AUSTRALIAN ENERGY MARKET COMMISSION



RULE

Draft rule determination

National Electricity Amendment (Calculation of system strength quantity) Rule 2024

Proponent

Australian Energy Market Operator

Inquiries

Australian Energy Market Commission Level 15, 60 Castlereagh Street Sydney NSW 2000

E aemc@aemc.gov.au

T (02) 8296 7800

Reference: ERC0375

About the AEMC

The AEMC reports to the energy ministers. We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the energy ministers.

Acknowledgement of Country

The AEMC acknowledges and shows respect for the traditional custodians of the many different lands across Australia on which we all live and work. We pay respect to all Elders past and present and the continuing connection of Aboriginal and Torres Strait Islander peoples to Country. The AEMC office is located on the land traditionally owned by the Gadigal people of the Eora nation.

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Summary

- 1 The Australian Energy Market Commission (AEMC or Commission) has made a more preferable draft rule (referred to as the draft rule) that changes the way the system strength quantity (SSQ) component of the system strength charge is calculated so it is equivalent to the magnitude of general system strength impact that a connection applicant would otherwise need to remediate.
- 2 This is in response to a rule change request submitted by the Australian Energy Market Operator (AEMO). The Commission is progressing this rule change under a fast track process since AEMO has already consulted publicly on the nature and content of its proposal. The consultation occurred while AEMO was developing its system strength impact assessment guidelines (SSIAG) as part of implementing the revised system strength framework.
- 3 The fast track process allows the AEMC to proceed directly to publishing a draft determination and draft rule. We are seeking feedback on this draft rule and encourage stakeholders to lodge a submission by **18 January 2024.**

The draft rule promotes efficient investment in and use of system strength services.

- As the electricity sector decarbonises, significant investment in new generation is required. A substantial volume of this generation is forecast to be lower-cost, inverter-connected generation such as batteries, wind and solar. Connection of this generation will necessitate investments in system strength services to ensure the secure operation of the power system.
- 5 The system strength framework in the National Electricity Rules (NER or rules) is designed to promote the efficient investment in, and efficient operation and use of, system strength services by encouraging connection applicants to make efficient decisions about whether to:
 - invest capital to self-remediate their plant's general system strength impact; or
 - pay the system strength charge for centrally provided system strength services.
- 6
- Efficient decisions by connection applicants contribute to the overall aims of the system strength framework which are to:
 - encourage better locational decisions by sending clear signals about the cost of system strength at specific connection points,
 - promote more effective management of system strength by clearly allocating the responsibilities of providing and paying for it,
 - capture potential efficiencies from central procurement of system strength where applicants elect to pay the charge,
 - ultimately reduce total demand for system strength and the total cost to customers.
- 7 But to make efficient decisions about whether to remediate or pay the charge, connection applicants need the options to be equivalent. The draft rule makes the two options equivalent as originally intended. This will enable the benefits and efficiencies of the system strength framework to be realised.

The system strength framework gives connection applicants two options to address system strength impact, but currently, the options are not equivalent

8 The system strength framework requires a new or altered connection (typically a generator or large load) to mitigate its system strength impact through self-remediation (for example by

installing a synchronous condenser or grid forming battery) or by paying a system strength charge to a system strength service provider (SSSP) - typically, the local transmission network service provider (TNSP).

- 9 If the applicant chooses self-remediation, a full system strength impact assessment must be undertaken in accordance with AEMO's SSIAG to work out the system strength impact of the connection. If a connection applicant chooses to pay the system strength charge, the SSQ is used instead of a full system strength impact assessment as the proxy for working out the system strength impact of the connection.
- 10 AEMO identified, during its public consultation process to develop the SSIAG, that the SSQ component of the system strength charge overstates the system strength impact of a connecting plant for applicants electing to pay the system strength charge. This is because the SSQ calculation in the NER does not account for the minimum or steady-state stability short circuit ratio below which a connected plant cannot stably operate and export its rated capacity. For the National Electricity Market (NEM), as with many power systems, the minimum stability level is roughly 1.2 and is provided by the network service provider (NSP).
- 11 The minimum stability level of system strength is accounted for in the SSIAG when assessing the system strength impact for applicants that have elected to self-remediate.
- 12 The two options (remediation and paying the charge) are therefore not equivalent, as originally intended, which may:
 - deter connection applicants that might otherwise do so, from paying the charge in favour of self-remediation,
 - · reduce efficiencies from central procurement of system strength,
 - result in unnecessary costs being passed onto consumers due to inefficient provision of system strength services.

The draft rule would move the SSQ to a principles-based approach to accommodate changes in knowledge, technology and policy.

- 13 The draft rule addresses the issues raised by AEMO by changing the way SSQ is calculated for connection applicants electing to pay the system strength charge. Specifically, the draft rule:
 - removes the SSQ calculation from the NER and replaces it with a requirement for AEMO to determine a methodology for calculating SSQ, as part of the SSIAG,
 - includes new policy principles in the NER to guide AEMO's development of the SSQ methodology and provide a level of certainty for stakeholders about what the SSQ should represent,
 - clarifies the process of moving from an indicative to a final SSQ, noting that the final SSQ remains in place unless the connected plant is altered.
- 14 Transitional arrangements have been included in the draft rule for applicants that are part-way through a process or have already commenced paying the charge under the current arrangements. This means that the new arrangements would be available for connection applicants mid-way through a process and for those who have already elected to pay the charge, but not where a connection applicant has elected to self-remediate and the connection agreement has been concluded.
- 15 The draft rule would trigger an update to AEMO's SSIAG in consultation with stakeholders. AEMO's intention is to propose for consultation the use of a minimum stability coefficient of 1.2 in the SSQ

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so it can be broadly comparable to the calculation of the system strength impact used for selfremediation.

We assessed our draft rule against three assessment criteria using regulatory impact analysis and stakeholder feedback

- 16 The Commission has considered the NEO¹ and the issues raised in the rule change request and assessed the draft rule against three assessment criteria outlined below. We undertook regulatory impact analysis in relation to these criteria.
- 17 The Commission has made a draft rule that achieves the intent of AEMO's proposed rule by simplifying the approach to drafting and by being more specific about the intended outcomes of the SSQ calculation. The Commission considers this would better achieve the NEO by more clearly outlining the processes and expected outcomes for stakeholders interacting with the system strength framework.
- 18 The draft rule would contribute to achieving the NEO by supporting:
 - **Safety, security and reliability** the draft rule promotes efficient investment in and provision of system strength services by providing two equivalent options for connection applicants to choose from when mitigating their system strength impacts.
 - Innovation and flexibility by adopting a principles-based approach to calculating SSQ, the draft rule is designed to accommodate changes in knowledge, technology and policy as the power system evolves.
 - **Principles of good regulatory practice** the draft rule would interact constructively with other system security reforms underway.
- 19 While emissions reduction is not the purpose of this draft rule and has not been selected as an assessment criteria, the draft rule would support the transition to a lower emissions power sector. Sufficient levels of system strength are needed to support the connection of renewable inverter-based resources and this draft rule is an important amendment to make sure that the system strength framework works effectively to enable the transition to a lower-emissions power system.

