by a licensee to vary its licence to add new generation plant or equipment or increase the capacity of existing generation plant
- evidence of upgrades or material changes to a licensee's generation plant or equipment authorised under its electricity generation licence, and
- evidence of material changes to the business or operational practices of the operator of the generation plant and equipment authorised under an electricity generation licence.

In considering a potential licence variation, the Commission must consider the factors specified in section 6 of the Essential Services Commission Act 2002 (**ESC Act**) (which sets out the Commission's primary statutory objective and other relevant considerations), the objects of the Electricity Act (as set out in section 3 of that Act). It will also be informed by any information submitted by a licensee to which the variation may apply, through public consultation and by engagement with regulatory agencies involved in the electricity supply industry.

Since 2005, the Commission has put in place additional technical licence conditions, dealing with system stability and support: initially for wind-powered electricity generators and (since 2017) for all electricity generators. It has done so on the basis that the prevailing national regulatory frameworks and arrangements did not deal adequately with the technical and system impacts of new electricity generation technologies in South Australia, particularly where those are intermittent or otherwise variable. At all times the Commission has been clear that, if national arrangements become sufficiently robust to protect South Australians, then it would be appropriate to no longer impose its State-based technical licence conditions.

Following reviews in 2005 and 2010, in August 2017 the Commission completed a third review of those technical licence conditions. The 2017 review found that the national regulatory frameworks and

arrangements still did not adequately protect South Australians.[1] They did not deal adequately with the technical and system impacts of the changing electricity generation mix in South Australia, particularly the level of non-synchronous connection to the grid. As a result, the Commission introduced 15 new model technical licence conditions (technical licence conditions), applying from 17 August 2017. These were designed to require all new electricity generators to incorporate cost-effective features contributing towards a secure and resilient power system. A copy of the 2017 model licence conditions for new generators is provided as Appendix A.

The 2017 technical conditions, designed to be consistent with and not duplicate existing national rules and frameworks, require new generators to be better able to:

- ride through power system disturbances without prematurely disconnecting and be available to assist with remediating contingency events, as required by conditions 2, 3, 4, 5, 6, 7, 8 and 9
- control their energy output to maintain stable operation of the power system, as required by conditions 12, 13, 14 and 15
- manage and control voltages to support the network during disturbances and to efficiently transfer power, as required by condition 10
- be capable of operating in weak system conditions (where limited fault current is available), as required by condition 11, and
- assist with power system restoration, should there be a major outage on the power system, as required by condition 16.

Over the past two years the market has continued to evolve, with changes to the Rules in areas relating to technical requirements for electricity generators. As a result, the Commission has assessed the extent to which the 15 technical licence conditions remain necessary, with this Final decision providing the outcome of that assessment.

2.1 Purpose and scope

On 27 September 2018, the Australian Energy Market Commission (AEMC) published amendments to the Rules.[2] These apply to all jurisdictions in the National Electricity Market (NEM), including South Australia, and change the way that levels of performance are negotiated between an electricity generator and the Network Service Provider (NSP) for equipment connecting to the power system. They also improve the technical requirements associated with security and resilience for new generating systems. These Rule changes commenced on 5 October 2018, and transitional arrangements ended on 1 February 2019.

The Commission has reviewed the 2017 technical licence conditions in the context of those recent Rules' amendments (this Review). The purpose of this Review was to consider the possibility of ceasing to impose any local licence conditions given those amendments, in the context of maintaining the long-term interests of South Australian consumers. The protection of the long-term interests of South Australian consumers with respect to the price, quality and reliability of essential services is the primary objective of the Commission under the ESC Act.[3]

As part of this Review, the Commission sought and received advice from the Australian Energy Market Operator (AEMO) regarding the extent to which the amended Rules address the matters dealt with by the Commission's technical licence conditions. AEMO has recommended no longer imposing all the

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1 Essential Services Commission, *Inquiry into the licensing arrangements for generators in South Australia*, Final report, August 2017, available at https://www.escosa.sa.gov.au/ArticleDocuments/1050/20170817-Inquiry-LicensingArrangementsforGgneratorsSA-FinalReport.pdf.aspx?Embed=Y.

2 AEMC, *National electricity amendment (generator technical performance standards) rule 2018*, Rule Determination, 27 September 2018, available at https://www.aemc.gov.au/sites/default/files/2018-09/Final%20Determination_0.pdf.

3 Section 6(a), ESC Act.

conditions, other than three – those that related to disturbance ride-through – voltage phase angle shift, system strength and system restoration.

2.2 Review process

This Review commenced on 3 June 2019, with the release of a Consultation paper[4] and a copy of AEMO's advice.[5] Table 1 below lists the submissions received to the Consultation paper.[6]

Table 1 – Submissions received to the Commission's June 2019 Consultation paper

Contributor	Role
AGL Energy Limited (**AGL**)	Generator/Retailer
Clean Energy Council (**CEC**)	Peak body
ElectraNet Pty Ltd (**ElectraNet**)	Transmission Network Service Provider (**TNSP**)
Meridian Energy Australia Pty Ltd and Powershop Australia Pty Ltd (**MEA Group**)	Generator/Retailer

The Commission released a Draft decision on 14 October 2019, with submissions sought by 8 November 2019.[7] Table 2 below lists the submissions received to the Draft decision.[8]

Table 2 – Submissions received to the Commission's October 2019 Draft decision

Contributor	Role
Clean Energy Council	Peak body
ElectraNet	TNSP

The Commission requested further advice from AEMO in relation to these two submissions, with the advice received presented in section 3.1.

