



Electricity

Review of the licensing arrangements for generators in South Australia

DRAFT Decision

October 2019

Request for submissions

The Essential Services Commission (**Commission**) invites written submissions on this paper by **Friday, 8 November 2019**.

It is the Commission's policy to make all submissions publicly available via its website (www.escosa.sa.gov.au), except where a submission either wholly or partly contains confidential or commercially sensitive information provided on a confidential basis and appropriate prior notice has been given.

The Commission may also exercise its discretion not to publish any submission based on length or content (for example containing material that is defamatory, offensive or in breach of any law).

Responses to this paper should be directed to: **Licensing arrangements for generators in South Australia**

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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)
Review	This review of the technical licence conditions
Rules	National Electricity Rules
SRAS	System Restart Ancillary Services
Technical licence conditions	Refers to the technical licence conditions adopted by the Commission in 2017, as summarised in Appendix A
TNSP	Transmission Network Service Provider, which in South Australia's case is ElectraNet

1 Executive summary

The Commission's Draft Decision is to remove 12 of the 15 technical licence conditions for electricity generators; which were introduced following its 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).

A statutory function of the Essential Services Commission (**Commission**) is to licence and set licence conditions for electricity generators in South Australia. 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, then it would be appropriate to remove 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 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 market has continued to evolve, with changes to the National Electricity Rules (**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 remained necessary. A consultation paper was released at that time, accompanied by technical advice provided by the Australian Energy Market Operator (**AEMO**).

AEMO recommended the removal of the technical licence conditions except condition 9 (disturbance ride-through – voltage phase angle shift), condition 11 (system strength) and condition 16 (system restoration). Submissions were received from four stakeholders. While opinion was divided as to whether those three conditions should remain, all stakeholders considered there were grounds to remove 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 removal of these three conditions.

The Commission welcomes submissions on this Draft Decision by **Friday, 8 November 2019**, with a Final Decision to be made in December 2019.

2 Introduction

The **Commission** performs a range of functions across the different industries it regulates. These include pricing, licensing, performance monitoring and reporting, compliance and scheme administration. Under section 22 of the Electricity Act 1996, one of the Commission's statutory functions is to licence and set licence conditions for electricity generators operating in South Australia.

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, then it would be appropriate to remove 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 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 market has continued to evolve, with changes to the National Electricity Rules (**Rules**) in areas relating to technical requirements for electricity generators. The Commission's third review of the licensing arrangements for South Australian electricity generators was completed in August 2017.¹ The review found that the national regulatory frameworks and arrangements operating at that time still did not deal adequately with the technical and system impacts of the changing electricity generation mix in South Australia, particularly for generating systems that have a non-synchronous connection to the grid.

As an outcome of the review, the Commission introduced 15 new model licence technical conditions designed to enable all new South Australian generators to incorporate cost-effective features that contribute towards a secure and resilient power system (**technical licence conditions**). 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.

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 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 is reviewing the 2017 technical licence conditions in the context of those recent amendments. The purpose of this Review is to consider the possibility of removing 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 Essential Services Commission Act 2002 (**ESC Act**).³

As part of this Review, the Commission sought and received advice from AEMO regarding the extent to which the amended Rules address the matters dealt with by the technical licence conditions. AEMO has recommended the removal of all the conditions, other than three – those that related to disturbance ride-through – voltage phase angle shift, system strength and system restoration.

2.2 Review process

The Review commenced on 3 June 2019, with the release of a Consultation Paper⁴ and a copy of AEMO's advice.⁵ Table 1 below lists the submissions received.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 will request further advice from AEMO in relation to any submissions received to this Draft Decision, and release a Final Decision in December 2019. The subsequent sections of this paper are:

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.

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/inquiries/inquiry-into-licensing-arrangements-under-the-electricity-act-1996-for-inverter-connected-generators/inquiry-into-licensing-arrangements-under-the-electricity-act-1996-for-inverter-connected-generators>.

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>.

- ▶ Chapter 3 outlines the Commission's Draft Decision on the Review, the key issues raised in the submissions in response to the consultation paper and the Commission's assessment in reaching its Draft Decision.
- ▶ Chapter 4 outlines the next steps in the review process and the timetable for the upcoming stages of the Review.

3 Draft decision

Summary

Based on the evidence available to it, having considered AEMO's recommendations and feedback from stakeholders, the Commission's Draft Decision is to remove 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 their removal is supported by developments in the NEM.

The Commission considers that, at this time, removing 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 Draft 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.

3.1 AEMO's advice and recommendations

In its March 2019 advice to the Commission, AEMO recommended the removal of all but three of the 2017 technical licence conditions.⁷ 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 3.2.2.

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.

3.2 Key issues raised in submissions to Consultation Paper

In summary, the overarching outcomes arising from submissions can be broadly categorised as follows:

- ▶ **Conditions proposed to be removed:** All four submissions supported the removal of the 12 technical licence conditions identified by AEMO (section 3.2.1). 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 3.2.2), primarily because they agreed with AEMO's recommendation. CEC 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.

⁷ AEMO, *Recommended Technical Standards for Generator Licensing in South Australia*, Alignment advice to the Commission, 18 March 2019.

► **Additional Matters:**

- **New generator performance assessment framework:** ElectraNet raised a concern that the new negotiation process may not achieve the outcomes sought by the current technical licence conditions (section 3.2.3). AGL considered that the Commission’s technical licence conditions interfere with the intended flexibility of the negotiation process established under the Rules.
- **Generator connection process:** Two submissions raised 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 3.2.4).

3.2.1 Draft Decision: Conditions proposed to be removed

The Commission’s Draft Decision is to remove conditions 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14 and 15 from its 2017 technical licence conditions (see Appendix B).