AEMO will update the SSIAG by 30 June 2024 in consultation with stakeholders

- 20 The draft rule would trigger an update to AEMO's SSIAG. AEMO would consult on amendments to the SSIAG to take account of the final rule as soon as practicable after the rule is made, in accordance with the rules consultation procedures.
- 21 Under the draft rule, a new version of the SSIAG must be published by **30 June 2024** with the new SSQ calculation applying from **1 July 2024**.
- 22 The Commission notes that the draft rule may significantly affect the value of SSQ and impact the total amount paid by connection applicants that have elected to pay the system strength charge. AEMO and the Australian Energy Regulator (AER) have introduced an interim solution to facilitate the progress of connection applications during the rule change process. The interim solution is underpinned by:

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¹ Section 7 of the NEL

- an AEMO guidance paper proposing a revised SSQ calculation,²
- <u>communication</u> from the AER to NSPs noting that it won't take action for non-compliance if AEMO's proposed methodology is followed. The AER will re-evaluate its stance on compliance once the AEMC issues the final rule change determination.³

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² AEMO, Calculating system strength quantities in the NEM, May 2023, available at: <u>https://aemo.com.au/-</u> /media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/amendment/guidance—calculating-system-strength-quantitie es-in-the-nem.pdf?la=en

³ AER, Letter of comfort to system strength service providers, 5 September 2023, available at: https://www.aer.gov.au/publications/reports/compliance/letter-comfort-system-strength-service-providers

How to make a submission

We encourage you to make a submission

Stakeholders can help shape the solution by participating in the rule change process. Engaging with stakeholders helps us understand the potential impacts of our decisions and contributes to well-informed, high quality rule changes.

How to make a written submission

Due date: Written submissions responding to this draft determination and rule must be lodged with Commission by **18 January 2024.**

How to make a submission: Go to the Commission's website, <u>www.aemc.gov.au</u>, find the "lodge a submission" function under the "Contact Us" tab, and select the project reference code **ERC0375.**⁴

Tips for making submissions on rule change requests are available on our website.⁵

Publication: The Commission publishes submissions on its website. However, we will not publish parts of a submission that we agree are confidential, or that we consider inappropriate (for example offensive or defamatory content, or content that is likely to infringe intellectual property rights).⁶

Next steps and opportunities for engagement

There are other opportunities for you to engage with us, such as one-on-one discussions or industry briefing sessions. Please reach out to the project leader to schedule a discussion.

You can also request the Commission to hold a public hearing in relation to this draft rule determination.⁷

Due date: Requests for a hearing must be lodged with the Commission by 7 December 2023.

How to request a hearing: Go to the Commission's website, <u>www.aemc.gov.au</u>, find the "lodge a submission" function under the "Contact Us" tab, and select the project reference code **ERC0375.** Specify in the comment field that you are requesting a hearing rather than making a submission.⁸

For more information, you can contact us

Please contact the project leader with questions or feedback at any stage.

Project leader:	Jessie Foran
Email:	Jessie.Foran@aemc.gov.au
Telephone:	+61 2 8296 7800

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⁴ If you are not able to lodge a submission online, please contact us and we will provide instructions for alternative methods to lodge the submission

⁵ See: https://www.aemc.gov.au/our-work/changing-energy-rules-unique-process/making-rule-change-request/our-work-3

⁶ Further information about publication of submissions and our privacy policy can be found here: https://www.aemc.gov.au/contact-us/lodge-

<u>submission</u>Section 101(1a) of the NEL.

⁸ If you are not able to lodge a request online, please contact us and we will provide instructions for alternative methods to lodge the request.

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1 The Commission has made a draft determination

This draft determination is to make a draft, more preferable rule (referred to as the draft rule), in response to a rule change request submitted by the Australian Energy Market Operator (AEMO).⁹ The draft rule changes the way the system strength quantity (SSQ) component of the system strength charge is calculated.

The purpose is to allow AEMO to determine a methodology for the calculation of the SSQ, that more accurately reflects the system strength impact of a new or altered connection at a connection point, and is broadly comparable to the calculation of the general system strength impact that is used for the self-remediation framework. We are seeking feedback on this draft rule.

1.1 The role of SSQ in the system strength framework and what it represents

The system strength framework in the NER requires the system strength impact of a new connection to the network, or an alteration to a connection, to be addressed by the connection applicant. Usually this is done through either:

- self-remediation activities such as installing some synchronous plant as part of the connection – often a synchronous condenser or grid-forming battery, or
- the connection applicant electing to pay a system strength charge to a system strength service provider (SSSP - typically, the local transmission network services provider (TNSP)) to access centrally provided system strength services.¹⁰

If the applicant chooses self-remediation, a full system strength impact assessment must be undertaken to work out the system strength impact of the connection. This is referred to in the NER as the 'general system strength impact' and is assessed in accordance with the system strength impact assessment guidelines (SSIAG) made by AEMO.¹¹The assessment includes:¹²

- the 'adverse system strength impact' of the connection or alteration; and
- any additional amount by which the new connection or connection alteration reduces the available fault level at the connection point for the new connection or connected plant.

If a connection applicant chooses to pay the system strength charge, a full system strength impact assessment is not required. Instead, SSQ is used as the proxy for working out the system strength impact of the connection. The SSQ calculation is currently set out in the NER and uses the:¹³

short circuit ratio agreed in the performance standards,¹⁴ and

13 SSQ calculation is set out in NER Clause 6A.23.5(j)

⁹ AEMO, Calculation of system strength quantity rule change request, September 2023, available at: https://www.aemc.gov.au/sites/default/files/2023-09/ERC0375%20-%20Calculation%20of%20system%20strength%20quantity%20-%20AEMO%20rule%20change%20request%20-%20combined.pdf

¹⁰ NER clause 5.3.4B(e) and (f). The clause also allows connection works to be undertaken by the NSP at the cost of the connection applicant, as a form of self-remediation.

¹¹ The SSIAG are made under clause 4.6.6 of the NER to support the system strength framework. The key function of the SSIAG is to prescribe how connecting NSPs will assess the impact of a connection to system strength when processing connection enquiries, applications for connection or alterations to plant. More information can be found at: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/participate-in-the-market/network-connections/system-strength-impact-assessment-guidelines

¹² NER, Chapter 10 definition of 'general system strength impact'.

¹⁴ The short circuit ratio agreed in performance standards is also referred to as withstand short circuit ratio: refer to AEMO's guideline at https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/amendment/guidance--calculatingsystem-strength-quantities-in-the-nem.pdf?la=en

 (as applicable) the agreed rated active power, rated power transfer capability or maximum demand.¹⁵

The intent set out in the final determination for the *Efficient management of system strength on the power system*, is for SSQ to be equivalent to the magnitude of general system strength impact that [a connection applicant] would [otherwise] need to remediate.¹⁶

Currently, the rules-based calculation of SSQ used to assess the impact for connection applicants electing to pay the system strength charge, and the change in available fault level (Δ AFL) calculation used as the core component of the SSIAG's full impact assessment for applicants electing to self-remediate, are not equivalent.

The SSQ calculation results in a system strength impact that includes the minimum stability levels of system strength already provided by the TNSP (in the National Electricity Market (NEM) this is broadly accepted to be an short circuit ratio of roughly 1.2) whereas the Δ AFL calculation subtracts the minimum stability level of system strength from the general system strength impact of an applicant electing to self-remediate.¹⁷ As a result, Applicants electing to pay the charge under current arrangements would pay for more of the impact than if they had chosen to self-remediate.

Figure 1.1 below illustrates this point using an example plant with a withstand short circuit ratio of 2.0 at the connection point.



Figure 1.1: Impact assessment for self-remediating vs charge paying applicants

Source: AEMC, using, as an example, a connecting plant with a withstand short circuit ratio of 2.0

1.2 Our draft rule changes the way SSQ is calculated

The draft rule would change the way SSQ is calculated for generators and other connecting entities electing to pay the system strength charge.

Specifically the draft rule:

 removes the SSQ calculation from the NER and replaces it with a requirement for AEMO to determine a methodology for calculating SSQ, as part of the SSIAG,¹⁸

¹⁵ Each term reflects the power rating of the connection point dependent on whether the connection is a generator, transmission line, or load.

¹⁶ AEMC, Efficient management of system strength in the power system final determination, October 2021, page 153, available at: https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system

¹⁷ A minimum SCR below which a generating plant (whether synchronous or asynchronous) cannot stably operate and export its rated capacity, is a well-discussed limit in electrical engineering. The accepted minimum short circuit ratio for most power systems around the world is roughly in the range of 1.1-1.3. A recent example related to wind farms can be found here: T. Lund, H. Wu, H. Soltani, J. G. Nielsen, G. K. Andersen and X. Wang, *Operating Wind Power Plants Under Weak Grid Conditions Considering Voltage Stability Constraints*, in IEEE Transactions on Power Electronics, vol. 37, no. 12, pp. 15482-15492, Dec. 2022, doi: 10.1109/TPEL.2022.3197308.