2.3 Contents and structure

Chapter 3 outlines the Commission's Final decision on this Review, the key issues raised in the submissions in response to the Draft decision and the Commission's assessment in reaching its Final decision. The Commission's Final decision is summarised in Appendix B.

Chapter 4 outlines the next steps, which includes the Commission continuing to review developments in this area.

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4 Essential Services Commission, *Licensing arrangements for generators in South Australia,* Consultation paper, 3 June 2019, available at https://www.escosa.sa.gov.au/projects-and-publications/projects/electricity/licensing-arrangements-for-generators-in-south-australia.

5 AEMO, *Recommended technical standards for generator licensing in South Australia*, Alignment advice to the Commission, 18 March 2019, available at https://www.escosa.sa.gov.au/ArticleDocuments/11389/20190527-Electricity-LicensingArrangementsGeneratorsSA-AEMO-NERAlignmentAdvice.pdf.aspx?Embed=Y.

6 Submissions to the Commission's June 2019 Consultation paper are available at: https://www.escosa.sa.gov.au/projects-and-publications/projects/electricity/licensing-arrangements-for-generators-in-south-australia.

7 Essential Services Commission, *Review of the licensing arrangements for generators in South Australia,* Draft decision, 14 October 2019, available at https://www.escosa.sa.gov.au/projects-and-publications/projects/electricity/licensing-arrangements-for-generators-in-south-australia.

8 Submissions to the Commission's October 2019 Draft decision are available at: https://www.escosa.sa.gov.au/projects-and-publications/projects/electricity/licensing-arrangements-for-generators-in-south-australia.

3 Final decision and reasons

Summary

Based on the evidence available, and having considered AEMO's recommendations and feedback from stakeholders, the Commission's Final decision is to cease imposing conditions 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14 and 15 of the current 15 technical licence conditions adopted in 2017, on the basis that this action is supported by developments in the NEM.

The Commission considers that, at this time, ceasing to impose the remaining three technical licence conditions would expose South Australian consumers to unnecessary risks with respect to the security of the South Australian power system. The Commission's Final decision is to retain condition 9 (disturbance ride-through – voltage phase angle shift), condition 11 (system strength) and condition 16 (system restoration) for new generators operating in South Australia.

These changes are effective from the date of release of this Final decision paper.

3.1 AEMO's advice and recommendations

In its March 2019 advice to the Commission, AEMO recommended no longer imposing of all but three of the 2017 technical licence conditions.[9] AEMO recommended retaining three technical licence conditions that cover: disturbance ride-through – voltage phase angle shift (condition 9), system strength (condition 11) and system restoration (condition 16). AEMO's rationale is that these conditions remain specific to South Australian network conditions and are not specifically defined under the Rules. Further discussion of AEMO's reasons for retaining these is presented in section 3.2.1.

AEMO made this recommendation on the understanding that the updated negotiation framework, as applicable to new generator connections in the NEM, is effective in ensuring that new generators aim to achieve the highest standard defined in the Rules. This is known as the automatic access standard. Where a lesser standard is sought, the connection applicant must provide reasons and evidence establishing that the proposed lesser standard is as close as practicable to the highest standard, as is necessary, taking into account the limited considerations in the Rules. The objective being to provide an opportunity to adopt more cost-effective, lower standards than the automatic access standards where specific system conditions allow.

The Commission subsequently requested AEMO consider whether, in its view, the submissions received to the Draft decision warranted any amendment to that decision. AEMO advised that they did not. More detail is provided in sections 3.2.1.3 and 3.2.2.1.

3.2 Commission response to issues raised in submissions

The Commission responded in detail to issues raised in submissions to the Consultation paper, in Tables 2 to 5 of the Draft decision paper. These tables are reproduced in this Final decision paper as Tables 3 to 6, with – where new material has been received - the addition of issues raised in submissions to the Draft decision and the Commission's response. CEC and ElectraNet provided submissions to the Draft decision.

[9] AEMO, *Recommended technical standards for generator licensing in South Australia*, Alignment advice to the Commission, 18 March 2019.

In summary, the overarching outcomes arising from submissions to the Consultation paper and the Draft decision can be broadly categorised as follows:

- Conditions proposed to no longer be imposed: All submissions supported ceasing to impose the 12 technical licence conditions identified by AEMO. Submissions noted this avoids duplication with the Rules and provides a more consistent market framework across jurisdictions.
- Conditions proposed to be retained:
  - ElectraNet and the MEA Group supported retention of technical licence conditions 9, 11 and 16 (section 3.2.1), primarily because they agreed with AEMO's recommendation.
  - CEC (in its submission to the Consultation paper) and AGL did not agree with AEMO and considered these conditions redundant. Their view is that retaining the conditions would be inconsistent with the recently amended Rules and that there are now sufficient obligations within the overall national framework to satisfy the intent of these conditions.
  - Further, in its submission to the Draft decision, CEC submitted the Commission should wait to make its final decision regarding retention of condition 16 until after the AEMC releases its draft determination on a system restart services, standards and testing rule change proposal (ERC0278), due on 19 December 2019.
- Additional matters:
  - New generator performance assessment framework: AGL considered that the Commission's technical licence conditions interfere with the intended flexibility of the negotiation process established under the Rules. ElectraNet raised a concern that the new negotiation process may not achieve the outcomes sought by the current technical licence conditions (section 3.2.2.1).