Given the changes to the Rules, the Commission considers that these conditions can be removed, 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, submissions to the Consultation Paper supported this proposition.

3.2.2 Draft Decision: Conditions proposed to be retained

The Commission’s Draft Decision is to retain conditions 9, 11 and 16 of its 2017 technical licence conditions (see Appendix B).

The Commission acknowledges some stakeholders consider these conditions should be removed. 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.

Submissions and Commission’s response

Both ElectraNet and the MEA Group support AEMO’s recommendation to retain technical licence conditions 9, 11 and 16. In contrast, the CEC and AGL do not agree with AEMO’s recommendations. The Commission’s response regarding the specific technical points made by CEC and AGL is provided below.

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

Table 2 below provides the Commission’s responses to stakeholder comments on condition 9.

Table 2 – Licence condition 9: specific issues raised in submissions and Commission’s response

Issue	Stakeholder view	Commission’s response
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.

In reaching its position on retaining condition 9, the Commission has had 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.

Licence condition 11: System strength

Table 3 below provides the Commission’s responses to stakeholder comments on condition 11.

Table 3 – Licence condition 11: specific issues raised in submissions and Commission’s response

Issue	Stakeholder view	Commission’s response
11(1)	<p>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.</p>	<p>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).</p> <p>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 remove 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.</p>
11(2)	<p>AGL submitted that the 2017 “managing power system fault levels” rule (Rules) and AEMO’s system strength guidelines adequately cover system strength issues.</p>	<p>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.</p> <p>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.</p>
11(3)	<p>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.</p>	<p>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.</p>
11(4)	<p>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 remove the South Australian specific condition.</p>	<p>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.</p>

In reaching its position on retaining condition 11, the Commission has had 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 stability of the power system must be ensured.

Licence condition 16: System restoration

Table 4 below provides the Commission’s responses to stakeholder comments on condition 16.

Table 4 – Licence condition 16: specific issues raised in submissions and Commission’s response

Issue	Stakeholder view	Commission’s response
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.

In reaching its position on retaining condition 16, the Commission has had 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.

Commission’s conclusion and draft decision

In addition to the above analysis of the specific issues raised, 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.

The Commission’s intent has always been to remove 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 can be removed.

However, the Commission considers that, on balance at this time, removing 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, removing these three licence conditions is likely to run counter to its regulatory obligations (see section 2.1).

3.2.3 Additional matters – 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.

Submissions and Commission's response

Table 5 summarises issues raised by stakeholders in their submissions in relation to the new generator performance assessment framework, with a Commission response provided to each. Overall and based on the responses below, the Commission's position is that its Draft 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.

Table 5 – New generator performance assessment framework: specific issues raised in submissions and Commission's response

Issue	Stakeholder view	Commission's response
(1)	<p>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.</p> <p>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.</p>	<p>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.</p>
(2)	<p>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</p>	<p>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 3.2.2 outlines the Commission's overarching reasoning regarding why it considers that, at this time, certain conditions should be retained.</p>

Issue	Stakeholder view	Commission's response
	in South Australia had proven to be an unnecessarily complicated, and at times, inefficient process.	
(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.

3.3.4 Additional matters - Generator connection process

Comments were received from two stakeholders relating to the licensing process.

Submissions and Commission's response

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.

4 Next steps

The Commission welcomes all views on matters relevant to this Review. Written submissions on this Draft Decision are invited by **Friday, 8 November 2019**. Information on how to make a submission to the Review is set out on the inside front cover of this Draft Decision.

The Commission's consultation is not limited to the receipt of stakeholders' written submissions. It is seeking to engage directly with a broad range of stakeholders and will also continue to work closely with AEMO in relation to technical matters.⁸ The Commission welcomes requests by stakeholders to meet and provide any further and final evidence on any concerns with the Draft Decision or the consultation process.

Following consideration of any issues raised through consultation on this Draft Decision, and taking into account any subsequent advice from AEMO arising from the consultation phase, the Commission intends releasing a Final Decision in **December 2019**.

4.1 Timetable for this Review

The intended timeframes for the upcoming stages of this Review are provided below.

Stage	Timing
Draft Decision released	11 October 2019
Public consultation	October/November 2019
Consultation closes	8 November 2019
Final Decision released	December 2019

⁸ The Commission's approach to consultation is detailed in its Charter of Consultation and Regulatory Practice which may be accessed at: <http://www.escosa.sa.gov.au/consultation/charter-of-consultation-and-regulatory-practice>.

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.⁹
- 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.¹⁰
 - (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).¹¹
 - (c) The reactive current response must be adequately damped as defined in the NER.

⁹ The exact ratio of negative-sequence to positive-sequence current injection will be specified by the Commission at the time the licence is issued.

¹⁰ The settling time requirement does not apply to synchronous generators.

¹¹ 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.¹²
- 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.

¹² 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.¹³

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 2.¹⁴
- 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.¹⁵

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.

¹³ 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.

¹⁴ Unless otherwise specified by the Commission at the time the licence is issued.

¹⁵ 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 12.1:
 - (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.

- 12.3. 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.
- 12.4. 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 minutes¹⁶ 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.¹⁷

¹⁶ The exact duration will be specified by the Commission at the time the licence is issued.

¹⁷ The exact duration will be specified by the Commission at the time the licence is issued.

Appendix B - Draft Decision on technical generator licence conditions

Table B.1. summarises the Commission's Draft Decision by licence condition.

Table B.1: Draft position on retention and removal of technical generator technical licence conditions¹⁸

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

¹⁸ The numbering of conditions starts at 2 because the first item in the schedule of conditions is an interpretation clause and not a condition.



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