- includes new policy principles in the NER to guide AEMO's development of the SSQ methodology and provide a level of certainty for stakeholders about what the SSQ should represent,¹⁹
- clarifies the process of moving from an indicative to a final SSQ, noting that the final SSQ remains in place unless the connected plant is altered,²⁰
- makes a range of other amendments to clarify the process for assessing system strength impact and calculating SSQ.

Transitional arrangements have been included in the draft rule for applicants that are part-way through a process or have already commenced paying the charge under the current arrangements. Except where an applicant has a final connection agreement in place to remediate their system strength impact, the transitional arrangements would allow applicants to change their election and/or recalculate their SSQ under the new rules and SSIAG.

The draft rule would trigger an update to AEMO's SSIAG with a new version to be published by **30 June 2024**. AEMO would consult on amendments to the SSIAG to take account of the final rule as soon as practicable after the rule is made, in accordance with the rules consultation procedures.²¹ The new calculation of SSQ would apply from **1 July 2024**.

AEMO's intention would be to use a stability coefficient of 1.2 in the SSQ calculation to account for the minimum stability level of system strength provided by NSPs. This more closely approximates the approach used to assess the general system strength impact of connection applicants electing to self-remediate.²² More information on how AEMO may consider changes to SSQ in the future is included in section 3.3.

Chapter 3 provides more detail on each element of the draft rule.

1.3 Stakeholder feedback as part of AEMO's consultation to develop the SSIAG shaped our determination

During AEMO's consultation on the SSIAG from January - June 2023, it was identified that the two options for connection applicants to address their system strength impact (self-remediation or paying a system strength charge) are not based on equivalent calculations (see section 1.1).

AEMO noted that both options should assess the system strength impact of the connection in an equivalent, or comparable way in order to achieve the intent of the NER. AEMO proposed its alternative approach to calculating SSQ in its *Amendments to SSIAG draft determination* published on 12 January 2023.²³ AEMO's alternative approach to calculating SSQ centered around the use of a coefficient of 1.2 to represent the minimum stability levels of system strength provided by the NSP, an approach similar to what AEMO uses to assess the general system strength impact under the SSIAG for applicants electing to self-remediate. AEMO noted at that time that it was seeking feedback on whether a rule change would be appropriate to implement the alternative approach for calculating SSQ.

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¹⁹ NER clause 4.6.6(b1)(3)

²⁰ The system strength framework in clause 5.3.4B extends to alterations to plant to which clause 5.3.9 or clause 5.3.12 applies. Clause 6A.23.5, which provides for calculation of the system strength change by SSS Providers, recognises the possibility that the SSQ needs to change due to a new election being made to pay the system strength change, when the plant is altered. Refer to clauses 6A.23.5(j) to (k)

²¹ Proposed clause 11.[xxx].2 in the transitional provisions in the draft rule.

²² AEMO SSIAG V2.1, 6 June 2023, available at: <u>https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/amendment/system-strength-impact-assessment-guidelines-v21.pdf?la=en</u>

²³ AEMO, Amendments to SSIAG draft report and determination, 12 January 2023, page 86-89, available at: <u>https://aemo.com.au/-</u> /media/files/electricity/nem/security_and_reliability/system-strength-requirements/notice-of-consultation-and-draft-determination.pdf?la=en

AEMO received eight written submissions to the SSIAG draft determination which were generally supportive of the adoption of a stability co-efficient in the calculation of the SSQ to account for the minimum levels of system strength already provided by NSPs. TasNetworks' submission recognised the necessity of the adjustment, but raised concerns about how to address the discrepancies between the proposed SSIAG and the NER.²⁴

AEMO addressed most of these concerns it final report, published on 15 March 2023 .25

AEMO ultimately submitted this rule change request in response to the fact that its alternative approach to calculating SSQ is not consistent with the NER.

The Commission agrees with AEMO that, now implemented in full, the differences between the way the system strength impact is assessed for the purposes of self-remediation compared to how it is calculated for the purposes of the system strength charge does not achieve the original intent of the system strength framework.

The fact that the SSQ calculation in the NER overstates a connection applicant's impact, and that the two options are not equivalent, are the core issues identified in AEMO's rule change request and the reason the Commission has made this draft rule.

1.4 We are progressing this rule under a fast-track process as AEMO has consulted on the nature and content of the rule change request.

In its rule change request, AEMO requested that this issue be prioritised to provide the necessary certainty for NSPs and connection applicants to give effect to the policy intent of the original system strength rules.²⁶

The AEMC published the formal notice to commence this rule change process on **9 November 2023** under a fast track process.²⁷ This is on the basis that AEMO has already consulted on the nature and content of its proposal while developing the SSIAG.²⁸

AEMO has described the extent of its stakeholder engagement on matters relating to this rule change request in section 2.3 of its rule change request.²⁹More information including all dates, consultation documents, submissions and versions of the SSIAG can be found on AEMO's website.³⁰

1.5 An interim solution is in place for industry while the AEMC considers the rule change request

The draft rule could have a substantial impact on the value of the SSQ and therefore the total system strength charge paid by connecting generators electing that option.

TasNetworks, Submission to AEMO's draft SSIAG, 10 February 2023, available at: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/second-stage-submissions--ssiag/tasnetworks.pdf?la=en
 AEMO, Amendments to the system strength impact assessment guidelines, Final report and determination, March 2023, available at:

²⁵ AEMO, Amendments to the system strength impact assessment guidelines, Final report and determination, March 2023, available at. https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/final-report/ssiag-final-report-anddetermination.pdf?la=en

²⁶ AEMO, Calculation of system strength quantity rule change request, 19 September 2023, available at: https://www.aemc.gov.au/rulechanges/calculation-system-strength-quantity

²⁷ Notice to commence available here: https://www.aemc.gov.au/sites/default/files/2023-11/Notice%20under%20National%20Electricity%20Law_ERC0375.pdf

²⁸ The AEMC may use the fast track process to progress a rule change request if (as per s. 96A(1)(a)) An energy market regulatory body has made the rule change request and has already consulted with the public on the nature and content of the rule change request and the consultation was adequate. The fast track rule-making process allows the AEMC to proceed directly to publishing a draft determination and draft rule (if made) which stakeholders will have the opportunity to provide feedback on.

²⁹ AEMO, Calculation of system strength quantity rule change request, 19 September 2023, available at: https://www.aemc.gov.au/rulechanges/calculation-system-strength-quantity

³⁰ SSIAG consultation page: <u>https://aemo.com.au/en/consultations/current-and-closed-consultations/ssrmiag</u>.

AEMO and the AER have put in place an interim solution to support applicants in progressing their connection applications until a final determination is made in relation to this rule change request. This interim solution is made up of:

- an AEMO guidance paper, proposing a methodology for calculating the SSQ that, in AEMO's view, better aligns with the intended outcomes of the NER.³¹
- a letter from the AER to SSSPs, noting that it does not intend to take action in relation to the non-compliance should AEMO's methodology for calculating SSQ set out in the guidance paper be followed. The letter notes that, once the AEMC has issued its final rule change determination, the AER will re-assess its position on what is a compliant approach under the NER for new connections looking forward.³²

1.6 Our determination would support the efficient provision of system strength as the power system transitions

The draft rule would promote efficient investment in, and provision of adequate levels of system strength services overall by providing an equivalent choice between two options for connection applicants to mitigate their system strength impact.

Choosing between two equivalent options would support connection applicants in making an efficient choice and contribute to the overall aims of the system strength framework which are to:

- encourage better locational decisions by sending clear signals about the cost of system strength at specific connection points,
- promote more effective management of system strength by clearly allocating the responsibilities of providing and paying for it,
- capture potential efficiencies from central procurement of system strength where applicants elect to pay the charge,
- ultimately reduce total demand for system strength and, in turn, the total cost to customers of providing it.