    In its submission to the Draft decision, ElectraNet emphasised an aspect of its submission to the Consultation paper. ElectraNet submitted that with respect to the new national framework for negotiated access standards, in addition to network service providers (such as ElectraNet), AEMO has a key role in assessing system security requirements.
  - Generator connection process: CEC and AGL submitted concern with the efficiency of the generation connection process, seeking better coordination to minimise time delays, should the Commission decide to retain the final three conditions (section 3.2.2.2).

3.2.1 Response to submissions dealing with retained licence conditions

This section focuses on submissions that raised issue with the Commission's proposal to retain technical licence conditions, separately for each licence condition.

3.2.1.1 Licence condition 9: Disturbance ride through – Voltage phase angle shift

Table 3 provides the Commission's responses to stakeholder comments on condition 9.

Table 3 – Licence condition 9: specific issues raised in submissions and Commission's response

Issue	Stakeholder view	Commission's response
Consultation paper		
9(1)	The CEC submitted that vector shift protection is known to be unreliable if set too sensitively. However, it should not be desensitised to a value greater than 20 degrees because it would likely not detect an actual islanding event. That is the reason for this type of protection not being utilised in many other regions across the NEM.	The Commission acknowledges that there is an optimum point for setting vector shift (or voltage phase angle) protection to get the right balance between avoiding spurious tripping of generators (when set too sensitively) and detecting islanding situations (when desensitised). Condition 9 has only been required for new generators since October 2018, and the Commission does not have sufficient evidence to suggest the required settings are not detecting islanding events. However, it is acknowledged these requirements may have to be revisited over time if these events do occur and are proven to be due to protection being set too insensitively.
9(2)	The CEC also submitted that requirements for anti-islanding protection are covered by the relevant NSP requirements.	While some NSPs may have requirements for anti-islanding protection, ElectraNet's submission has agreed with AEMO's advice that South Australia still requires condition 9 as a special provision if vector shift relays are used. This suggests that ElectraNet considers the condition remains relevant.
9(3)	Both the CEC and AGL submitted that protection system operation during disturbances is sufficiently dealt with in the Rules (clause S5.2.5.8(c)), hence condition 9 is redundant.	It is acknowledged that clause S5.2.5.8(c) of the Rules defines the possibility of a requirement by AEMO or the NSP for the generating system to automatically disconnect from the network upon detection of an electrical island. However, condition 9 provides guidance regarding acceptable minimum settings for vector shift protection, should it be utilised.
9(4)	AGL also submitted that AEMO's Power System Model Guidelines specify that protection relays must be included in the models developed for connecting or altered generators.	While protection relay settings must be included in generator models submitted to AEMO, condition 9 defines the permissible settings that go into the generator model, as required for South Australia.
Draft decision		
	No new issues raised.	

In reaching its Final decision to retain condition 9, the Commission continues to have regard to the following:

- AEMO's concern with the use of vector shift relays in South Australia. This type of relay, when set too sensitively, is vulnerable to false detection of faults. The incorrect response of a sufficient number of these relays can collectively exacerbate the impact of a disturbance in the South Australian network.

- A moderate disturbance in a weak power system, such as in South Australia, is prone to cause a considerable voltage phase angle shift that, if erroneously detected by multiple generators as an islanding event, can prematurely trip those generators. If the deficit in generation is high, this could result in loss of synchronism between South Australia and Victoria particularly during high power transfer between the two states. This event may lead to the electrical islanding of South Australia and, in the extreme, the occurrence of a black system event. Retaining condition 9 can, to some extent, mitigate this risk.

3.2.1.2 Licence condition 11: System strength

Table 4 below provides the Commission's responses to stakeholder comments on condition 11.

Table 4 – Licence condition 11: specific issues raised in submissions and Commission's response

Issue	Stakeholder view	Commission's response
Consultation paper		
11(1)	The CEC considered the Commission retaining a system strength access standard would create inconsistency across the NEM. It submitted that the AEMC ruled not to include a system strength access standard in the Rules for reasons of upfront costs and interactions with other rules. CEC quoted relevant text from the AEMC consultation process on the recently introduced generator performance standards in the Rules.	While the Commission agrees with the CEC in principle, this has to be considered in the context of the practical performance of the recently updated national framework. This places an obligation on the TNSP to provide a central solution for system strength, which ElectraNet is currently proceeding with through installing synchronous condensers in South Australia by the end of 2020 (see point 2 below). While the AEMC determination by necessity had to consider the impact of system strength matters across the entire NEM, the context for South Australia is that system strength is already an operational challenge. In such circumstances, to cease to impose condition 11 when AEMO recommends it be retained (in response to current operating conditions in South Australia) might be premature and place South Australian consumers at undue risk.
11(2)	AGL submitted that the 2017 "managing power system fault levels" rule (Rules) and AEMO's system strength guidelines adequately cover system strength issues.	The Commission acknowledges that there is a new rule for managing power system fault levels that is designed to resolve existing issues with system strength, and remove the need for costly (market intervention) measures by the end of 2020. However, the implementation of this rule has yet to come into effect and its performance is unknown. By contrast, the risks facing the South Australian network are known, transparent, and to an extent mitigated through condition 11. Also, the Commission notes AEMO's concern that, given the consistently high rate of non-synchronous generation penetration in South Australia, the rule AGL refers to will not be sufficient to mitigate against all future developments.
11(3)	AGL submitted that, according to AEMO's simulation models, the low short-circuit ratio stated in condition 11 was beyond the capability of generators to sustain a stable performance.	The Commission considers that if simulation studies show that reducing system strength beyond the capabilities of existing generators may cause system instability at certain times, this represents a good reason for ensuring that all new plant can operate down to the low levels specified in condition 11 - and do not suffer from the same issue. Also, whether the new centralised measures for system strength in the Rules will cover all parts of the network at all times is yet to be practically demonstrated.

Issue	Stakeholder view	Commission's response
11(4)	AGL submitted that the AEMC was in the process of investigating whether the current Rule framework was appropriately addressing system strength, with a view to limiting the need for AEMO intervention in the NEM. Hence, it would be appropriate to cease to impose the South Australian specific condition.	The Commission awaits the outcomes of the AEMC's investigation of the appropriateness of the Rule framework with regards to system strength. These outcomes will be an important input in any future Commission decision to review the need for condition 11.
Draft decision		
	No new issues raised.	

In reaching its Final decision to retain condition 11, the Commission continues to have regard to the following:

- The need to carefully consider the low system strength implications on regional system security and the reliability of supply to customers in South Australia.
- The fact that the Rules do not yet contain sufficient practically tested permanent measures for low system strength scenarios for which the stability of the power system must be ensured.

3.2.1.3 Licence condition 16: System restoration

Table 5 below provides the Commission's responses to stakeholder comments on condition 16.

Table 5 – Licence condition 16: specific issues raised in submissions and Commission's response

Issue	Stakeholder view	Commission's response
Consultation paper		
16(1)	The CEC submitted that, while it acknowledged the importance of the role of asynchronous generation in system restoration, such requirements should be captured under the assessment of the overall system restoration process and a System Restart Ancillary Services (SRAS) agreement on an 'as required' basis, instead of adding extra costs to projects.	The Commission acknowledges the points raised by CEC. But, given the rapidly changing generation mix in South Australia, the Commission also notes AEMO's consideration that it is critical at this time that all new generation plant has the capability to contribute to system restoration - given certain system conditions - in a manner additional to the SRAS contracts in place.
16(2)	AGL submitted that system restoration is sufficiently dealt with in the Rules and that, in particular, AEMO's Power System Model Guidelines specify that control systems must be included in the models developed for connecting generators.	While control system settings must be included in generator models submitted to AEMO, the Commission notes that condition 16 defines the performance capability that needs to be delivered by the generating system being modelled. The provision of a model does not deliver such capability.

Issue	Stakeholder view	Commission's response
Draft decision		
16(3)	The CEC submitted that the Commission should wait to make its final decision regarding retention of condition 16, pending the release of AEMC's draft determination relating to the standards and testing of SRAS[10].	The proposed release of the AEMC's draft determination is December 2019, with a project end date of May 2020[11]. Given this, there is a considerable amount of time before any resulting Rule change comes into effect. AEMO also recommends retention of condition 16 at this time, recommending condition 16 be reviewed by the Commission following the AEMC's final determination of the SRAS rule change. In this context, the Commission also notes that from the perspective of protecting the long-term interests of South Australian consumers, practical evidence of the effectiveness of any SRAS rule change is also highly relevant. Overall, the Commission continues to monitor the need for South Australian specific licence conditions as the national framework develops. It acknowledges that industry benefits from removal of duplication, but notes this has to be balanced with protecting South Australian consumer interests.

In reaching its Final decision to retain condition 16, the Commission continues to have regard to the following:

- While the rate of decentralisation of generation resources is increasing at a steady pace in South Australia, the Commission needs to ensure that consumers are protected when it comes to optimal restoration of supply after a possible system black event.
- There is likely to be value in maintaining condition 16 pending:
  - a more efficient regional system restoration process being adopted, that is centrally procured by AEMO; or
  - the national framework evolving to deal with system restoration in a region with South Australia's generation mix and load characteristics.

3.2.2 Response to submissions dealing with additional matters

As noted above (see section 3.2), some stakeholders raised matters not related to specific technical licence conditions. These are discussed in the following sections.

3.2.2.1 New generator performance assessment framework

As noted in section 3.1, AEMO's advice is based on the new framework for negotiated access standards resulting in most cases in new generation connections performing at, or very close to, the automatic access standard levels. Stakeholders had varying views on the role of the performance assessment framework. Table 6 below provides the Commission's response to stakeholder comments on the new generator performance assessment framework.

[10] AEMC, *National electricity amendment (system restart services, standards and testing) Rule 2019*, Consultation paper, 19 September 2019, available at https://www.aemc.gov.au/sites/default/files/2019-09/Consultation%20paper%20-%20System%20restart%20services%2C%20standards%20and%20testing.pdf.

[11] AEMC website shows an expected completion date of 28 May 2020, see https://www.aemc.gov.au/rule-changes/system-restart-services-standards-and-testing. AEMC website viewed 15 November 2019.