This aligns with the original intent of the *Efficient Management of System Strength on the Power System* rule change made in October 2021³³ and can now be achieved under the draft rule. See section 2.3.1 for more information.

In a much broader context, the draft rule would support the transition to a lower emissions power sector. System strength is an important component of system security with sufficient levels of system strength needed to support the connection of renewable inverter-based resources and by extension, enable the transition to a lower-emissions power system.

In the immediate term, the system strength framework provides a buffer to support the transitioning power system underpinning stable operation of the grid, and plant connected to it. In the longer term, the system strength framework is expected to work alongside other reforms to promote innovation in the use of current technologies, as well as opportunities for new technological developments to contribute to efficient system security outcomes overall.

³¹ AEMO, Calculating system strength quantities in the NEM, May 2023, available at: <u>https://aemo.com.au/-</u> /media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/amendment/guidance--calculating-system-strength-quantitie es-in-the-nem.pdf?la=en

³² AER, Letter of comfort to system strength service providers, 5 September 2023, available at: https://www.aer.gov.au/publications/reports/compliance/letter-comfort-system-strength-service-providers

³³ AEMC, Efficient Management of System Strength on the Power System final determination, October 2021, available at: <u>https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system</u>

2 The draft rule would contribute to the energy objectives

This draft rule would promote efficient investment in, and efficient operation and use of, system strength services because it would encourage connection applicants to make efficient decisions about whether to:

- · invest capital to self-remediate their plant's general system strength impact; or
- pay the system strength charge for centrally provided system strength services.

Efficient decisions by connecting generators would lead to lower-cost provision of system strength across the power system, which is in the long term interests of energy consumers.

2.1 The Commission must act in the long-term interests of energy consumers

The Commission can only make a rule if it is satisfied that the rule will or is likely to contribute to the achievement of the relevant energy objectives.³⁴

For this rule change, the relevant energy objective is the NEO, which is:³⁵

to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to-

- (a) price, quality, safety, reliability and security of supply of electricity; and
- (b) the reliability, safety and security of the national electricity system; and
- (c) the achievement of targets set by a participating jurisdiction-
 - (i) for reducing Australia's greenhouse gas emissions; or
 - (ii) that are likely to contribute to reducing Australia's greenhouse gas emissions.

The targets statement, available on the AEMC website, lists the emissions reduction targets to be considered, as a minimum, in having regard to the NEO.³⁶

2.2 We must also take these factors into account

2.2.1 We have considered whether to make a more preferable rule

The Commission may make a rule that is different, including materially different, to a proposed rule (a more preferable rule) if it is satisfied that, having regard to the issue or issues raised in the rule change request, the more preferable rule is likely to better contribute to the achievement of the NEO.³⁷

For this rule change, the Commission has made a more preferable draft rule that would achieve the intent of AEMO's proposed rule by:

simplifying the approach to drafting - for example when clarifying when an SSQ is indicative versus final

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³⁴ Section 88(1) of the NEL.

³⁵ Section 7 of the NEL.

³⁶ Section 32A(5) of the NEL

³⁷ Section 91A of the NEL

 being more specific in the wording of policy principles that describe the intended outcomes of the SSQ calculation.

The Commission considers this would better achieve the NEO because it more clearly outlines the processes and expected outcomes for stakeholders interacting with the system strength framework.

2.2.2 We have considered how the rule would apply in the Northern Territory

In developing the draft rule, the Commission has considered how it should apply to the Northern Territory according to the following questions:

- Should the NEO test include the Northern Territory electricity systems? For this rule change
 request, the Commission has determined that the reference to the "national electricity system"
 in the NEO includes the local electricity systems in the Northern Territory.
- Should the rule be different in the Northern Territory? The Commission has determined that a uniform rule should apply to the Northern Territory.

See appendix D for more detail on the legal requirements for our decision.

2.3 How we have applied the legal framework to our decision

The Commission must consider how to address inefficiencies in the system strength framework, against the legal framework.

We identified the following criteria to assess whether the proposed rule change, no change to the rules (business-as-usual), or other viable, rule-based options are likely to better contribute to achieving the NEO:

- **Safety, security and reliability** the draft rule promotes efficient investment in and provision of system strength services by providing two equivalent options for connection applicants to choose from when mitigating their system strength impacts.
- Innovation and flexibility by adopting a principles-based approach to calculating SSQ, the draft rule is designed to accommodate changes in knowledge, technology and policy as the power system evolves.
- **Principles of good regulatory practice** the draft rule would interact constructively with other system security reforms underway.

These assessment criteria reflect the key potential impacts – costs and benefits – of the rule change request, for impacts within the scope of the NEO. This draft rule may contribute to a range of outcomes relating to the long term interests of consumers. For example, the draft rule would support the transition to a lower emissions power sector given it supports efficient provision of system strength services which are needed to support the connection of renewable inverter-based resources. However, the criteria listed above have been chosen as the most relevant in assessing whether the draft rule would achieve the primary intent, which is the efficient delivery of adequate levels of system strength in a transforming power system.

The Commission has undertaken a regulatory impact analysis to evaluate the impacts of the various policy options against the assessment criteria. Appendix B outlines the methodology of the regulatory impact analysis.

This section explains why the draft rule best promotes the long-term interest of consumers when compared to other options and assessed against the criteria.

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2.3.1 The draft rule promotes efficient investment in and provision of system strength services by providing connection applicants with an equivalent choice between the two options to mitigate system strength impact

AEMO's rule change request identifies a key inefficiency in the system strength framework that is working against the overarching aim of the system strength framework which is to promote safety security and reliability in the long term interests of customers - in this case, through efficient investment in and provision of system strength services.

The inefficiency identified is that the two options underpinning the framework - to remediate or pay a charge to mitigate system strength impact - are not equivalent.³⁸ The Commission considers this would likely lead to inefficient decision-making by connection applicants if not addressed.

Providing an equivalent choice for connecting generators to mitigate their system strength impact should promote efficient investment in and provision of system strength services overall.

Efficient marginal decision-making requires a party, in this case the connection applicant, to compare the incremental cost associated with one decision against alternatives. With regard to its system strength impact, a connection applicant has the option to self-remediate, pay the system strength charge, or not proceed with the connection. This should be a rational decision based on a like-for-like comparison of alternatives. However, the NER does not currently provide a like-for-like comparison between the option to self-remediate and the option to pay the charge, as explained in section 1.1

Without an equivalent choice, connection applicants, that might otherwise have chosen to pay the charge, may be deterred from choosing this option in favour of self-remediation. Where remediation is the lower cost option, or where there is another business driver at play, this may be efficient.³⁹However, if the option to self-remediate is the dominant choice because the system strength charge is overstating a connection applicant's system strength impact, then it is no longer efficient, or in the best interests of consumers. It may:

- · reduce efficiencies from central procurement of system strength,
- obscure any incentives to locate in areas of the grid that are better able to support the connection
- result in unnecessary costs being passed onto consumers, particularly if NSPs build or procure to meet forecasts of centrally provided system strength requirements that never eventuate.

Providing an equivalent choice for connection applicants for how they mitigate their system strength impact should:

- capture some economies of scale and scope where connection applicants elect to pay the system strength charge
- reinstate incentives to make better locational decisions
- underpin development of energy projects in the NEM as it lowers the barriers to entry for projects unable to self-remediate
- ultimately lower the total costs of providing adequate levels of system strength.

³⁸ AEMO, Calculation of system strength quantity rule change request, September 2023,page 5 and 6, available at: https://www.aemc.gov.au/sites/default/files/2023-09/ERC0375%20-%20Calculation%20of%20system%20strength%20quantity%20-%20AEMO%20rule%20change%20request%20-%20combined.pdf

³⁹ A connection applicant may have a range of non-cost factors contributing to a decision on whether to self-remediate or pay the system strength charge. This may include the adaptability of the plant design, the level of expertise within the business to develop a remediation plan, specifics of the connection point making it more or less practical to remediate, preference to manage system strength costs and uncertainties in house, or outsource it etc.