Table 6 – New generator performance assessment framework: specific issues raised in submissions and Commission's response

Issue	Stakeholder view	Commission's response
Consultation paper		
(1)	ElectraNet expressed concern in its submission that, despite due diligence in the assessment of performance requirements by the NSP and AEMO under the Rules' negotiation framework, the process is still a negotiation. The outcome of the negotiation may be legally challenged and result in a negotiated access standard being rejected. To avoid this situation, ElectraNet suggested (but did not advocate) that if the Commission's intent was to ensure the automatic access standard is achieved, then the Commission should mandate this standard to avoid any adverse outcome from the negotiation process.	The Commission acknowledges that the new negotiation process might assign ElectraNet more risk if it fails to negotiate appropriate technical standards with a prospective generator. However, as the transmission operator of the South Australian system, ElectraNet is well placed to manage such risks and should have the information and expertise to mitigate them. If, in the South Australian context, a necessary outcome of a negotiation is that a new generation connection should perform at, or very close to, the outcomes sought by the current technical licence conditions, the Commission can see no particular reason why in negotiations ElectraNet would consider an alternative outcome acceptable. To do otherwise would not appear to be in ElectraNet's interests or that of the South Australian public.
(2)	AGL submitted that the Commission's licensing regime was highly rigid, offered little scope for the differing capabilities of generating plant and removed the flexibility that the obligations under the Rules were designed to provide. According to AGL's experience, connecting generation in South Australia had proven to be an unnecessarily complicated, and at times, inefficient process.	The Commission acknowledges AGL's point that by retaining certain licence conditions it is technically possible to constrain the flexibility of the negotiation process. Section 3.2.1 outlines the Commission's overarching reasoning regarding why it considers that, at this time, certain conditions should be retained.
(3)	The MEA Group submitted that AEMO should undertake a review of the existing generator performance standards and consider submitting a rule change request to incorporate the requirements of the three remaining conditions (proposed to be retained) into the Rules. The MEA Group noted that while these technical licence conditions pertain to issues currently relevant to South Australia, the potential exists for some of these issues to manifest in other regions of the NEM.	With respect to the MEA Group's point regarding incorporating the requirements of the three conditions in the Rules, this is a matter for AEMO and national regulators. The Commission is of the view that they are in the best position to decide where these requirements should be placed and when that should be. This choice assists in ensuring that the power system is able to operate in a secure and stable manner while facilitating the ongoing evolution of the energy supply mix.

Issue	Stakeholder view	Commission's response
Draft decision		
(4)	ElectraNet submitted that an important point raised in its submission to the Consultation paper, but not captured in Issue (1) above, was that in addition to NSPs (such as ElectraNet), AEMO has a key role in assessing system security requirements as part of the access standards assessment process. For instance, NSPs are obliged to take AEMO advice on access standards that relate to system security matters. Consequently, ElectraNet submitted that it is important to recognise both the nature of the negotiation process and the important role of AEMO in assessing generator access standards under the Rules, in the context of removing specific jurisdictional licence conditions.	The Commission acknowledges Electranet's point and notes AEMO has advised the Commission that its role in the negotiation process is clearly defined in the Rules.

The Commission's position is that its Final decision provides the opportunity for negotiation where that is practicable, while providing specific guidance where necessary to manage network reliability and stability risk, based on the specific generation mix within South Australia. It seeks to balance the interests of South Australian consumers with those of market participants at this time. As the NEM and Rules evolve, there will likely be further reviews of South Australian specific conditions. The Final decision acknowledges the important role of AEMO in assessing system security requirements and this is why the Commission has sought advice from AEMO at each stage of the Review.

3.2.2.2 Generator connection process

In submissions to the Consultation paper, both CEC and AGL support the performance assessment of a generator for both the licence and Rule connection application processes taking place concurrently. They consider this makes for a more efficient generator connection process.

The Commission agrees that the most efficient process from a practical perspective is desirable. The Commission encourages applicants to engage early with the Commission so all the necessary processes can be worked through as concurrently as is possible given the specific circumstances. The Commission welcomes any feedback on how processes can be improved, while achieving the necessary outcomes.

3.3 Final decision

The Commission's Final decision is to cease to impose conditions 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14 and 15 from its 2017 model technical licence conditions (see Appendix B).

Given the changes to the Rules, the Commission considers that these conditions can cease to be imposed, as they are no longer required as a State-based protection. The Commission notes AEMO's recommendation that it considers these conditions are no longer required, given the South Australian context and the evolution of the Rules. Further, stakeholder submissions supported this proposition.

The Commission's Final decision is to retain conditions 9, 11 and 16 of its 2017 technical licence conditions (see Appendix B).

These changes only relate to the 15 licence conditions introduced in 2017 and are effective from the date of release of this Final decision. The changes apply for new generator licence applications from that date. Conditions on existing licences on that date will remain unchanged. Proponents of licence applications being processed at that date can choose whether to re-apply.

The Commission acknowledges differing stakeholder views on whether these conditions should cease to be imposed at this time. However, on balance, and having regard to its primary objective of protecting South Australian consumers' long-term interests, as well as AEMO's view that these conditions still have relevance in the South Australian context (notwithstanding the evolution of the Rules), the Commission considers it prudent to retain them at this time. Essentially, the Commission considers that, at this time, ceasing to impose the remaining three technical licence conditions exposes South Australian consumers to unnecessary risks with respect to the security of the South Australian power system. In its view, no longer imposing these three licence conditions is likely to run counter to its regulatory obligations (see section 2.1).

In reaching this conclusion, in addition to the analysis of the specific issues raised (see section 3.2.1), the Commission has given weight to the fact that South Australia has a unique generation mix and a broad range of operating scenarios as compared to other Australian states. This has been the case for a number of years and will likely remain so in the near future. Consideration of these unique operational challenges and how these can be efficiently managed remains a priority for the Commission in terms of its licensing functions.

However, the Commission's intent has always been to no longer impose South Australian specific conditions as the national framework's capability develops to adequately manage the risks that these conditions were put in place to address. This is illustrated by the fact the Commission supports AEMO's proposal that the national market has developed to the extent that the majority of the Commission's technical licence conditions no longer need to apply for new licences.

4 Next steps

The Commission will continue to monitor technological developments and prevailing national regulatory frameworks and arrangements, and liaise with AEMO, the AEMC and stakeholders to determine whether the Commission's licence conditions remain fit-for-purpose, in accordance with Commission's objectives under section 6 of the ESC Act. If the Commission considers that this is no longer the case, it will respond at that time.

4.1 Process for applicants in applying for a generator licence

The Commission is committed to working with other regulators, including the Technical Regulator and AEMO, and other stakeholders, such as ElectraNet, in order to streamline processes that applicants are required to complete. Further, the Commission encourages all potential licence applicants to engage with the Commission on the licence application process as early as practicable to ensure that appropriate information regarding the Commission's approval process is obtained.

4.2 Implementation date

The amended model licence conditions will apply from the date of publication of this Final decision paper on the Commission's web site.

4.3 Amended model licence conditions

A copy of the amended 2017 model licence conditions, as a result of this Final decision, is provided in Appendix C and available separately on the Commission's web site at https://www.escosa.sa.gov.au/projects-and-publications/projects/electricity/licensing-arrangements-for-generators-in-south-australia.

Appendix A – 2017 model licence conditions for new generators

Interpretation of this schedule

1. Interpretation

1.1 Terms used in this schedule and also in the National Electricity Rules (NER) have the same meaning in this schedule as they have in those rules (unless otherwise specified or unless the context otherwise requires).

1.2 For the purposes of this schedule, the term:

Commission - means the Essential Services Commission, established under the Essential Services Commission Act 2002.

Continuous uninterrupted operation means that, for voltage disturbances within the continuous operating range (that is, connection point voltage fluctuating within 90 percent and 110 percent of normal voltage), active power must be maintained (unless there has been a change in the intermittent power source) and reactive power must be managed to meet voltage control requirements.

Disturbance ride through capability

2. Disturbance ride through capability – general requirements

2.1 The non-synchronous generating system must meet the following requirements:

(a) The low voltage ride-through activation threshold (LVRT), as measured at the low voltage (LV) terminals of the generating units and dynamic reactive support plant (as applicable), must not be less than 85 percent of nominal voltage.

(b) The generating system must maintain continuous uninterrupted operation for voltage disturbances as specified in clauses 3, 7 and 8.

(c) Where LVRT and high voltage ride-through (HVRT) requirements in the NER are specified in respect of the generating system's connection point, the withstand capability of individual generating units is to be determined at the LV side of the generating unit's transformer. All individual generating units must remain connected for connection point voltages within the LVRT/HVRT withstand requirements, irrespective of the generating system's transformer tap position.

3. Disturbance ride-through (reactive current injection)

3.1 The generating system must supply additional capacitive reactive current (reactive current injection) of up to 4 percent of the maximum continuous current of the generating system (in the absence of a disturbance) for each 1 percent reduction of connection point voltage below 90 percent of normal voltage, as shown in Table 1. This requirement applies at the LV terminals of the generating units and dynamic reactive support plant (as applicable) for power system disturbances resulting in a voltage reduction of up to 100 percent of normal voltage at the connection point.

3.2 The generating system must supply additional inductive reactive current (reactive current absorption) of up to 6 percent of the maximum continuous current of the generating system (in the absence of a disturbance) for each 1 percent increase in connection point voltage above 110 percent of the normal voltage, as shown in Table 1. This requirement applies at the LV terminals of the generating units and dynamic reactive support plant (as applicable).

3.3 The reactive current injection must be maintained until the connection point voltage returns to within the range of 90 percent to 110 percent of normal voltage.

Table 1: Reactive current injection requirements

Reactive current response	Current injection gain (%)	Current absorption gain (%)	Minimum amount of contribution as percentage of rated current	Speed of contribution	
				Rise time (millisecond)	Settling time (millisecond)
Synchronous	4	6	250	30	N/A
Non-synchronous	4	6	100	30	60

3.4 The amount of reactive current injection required may be calculated using phase-to-phase, phase-to-ground, or sequence components of voltage. For the last method, the ratio of negative-sequence to positive-sequence current injection must be X. [12]

3.5 The generating system must comply with the following response characteristics for reactive current injection:

(a) A rise time no greater than 30 milliseconds and a settling time no greater than 60 milliseconds applies to reactive current injection requirements.[13]

(b) The reactive current injection requirements described above apply for all pre-disturbance reactive power control modes (voltage control, power factor control and reactive power control).[14]

(c) The reactive current response must be adequately damped as defined in the NER.

[12] The exact ratio of negative-sequence to positive-sequence current injection will be specified by the Commission at the time the licence is issued.
[13] The settling time requirement does not apply to synchronous generators.
[14] This requirement does not apply to synchronous generators.