For the avoidance of doubt, the intent of the system strength framework is for the most efficient option to be chosen. This option may or may not be the option to pay for centrally provided system strength services.

Providing flexibility for the SSQ to evolve as part of the SSIAG and in consultation with stakeholders, would also allow efficiencies to be captured as knowledge and technology improve.

2.3.2 The draft rule takes a principles-based approach to provide flexibility so the SSQ calculation can accommodate market, technological, policy and other changes over time.

The draft rule promotes innovation and flexibility by moving the SSQ calculation from a rule-based prescriptive approach to a principles or outcomes-based approach. Under this approach, AEMO determines a methodology for calculating SSQ in the SSIAG, guided by policy principles set out in the NER. See section 3.1 for more information on how the draft rule works.

This differs from the current arrangements where the SSQ calculation, prescribed in the NER, can not be changed except through a rule change process. This was a deliberate design choice to help reduce the complexity, and associated cost, of the connection process and provide the system strength charge as a more streamlined option for connection applicants to mitigate their system strength impact.⁴⁰

In its rule change request, AEMO noted that it had considered amending the SSQ calculation in the NER but concluded that the issue identified in the request - the mismatch between the options available to connection applicants to mitigate their system strength impact - should be addressed on an ongoing basis. AEMO considered it appropriate that the SSQ (along with the other technical components that are already provided for in the SSIAG) be reassessed when necessary, to consider future developments in technology, network requirements or other relevant issues.⁴¹

The Commission also explored whether to amend the SSQ calculation in the NER to address the issue identified, given connection applicants and NSPs require a level of certainty in order to make investment decisions that have long-term financial implications and customers benefit from regulatory arrangements, and associated costs, that are predictable and stable.

However, the Commission also concluded that the rapid change in system strength knowledge, technology and policy makes it appropriate for the SSQ calculation to evolve in consultation with stakeholders, as part of the SSIAG.

The approach taken in the draft rule strikes a balance between the need for certainty, and the need for flexibility. By introducing new policy principles, the draft rule sets clear expectations about what the SSQ should include and the outcomes it should reflect. AEMO can then be responsive to changes when developing the SSIAG in consultation with stakeholders.

2.3.3 The draft rule will interact constructively with other reforms underway.

The draft rule adheres to principles of good regulator practice by aligning with the broader direction of reform. Knowledge of system strength, the technologies that provide it, and the policies that oversee the provision of system strength are evolving and this is part of a much broader evolution of power system security.

⁴⁰ AEMC, Efficient management of system strength in the power system final determination, October 2021, page 151, available at: https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-sy

⁴¹ AEMO, Calculation of system strength quantity rule change request, September 2023, available at: https://www.aemc.gov.au/sites/default/files/2023-09/ERC0375%20-%20Calculation%20of%20system%20strength%20quantity%20-%20AEMO%20rule%20change%20request%20-%20combined.pdf

The system strength framework represents a shift from the previous emergency stopgap measures, to a forward planning approach. The framework seeks to meet the challenges of the NEM's world-leading uptake of renewables and batteries and is an example of the way the Commission is designing frameworks that practically support the power system delivering efficient outcomes through the transition to lower emissions and beyond.⁴²

The system strength framework is still in the process of being implemented with the final element - the system strength planning standard applying to TNSPs - taking effect in December 2025. There are a large number of other reforms being considered, determined and implemented across the energy sector that either drive or impact system security outcomes.

The efficient and effective functioning of the system strength framework will be critical in supporting these other system security reforms. But as other areas of the system security policy landscape evolve, the system strength framework may also need to evolve so that system strength services are provided in a way that works in harmony with other security services.

The draft rule sets up the SSQ calculation as a key component of the broader system strength framework, to evolve as necessary so that it can interact constructively with other reforms underway.

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⁴² AEMC, Efficient management of system strength on the power system final determination, October 2021. p. 151, available at https://www.aemc.gov.au/sites/default/files/2021-10/ERC0300%20-%20Final%20determination_for%20publication.pdf

3 How our draft rule would operate

The draft rule would change the waySSQ is calculated for connection applicants electing to pay the system strength charge.

Currently, the calculation of SSQ is fixed in NER 6A.23.5(j) as the product of the short circuit ratio at the connection point and the rated megawatt (MW) capacity or 'size' of the plant.⁴³ AEMO has identified that the calculation does not account for the minimum level of system strength provided by the NSP.⁴⁴ This results in SSQ overstating the system strength impact of the new connection or connection alteration for connection applicants that are considering or may otherwise have elected to pay a system strength charge.

The draft rule would move the SSQ calculation from the NER into AEMO's SSIAG, making the key inputs and outcomes clear in the NER, but allowing AEMO, in consultation with stakeholders, to determine and then adjust the methodology as system strength knowledge, technology and policy evolves.

The draft rule delivers the intent of AEMO's proposal but with some structural and wording adjustments. Key elements of the draft rule are explained below.

3.1 Changing the way the SSQ is calculated

Box 1: The draft rule removes the SSQ calculation from the NER and replaces it with a requirement for AEMO to determine a methodology to calculate SSQ in the SSIAG

Specifically, the draft rule:

- removes the rules-based calculation of SSQ from NER cl. 6A.23.5(j) and instead, requires AEMO to include the methodology in the SSIAG at NER cl. 4.6.6(a)(1)(ii)
- includes an objective and new principles at NER cl. 4.6.6(b1)(3) to guide AEMO's development
 of the SSQ methodology and provide a level of certainty for stakeholders about what the SSQ
 should represent.
 - The objective provides that the methodology to calculate SSQ should produce a result that is an approximation of the level of impact that would be required to be remedied or avoided, as assessed by AEMO having regard to the need to avoid a full system strength impact assessment'.
 - The principles state that the SSQ must:
 - include the use of the short circuit ratio for the connection point; and the rated active power, the rated power transfer capability, or the maximum demand (as applicable) for the connection point,
 - reflect the adverse system strength impact of a new connection or alteration to a connected plant as well as any additional amount by which it reduces the available fault level at the connection point for the new connection or connected plant

⁴³ Short circuit ratio is, in this instance, the value agreed in the performance standards for the plant, which AEMO's SSIAG refers to as the 'withstand short circuit ratio'

⁴⁴ AEMO, Calculation of system strength quantity rule change request, September 2023, page 5, available at: https://www.aemc.gov.au/sites/default/files/2023-09/ERC0375%20-%20Calculation%20of%20system%20strength%20quantity%20-%20AEMO%20rule%20change%20request%20-%20combined.pdf

3.1.1 Removing the SSQ calculation from the NER and replacing it with a requirement for AEMO to determine a methodology to calculate SSQ in the SSIAG

The draft rule, changes the calculation of SSQ from being a rules-based, prescriptive approach to a principles, or outcomes-based approach.

In the original Rule, the system strength charge, specifically the SSQ component that represents a connection applicant's impact, was designed to be a straightforward and comparably quicker option for a generator to meet its system strength mitigation requirements compared to the alternative which is to remediate impact. The calculation for SSQ was prescribed in the NER to provide certainty and clarity for applicants choosing this option and to facilitate straightforward enforcement.⁴⁵

The Commission considers that the option to pay a system strength charge, specifically the SSQ component, should still be straightforward with a high degree of certainty, however acknowledges that when it comes to system strength, knowledge, technology and policies are changing rapidly. These changes may affect how connection applicants interact with the power system and the factors that need to be taken into account when assessing system strength impact, and calculating SSQ.

For this reason, the Commission considers a principles-based approach is appropriate for calculating SSQ. Under this approach:

- the NER sets the parameters that should be considered and the outcomes that should be achieved in relation to SSQ (see more detail at section 3.1.2), and
- AEMO, in consultation with stakeholders, can determine (and adjust) in its SSIAG how these parameters are used to achieve the desired outcomes (see section 3.3.1).