(d) Upon occurrence of a fault, reactive power consumption must not exceed 5 percent of maximum continuous rated current of the generating system and must be limited to the rise time duration set out in Table 1.

(e) The post-fault reactive power contribution of the generating system must be sufficient to ensure that the connection point voltage is within the following ranges for continuous uninterrupted operation:

(i) voltages over 110 percent for the durations permitted under NER clause S5.1a.4;

(ii) 90 percent to 110 percent of normal voltage continuously;

(iii) 80 percent to 90 percent of normal voltage for a period of at least 10 seconds; and

(iv) 70 percent to 80 percent of normal voltage for a period of at least 2 seconds.

4. Disturbance ride through (active power injection requirements)

4.1 The generating system must be capable of restoring active power to at least 95 percent of the level existing just prior to a fault within X milliseconds after disconnection of the faulted element.15

4.2 Upon occurrence of a fault, a generating system's transient active power consumption must not exceed one power frequency cycle and must not exceed 5 percent of the maximum continuous rated current of the generating system.

5. Multiple low voltage disturbance ride-through

5.1 The generating system, including, but not limited to, each of its generating units and dynamic reactive power support plant, must be capable of withstanding both of the following within a five minute interval:

(a) Any combination of voltage disturbances causing the voltage at the respective low voltage (LV) terminals of the equipment to drop below 85 percent of the nominal voltage for a total duration of 1,500 milliseconds regardless of disturbance type, duration, and residual voltage at the generating unit's terminals. The total number of voltage disturbances for which successful ride-through is required is limited to 15. Each fault can be a solid fault resulting in 100 percent voltage drop at the connection point with duration not exceeding the longest time expected to be taken for the breaker fail protection system to clear the fault, as set out in Table S5.1a.2 of the NER.

(b) A single worst-case long-duration shallow voltage disturbance, causing the voltage at the connection point to drop to 70- 80 percent of the normal voltage for a total duration of 2,000 milliseconds.

[15] The exact active power recovery time will be specified by the Commission at the time the licence is issued and will be between 100 and 500 milliseconds.

5.2 Subject to compliance with the requirements in clause 5.1, the generating system, including, but not limited to, each of its generating units and dynamic reactive power support plant, is not required to withstand any additional voltage variation exceeding ±10 percent of nominal voltage experienced at the respective LV terminals within 30 minutes from the commencement of the first variation.[16]

6. Disturbance ride-through (high voltage disturbance ride-through)

6.1 The generating system must have a level of over-voltage withstand capability consistent with the levels shown in Table 2.[17]

6.2 The generating system must maintain continuous uninterrupted operation for temporary over voltage durations as specified in Table 2.

Table 2: Required over voltage withstand capability

Temporary overvoltage (% of normal voltage)	110–115	>115–120	>120–125	>125–130	>130–140
Duration(s)	1,200	20	2	0.2	0.02

7. Disturbance ride-through (partial load rejection)

7.1 The non-synchronous generating system must be capable of continuous uninterrupted operation during and following a power system load reduction of 30 percent from its pre-disturbance level or equivalent impact from separation of part of the power system in less than 10 seconds, provided that the loading level remains above minimum load.

8. Disturbance ride-through (frequency disturbance ride-through)

8.1 The generating system must be capable of continuous uninterrupted operation for any combination of the following rates of change of frequency:

(a) ±4 Hz/s for 250 milliseconds

(b) ±3 Hz/s for 1 second, until such time as power system frequency breaches the extreme frequency excursion tolerance limits. [18]

9. Disturbance ride-through (voltage phase angle shift)

9.1 The generating system must not include any vector shift or similar relay/protective function acting upon voltage phase angle which might operate for phase angle changes less than 20 degrees.

[16] For synchronous generators, consideration will be given to the physical limitations of the plant. This may require a variation to this condition, to be determined by Commission at the time of issuing of the licence.

[17] Unless otherwise specified by the Commission at the time the licence is issued.

[18] For synchronous generators, consideration will be given to the physical limitations of the plant. This may require a variation to this condition, to be determined by the Commission at the time of issuing of the licence.

Voltage control capability

10. Voltage control capability

10.1 The generating system must be capable of being controlled by a fast-acting, continuously variable, voltage control system which must be able to receive a local and remote voltage set point.

10.2 The generating system must be capable of operating at either a set reactive power level or a set power factor, which must be able to be set locally or remotely at any time.

10.3 The voltage, power factor and reactive power control mode of the generating system must be capable of:

(a) being overridden by the disturbance ride through requirements specified in clauses 2 to 9 (inclusive) during power system voltage disturbances, and

(b) automatically reverting to power factor or reactive power mode when the disturbance has ceased.

System strength

11. System strength

11.1 Individual components of plant within a generating system, which includes but is not limited to generating units and dynamic reactive power plant, must be capable of operating down to the following levels at the high voltage terminals in relation to each component:

(a) minimum short circuit ratio of 1.5, and

(b) minimum positive sequence X/R ratio of 2.

Active power control capability

12. Active power control capability

12.1 The generating system must be capable of automatically providing a proportional increase or decrease in active power output, in response to falling and rising power system frequency respectively.

12.2 To comply with clause 12:

(a) An active power response to changing power system frequency must be provided with no delay, beyond that required for stable operation, or inherent in the plant controls, once frequency leaves the deadband.

(b) The steady state droop setting of the active power response must be adjustable in the range 2 percent to 10 percent.

(c) The frequency deadband for the active power response must be adjustable in the range from 0 to +/- 1.0 Hz.

12.1. The generating system must be capable of sustaining a response to abnormal frequency conditions for at least 10 minutes, subject only to energy resource availability for intermittent generating systems.

12.2. The generating system must be capable of applying different deadband and droop settings in response to rising and falling frequency and for different levels of frequency change.

13. Active power control capability (AGC capability)

13.1 The generating system must have active power control capabilities that allow it to participate in existing national electricity market arrangements requiring automatic generation control (AGC).

13.2 At a minimum, the AGC must have the capability to:

(a) receive and respond to a remotely determined active power control setpoint, updated at a rate of every four seconds, transmitted to the generating system, and

(b) provide the following information to AEMO, upon a request from AEMO under NER clauses S5.2.6.1 or 3.8.2:

(i) actual active power output;

(ii) maximum raise limit;

(iii) minimum lower limit;

(iv) maximum raise ramp rate; and

(v) maximum lower ramp rate.

14. Active power control capability (rate of change of active power)

14.1 The generating system must be capable of limiting the rate of change of active power, both upwards and downwards. A generating system is not required to comply with a limit on the rate of reduction of active power where the reduction in active power is caused by energy resource availability for intermittent generating systems.

14.2 The generating system must be capable of implementing different active power rate limits for operation in the normal operating frequency band and for contingency events.

14.3 The generating system must be capable of setting a ramp rate limit with accuracy of within 10 percent.

15. Active power control capability

15.1 The generating system must have the capability to provide real-time information about its active power control settings to AEMO, including mode of operation, deadband and droop parameters and any other active power control setting that may change during real-time operation.

System restoration

16. System restoration

16.1 Where sufficient minimum fault level is available from online synchronous machines, the generating system must have the following capability in the event of a black system:

(a) the generating system must be capable of operation with auxiliary loads only for X minutes[19] while system load is being restored, and

(b) the generating system, including, but not limited to, each of its generating units and dynamic reactive power support plant (as applicable) must have the capability to provide steady-state and dynamic reactive power when operating with auxiliary loads only for X minutes while system load is being restored.[20]

[19] The exact duration will be specified by the Commission at the time the licence is issued.
[20] The exact duration will be specified by the Commission at the time the licence is issued.

Appendix B – Final decision on technical generator licence conditions

Table B.1.summarises the Commission's Final decision on the 2017 model licence conditions by licence condition, for new licences from date of decision.

Table B.1: Final decision on 2017 model technical generator technical licence conditions[21]

#	2017 model technical licence conditions for new generators - focus area	AEMO's draft position
2	Disturbance ride-through capability – general requirements	Delete
3	Disturbance ride-through – Reactive current injection and reactive power support	Delete
4	Disturbance ride-through – Active power injection requirements (active power recovery)	Delete
5	Disturbance ride-through – Multiple low voltage disturbance ride-through	Delete
6	Disturbance ride-through – High voltage disturbance ride-through	Delete
7	Disturbance ride-through – Partial load rejection	Delete
8	Disturbance ride-through – Frequency disturbance ride-through	Delete
9	Disturbance ride-through – Voltage phase angle shift	Retain
10	Voltage control capability	Delete
11	System strength	Retain
12	Active power control capability	Delete
13	Active power control capability via Automatic Generation Control (AGC)	Delete
14	Active power control capability (ramp rate of active power)	Delete
15	Active power control capability (remote monitoring and control)	Delete
16	System restoration	Retain

[21] The numbering of conditions starts at 2 because the first item in the schedule of conditions is an interpretation clause and not a condition.

Appendix C – Amended 2017 model licence conditions for new generators

Interpretation of this schedule

1. Interpretation

1.1 Terms used in this schedule and also in the National Electricity Rules (NER) have the same meaning in this schedule as they have in those rules (unless otherwise specified or unless the context otherwise requires).

1.2 This schedule retains the numbering convention of the 2017 model licence conditions.

1.3 For the purposes of this schedule, the term **Commission** means the Essential Services Commission, established under the Essential Services Commission Act 2002.

Disturbance ride through capability

9. Disturbance ride-through (voltage phase angle shift)

9.1 The generating system must not include any vector shift or similar relay/protective function acting upon voltage phase angle which might operate for phase angle changes less than 20 degrees.

System strength

11. System strength

11.1 Individual components of plant within a generating system, which includes but is not limited to generating units and dynamic reactive power plant, must be capable of operating down to the following levels at the high voltage terminals in relation to each component:

(a) minimum short circuit ratio of 1.5, and

(b) minimum positive sequence X/R ratio of 2.

System restoration

16. System restoration

16.1 Where sufficient minimum fault level is available from online synchronous machines, the generating system must have the following capability in the event of a black system:

(a) the generating system must be capable of operation with auxiliary loads only for X minutes[22] while system load is being restored, and

(b) the generating system, including, but not limited to, each of its generating units and dynamic reactive power support plant (as applicable) must have the capability to provide steady-state and dynamic reactive power when operating with auxiliary loads only for X minutes while system load is being restored.[23]

[22] The exact duration will be specified by the Commission at the time the licence is issued.
[23] The exact duration will be specified by the Commission at the time the licence is issued.

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