A principles-based approach is also used for the system strength locational factor (SSL) component of the system strength charge and for assessing the general system strength impact of self-remediating generators (expressed in the SSIAG to include the change in available fault level (Δ AFL)).⁴⁶

As engineering knowledge improves, and technologies and the power system change, this approach means each of the components that are relevant to assessing system strength impact - for the purposes of self-remediation, or paying the charge - can be amended, enhanced and evolved over time through a single consistent review and consultation process to update the SSIAG.

3.1.2 Including new principles to guide AEMO's development of the SSQ methodology and provide a level of certainty for stakeholders about what the SSQ should represent.

The Commission acknowledges that removing the SSQ calculation from the NER and instead requiring AEMO to determine a methodology to calculate SSQ as part of its SSIAG may reduce the level of certainty for applicants. The Commission considers that this is outweighed by the benefits of greater flexibility, allowing the SSQ to evolve to reflect the realities of the changing power system.

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⁴⁵ NER cl. 6A.23.5(j) in the October 2021 Rule prescribed SSQ as the product of short circuit ratio and rated active power, the rated power transfer capability, or the maximum demand (as applicable)

⁴⁶ SSL reflects the electrical distance between the connection and the system strength node. Projects farther away will have a higher SSL. ΔAFL is used as a proxy to quantify the indicative impact of inverter-based resources on the power system. It does not reflect the actual fault current observed in the power system.

AEMO proposed, and the Commission agrees, that including policy principles in the NER will provide some certainty about what SSQ should represent, regardless of whether and how often the SSIAG is updated.

The policy principles included in the draft rule at NER cl. 4.6.6(b1)(3) are based on the ones proposed by AEMO but have been adjusted to better achieve the intent. The principles included in the draft rule are that the SSQ calculation must:

- include the use of the short circuit ratio for the connection point; and the rated active power, the rated power transfer capability, or the maximum demand (as applicable) for the connection point,⁴⁷
- reflect the adverse system strength impact of a new connection or alteration to a connected plant as well as any additional amount by which it reduces the available fault level at the connection point for the new connection or connected plant.⁴⁸

The draft rule also includes an objective to make it clear that the SSQ should deliver a result that is an approximation of the level of impact that would be required to be remedied or avoided, as assessed by AEMO having regard to the need to avoid a full system strength impact assessment.⁴⁹

The first principle includes the key components of the original rules-based calculation, since these are still core elements of SSQ.

For the purposes of assessing the impact under the SSIAG, short circuit ratio is interpreted as *withstand* short circuit ratio. This reflects the minimum fault level at a connection point at which the connecting plant can remain stable and connected. It may be a higher or lower fault level than is suggested by the first part of the short circuit ratio defined in NER chapter 10 as it depends on specific plant configuration at the connection point⁵⁰

The rated active power, rated power transfer capability or maximum demand for system strength reflects the power rating or size of the connection dependent on whether the connection is a generator, transmission line, or load.

The second policy principle seeks to address the key issue identified in AEMO's rule change request.

The second principle allows the SSQ calculation to be adjusted for other factors while at the same time being clear that the calculation should produce an outcome that is broadly equivalent to the assessment of the *general system strength impact* used for self-remediation. ⁵¹

For this reason the second policy principle includes the same two elements that appear in the chapter 10 definition of *general system strength impact*:

• *reduction in available fault level* - used in the SSIAG as a proxy for quantifying the indicative impact of a connection on the power system for the purposes of self-remediation, and

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⁴⁷ Clause 4.6.6(b1)(3)(i) of the draft rule

⁴⁸ Clause 4.6.6(b1)(3)(ii) of the draft rule

⁴⁹ Clause 4.6.6(b1)(3)

⁵⁰ AEMO, Calculating system strength quantities in the NEM, May 2023, available at: <u>https://aemo.com.au/-</u> /media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/amendment/guidance--calculating-system-strength-quantiti es-in-the-nem.pdf?la=en

⁵¹ Clause 4.6.6(b1)(3)(ii) draws on the definition of 'general system strength impact' in chapter 10. The 'general system strength impact' is used for the self-remediation framework.

adverse system strength impact - allowing AEMO to include in its methodology other matters that may not cause a change in available fault level, but may still, in some way be responsible for impacting system strength levels at the connection point.

The objective makes it clear that SSQ should be an approximation of the level of impact that would otherwise be remediated

The objective provides that the methodology to calculate SSQ, guided by the two principles above, should produce a result that is an approximation of the level of impact that would be required to be remedied or avoided by a system strength remediation scheme for that connection point, as assessed by AEMO having regard to the need to avoid a full system strength impact assessment. Key elements of the objective are that:

- · the result should be approximate, but does not need to be the same,
- AEMO assesses what is approximate
- a full system strength impact assessment should be avoided given the charging option was designed to be a straightforward option and not involving complex modelling.

AEMO has indicated that its intention, in order to achieve this objective would be to propose, for consultation, a stability coefficient of 1.2 to account for the minimum stability level of system strength provided by NSPs.⁵² This reflects the approach used to assess the change in available fault level when assessing the general system strength impact for connection applicants electing to self-remediate. More information about the consultation requirements to update the SSIAG can be found in section 3.3.1.

3.2 Clarifying the process of calculating an indicative and final SSQ

Box 2: The draft rule clarifies elements of the process to assess a connecting applicant's system strength impact

The draft rule makes a number of amendments to clarify when and how SSQ is calculated. This includes:

- separating the requirements for AEMO to determine the methodology for the following elements, to make it clear that they are different methodologies and processes:
 - impact assessments (NER cl. 4.6.6(b)), and
 - calculating SSL and SSQ (NER cl. 4.6.6(b1))
- clarifying at NER cl. 4.6.6(b)(i), that the SSQ value calculated at the first stage of impact assessment is an "indicative SSQ"
- clarifying at NER cl. 5.3.4B(a2)(2A) and (a4) that the SSQ calculated and (if relevant) revised remains an "indicative SSQ"
- adding a number of other references to SSQ under NER cl. 5.3.4C where it is treated in the same way as SSL

Implicit in the draft rule is the fact that:

52 AEMO, Calculation of system strength quantity rule change request, September 2023, page 7, available at: https://www.aemc.gov.au/sites/default/files/2023-09/ERC0375%20-%20Calculation%20of%20system%20strength%20quantity%20-

%20AEMO%20rule%20change%20request%20-%20combined.pdf

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- the final SSQ is the quantity calculated in accordance with the applicable version of the SSIAG, using the short circuit ratio and the rated active power (or equivalent) as recorded in the relevant performance standards for the plant. This is set out in NER cl. 6A.23.5(j), NER cl. 6A.23.5(j1) and NER cl. 6A.23.5(k).
- where the SSL is not required to be calculated, because it is not technically feasible, the SSQ also need not be calculated. The draft rule does not explicitly reference SSQ in each instance the SSL is referenced, as proposed by AEMO, but instead makes it clear in NER cl. 5.3.4B(a2)(2A).

Note: while under the draft rule, SSQ is generally treated the same as SSL, the main exception is that TNSPs and DNSPs publish SSLs in their annual planning reports, but the SSQ is not published because it is confidential to a particular connected party as it is based on their specific plant details.

3.2.1 Separating the requirements for AEMO to determine the methodology for impact assessments and for calculating SSL and SSQ

Consistent with AEMO's proposed rule, the Commission has made a draft rule that separates the requirements for AEMO to determine the methodology for impact assessments (NER cl. 4.6.6(b))from the methodology for calculating SSL and SSQ (NER cl. 4.6.6(b1)). While the two are related, they are not the same.

- Impact assessments are used to quantify the general system strength impact for the purposes
 of connection applicants electing to remediate their system strength impact. There are two
 stages:
 - a preliminary assessment to screen for the need for a full assessment, carried out using a simple isolated model such as a single machine infinite bus model
 - full assessment (if required) carried out using a *power system* model that is reasonably appropriate for conducting *system strength impact assessments* with more detail set out in the SSIAG.⁵³
- The calculation of SSL and SSQ are components used to quantify system strength impact for the purposes of calculating the system strength charge. They are not part of a system strength impact assessment and are provided separately in response to a connection enquiry.

The Commission agreed that it is important to separate the two processes in the NER to make it clear the methodologies are used for different purposes. The draft rule makes minor adjustments to the wording proposed by AEMO.

3.2.2 Clarifying where in the connection application process the indicative and final SSQ values are calculated

The SSQ may be calculated a number of times during a connection application process. This includes:

- 1. in response to a connection enquiry,⁵⁴
- 2. as part of stability assessments,55

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⁵³ AEMO, SSIAG V2. 6 June 2023, Section 4.2, p. 20-25, available at: https://aemo.com.au/-/media/files/stakeholder_consultations/nemconsultations/2022/ssrmiag/amendment/system-strength-impact-assessment-guidelines-v21.pdf?la=en

⁵⁴ NER cl.5.3.3(b5)(3)(i)

⁵⁵ NER cl.5.3.4B(a2)(4)

- 3. at the request of the applicant,⁵⁶
- 4. following the negotiation of performance standards.⁵⁷

The draft rule makes it clear that the value calculated in the first three instances listed above is an indicative SSQ (or a revised indicative SSQ) and can therefore change, since the short circuit ratio and rated active power components of SSQ are also changing at those times.

The draft rule also makes it clear that the final value for SSQ is the quantity calculated in accordance with the applicable version of the SSIAG, using the short circuit ratio and the rated active power (or rated power transfer capability or maximum demand for the system strength connection point as applicable); and as recorded in the relevant performance standards for the plant.⁵⁸

By approaching it in this way, the draft rule achieves the intent of the AEMO proposal; providing for indicative SSQs to result from multiple processes of negotiation and assessment, but clarifying that the SSQ used to calculate the system strength charge is not itself a negotiated value. Once the connection agreement is finalised, SSQ is locked in and will not change unless the connection itself is altered under NER cl. 5.3.9 or cl. 5.3.12.

Put another way, the final value of SSQ for a particular connection point is the outworking of the SSQ calculation set out in the SSIAG, using the final values of short circuit ratio and rated active power (or rated power transfer capability or maximum demand for the system strength connection point as applicable) as recorded in the connection agreement.

With this in mind, the draft rule makes a number of other changes to clarify which SSQ applies, including that it is the:

- indicative SSQ that must be notified at NER cl. 5.3.4C(b)
- short circuit ratio, rated active power (as agreed in the connection agreement) and the NSP's calculation of SSQ (applying the SSIAG that was in place at the time the election was made) that should be notified at NER cl.5.3.4C(b1).

3.3 Updating the SSIAG in consultation with stakeholders and transitional arrangements for applicants mid-way through a connections process.

Box 3: Transitional arrangements to support the draft rule

The draft rule includes arrangements to:

- require AEMO to consult with stakeholders and publish an updated SSIAG by 30 June 2024
- allow most connecting parties that have begun a connection application under existing arrangements, to recalculate their SSQ under the new arrangements (noting the interim solution in place while the rule change process is underway)

3.3.1 Updating the SSIAG in consultation with stakeholders to account for the draft rule

The draft rule would trigger an update to AEMO's SSIAG. While AEMO's proposal noted it would commence consultation as soon as practicable after a final rule is made, the draft rule includes a

⁵⁶ NER cl. 5.3.4B(a4)

⁵⁷ NER cl. 6A.23.5(j)

⁵⁸ Draft rule version of cl. 6A.23.5(j), supported by the draft rule versions of NER cl. 6A.23.5(j1) and NER cl. 6A.23.5(k)

fixed date on which new arrangements would take effect. The Commission considered this to be particularly important given the impact the changes proposed by the draft rule may have on industry investment decisions.

As such, the draft rule:

- requires AEMO to update and publish a new SSIAG to take into account the Amending Rule by 30 June 2024,
- provides that the new arrangements for calculating SSQ come into effect on 1 July 2024.

AEMO must comply with the rules consultation procedures when making or amending the SSIAG. AEMO intends to commence consultation soon after the final determination is published under an expedited process which involves:

- publishing a draft instrument (with changes marked-up) and a short explanatory paper,
- · a minimum four-week round of consultation,
- publishing a final decision within 10 weeks of the draft.⁵⁹

The ten-week time frame is built around the changes being non-material. It gives stakeholders sufficient time to comment on the proposal, and should provide AEMO sufficient time to review submissions, clarify any matters raised in consultation, and prepare and approve a final report and updated SSIAG.

3.3.2 Transitional arrangements for applicants mid way through a connections process

The draft rule provides guidance on how the new arrangements would apply for connecting applicants at different stages of the process. Transitional arrangements set out in the draft rule provide that:

- for existing connection enquiries, if a response was provided before the new arrangements took effect, the NSP must notify the Connection Applicant of the indicative SSQ for the plant using the new SSIAG
- where a Connection Applicant elected not to pay the system strength charge but the offer to connect has not been received, the Connection Applicant may change its election
- where there has been an election to pay the system strength charge, the SSQ must be determined in accordance with the old arrangements until 30 June 2024 and from 1 July 2024, SSQ must be determined in accordance with the new arrangements.

In essence, this means that the new arrangements would be available for connection applicants mid-way through a process and for those who have already elected to pay the charge but not where a connection applicant has elected to self-remediate and the connection agreement has been concluded.

The Commission considered this to be a balanced approach given the investment decisions and activities that would have occurred in advance of the new arrangements taking effect. The Commission notes also that the interim solution set out in section 1.5 may mitigate the risk of SSQ values being markedly different under the current vs draft new arrangements.

3.4 The draft rule makes other minor corrections

The draft rule also makes minor corrections to the NER to make the NER clearer to stakeholders. Specifically, the draft rule would remove the civil penalty note mistakenly located in clause 5.3.4B(a4) and corrects it by placing the civil penalty note in clause 5.3.4B(a2), as it is currently classified as a civil penalty provision under the National Electricity (South Australia) Regulations.

A Rule making process

A fast track rule change request includes the following stages:

- a proponent submits a rule change request
- the Commission initiates the rule change process by publishing a notice which communicates the Commission's decision to fast track the rule change.
- Commission publishes a draft determination and draft rule (if relevant)
 - stakeholders lodge submissions on the draft determination and engage through other channels to make their views known to the AEMC project team
- the Commission publishes a final determination and final rule (if relevant).

You can find more information on the rule change process on our website.⁶⁰

A.1 AEMO proposed a rule to change the way SSQ is calculated.

On 19 September 2023, AEMO submitted a rule change request proposing:

- the SSQ calculation be removed from the NER and replaced with a requirement for AEMO to determine a methodology for calculating SSQ, as part of the SSIAG.
- new policy principles be included in the NER to guide AEMO's development of the SSQ methodology.
- a range of other amendments to clarify the process for assessing system strength impact and calculating SSQ

AEMO's stated that its intention would be to use a stability coefficient of 1.2 to account for the minimum stability level of system strength provided by NSPs.⁶¹

A.2 The proposal suggests that issues with how SSQ is calculated will result in inefficient provision of system strength

AEMO's rule change request considers that the SSQ component of the system strength charge overstates the system strength impact of the plant in the network to which it connects. The request suggests that because of this, the system strength charge option does not achieve the intent of the original rules because:⁶²

- generators electing the charge option pay for the total system strength requirement at a connection point, not just the adverse system strength impact caused by the connection as the NER intended
- the charging and remediation options are therefore not equivalent with remediation only requiring connecting generators to do so to mitigate the adverse system strength impact caused by its connection.

Figure A.1 below illustrates this point using a plant with a withstand short circuit ratio of 2.0 at the connection point.

⁶⁰ See our website for more information on the rule change process: https://www.aemc.gov.au/our-work/changing-energy-rules

⁶¹ AEMO, Calculation of system strength quantity rule change request, September 2023, page 7, available at: https://www.aemc.gov.au/sites/default/files/2023-09/ERC0375%20-%20Calculation%20of%20system%20strength%20quantity%20-%20AEMO%20rule%20change%20request%20-%20combined.pdf

⁶² AEMC, Efficient management of system strength on the power system final determination, October 2021. p. 151, available at https://www.aemc.gov.au/sites/default/files/2021-10/ERC0300%20-%20Final%20determination_for%20publication.pdf

Figure A.1: Impact assessment for self-remediating vs charge paying applicants



Source: AEMC, using an example plant with a withstand short circuit ratio of 2.0

AEMO explains in its request that the issue with how SSQ is currently calculated stems from the fact that it is prescribed in the rules with no provisions for any allowances or adjustments to reflect the individual plant configuration, circumstances of the connection point, technology type or other matters.

AEMO suggests that the fact that the two options available to connecting generators are not equivalent will:

- · deter connecting generators from paying the charge in favour of self-remediation,
- reduce efficiencies from central procurement of system strength,
- result in unnecessary costs being passed onto consumers.

A.3 The proposal will provide an equivalent choice between charging and remediation to support efficient provision of system strength

AEMO's proposal to remove the SSQ from the NER so that AEMO determines a methodology to calculate it as part of its SSIAG will support flexibility and innovation as knowledge and technology relating to system strength evolve.

AEMO's proposed approach to calculating SSQ would mean that connection applicants electing to pay the system strength charge, do not pay for the minimum stability levels of system strength already provided by the NSP.

AEMO suggests that this will better achieve the original intent of the NER by making the system strength charging option equivalent to the alternative option which is to remediate. It would also align SSQ with other technical elements of the system strength framework (like SSL) which can evolve, in consultation with stakeholders, by updating the SSIAG. AEMO notes that this approach would lead to more efficient provision of system strength across the power system.

A.4 The process to date

On 9 November 2023, the Commission published a notice advising of its intention to initiate the rule making process in respect of the rule change request.⁶³ The Commission decided to fast-track this rule change request. This is because it concluded that the consultation carried out by AEMO was adequate for the nature and content of the request ⁶⁴

⁶³ This notice was published under section 95 of the NEL

⁶⁴ The decision to fast-track the rule change request was made under section 96A(1)(a) of the NEL.

Accordingly, the Commission did not publish a consultation paper upon initiation of the rule change process and there has been no formal consultation carried out in this rule change process to date.

B Regulatory impact analysis

The Commission has undertaken regulatory impact analysis to make its draft determination.

B.1 Our regulatory impact analysis methodology

We considered a range of policy options

The Commission compared a range of viable policy options that are within our statutory powers. The Commission analysed these options:

- the rule proposed in the rule change request;
- a business-as-usual scenario where we do not make a rule; and
- two more preferable rules;
 - one where the stability coefficient was added to the SSQ prescribed in the Rules, thereby addressing the issue identified, but without allowing for changes in knowledge technology and policy to evolve, and
 - another where the intent of the proposed rule change request is achieved but through a different drafting approach. These options are described in chapter 2.

We identified who will be affected and assessed the benefits and costs of each policy option

The Commission's regulatory impact analysis for this rule change used qualitative methodologies. It involved identifying the stakeholders impacted and assessing the benefits and costs of policy options. The depth of analysis was commensurate with the potential impacts. The Commission focused on the types of impacts within the scope of the NEO.

Table B.1 summarises the regulatory impact analysis the Commission undertook for this rule change. Based on this regulatory impact analysis, the Commission evaluated the primary potential costs and benefits of policy options against the assessment criteria. The Commission's determination considered the benefits of the options minus the costs.

Table B.1: Regulatory impact analysis methodology

Assessment criteria	Primary costs Low, medium or high – If high, bold font	Primary benefits Low, medium or high – If high, bold font	Stakeholders affected	Methodology QT = quantitative, QL = qualitative
Efficient provision of system-strength services	NSP procurement of central system strength services based on forecasts	Lower costs through central procurement of system strength	All electricity consumers	 QL: stakeholder feedback to assess all benefits and costs.
Flexibility	Reduced certainty given SSQ calculation can be amended	Can adapt to future changes in knowledge, technology and policy	 Market participants that must comply with new obligations AEMO 	 QL: stakeholder feedback to assess all benefits and costs.
Aligned with the broader direction of reform	Nil	Contributing to future business efficiencies	 Market participants that must comply with new obligations AEMO 	 QL: stakeholder feedback to assess all benefits and costs.

Background and context for system strength С framework

C.1

The AEMC made a final determination for the Efficient management of system strength on the power system (system strength framework) on 21 October 2021

On 21 October 2021, the Commission published its final determination on the system strength framework arising from a rule change request submitted by TransGrid. TransGrid's rule change request identified that the 'do no harm' arrangement at the time were not fit for purpose to achieve efficient investment in system strength services⁶⁵

The Commission's investigation of system strength frameworks in the NEM and TransGrid's rule change request both recognised the 'do no harm' framework was not keeping pace with the power system transition as it was too reactive and uncoordinated to deliver the amount of system strength required.66

The system strength framework addresses the need for a more forward-looking, coordinated solution for the supply and demand of system strength in the NEM. It does this through three components⁶⁷:

- 1. Supply side: A new transmission standard for system strength to provide system strength when and where it is needed. System strength service providers (SSSP) must meet the minimum level of system strength required for power system security, and a level of service required for a stable waveform to host IBR.
- 2. Demand side: New access standards for relevant generators, loads and market network service providers. These ensure that connecting parties efficiently demand system strength by using high quality plant.
- 3. Coordination: A charging mechanism so parties who use system strength services pay for them. Connecting parties have the choice of paying the charge or opting out providing their own system strength to remediate their own impact.

The system strength framework evolved from the 'do no harm' arrangement to introduce a new option for connecting parties to pay a system strength charge. The system strength charge is an amount reflecting an estimate of the forward-looking cost the connecting party would place on the SSSP in meeting the system strength standard (this reflects the cost the connecting party would have if it did not undertake remediation)68. The choice for connecting parties to either selfremediate or pay the system strength charge is the subject of AEMO's rule change request.

As noted above, the purpose of the Commission's 2021 final determination is to efficiently procure the specific services that are needed, to achieve power system security at least cost. The previous 'do no harm' arrangement had system strength considered in isolation by connecting parties, stopping them from considering adjacent power system security needs. The Commission's 2021 final determination sought to harness economies of scale by having the SSSP procure system strength solutions at lowest cost.

⁶⁵ TransGrid, Efficient management of system strength on the power system - rule change request, p. 4. https://www.aemc.gov.au/sites/default/files/documents/erc0300_rule_change_reguest_pending.pdf

AEMC, Efficient management of system strength on the power system final determination, October 2021. 66 https://www.aemc.gov.au/sites/default/files/2021-10/ERC0300%20-%20Final%20determination_for%20publication.pdf

⁶⁷ Ibid. p. 1.

⁶⁸ Ibid. p vii.

For the avoidance of doubt, the intent of the system strength framework is for the most efficient option to be chosen. This option may or may not be the option to pay for centrally provided system strength services.

C.2 Self-remediation under the current framework

When a connecting applicant elects to self-remediate their system strength impact, under clause 5.3.4B of the NER, the applicant may employ a system strength remediation scheme to remediate its general system strength impact (or have system strength remediation work included as part of its connection agreement).⁶⁹

The AEMC's final determination expands on the concept of 'general system strength impact' in relation to a new connection or an alteration to a generating system or other connected plant. It relates this to the adverse system strength impact⁷⁰ and any additional amount the plant reduces the available fault level at the connection point, assessed in accordance with AEMO's SSIAG.⁷¹

The adverse system strength impact is...

The change in the available fault level (Δ AFL) is currently determined in the SSIAG as a function of the plant's incremental impact on the available fault level. This is currently calculated as a function of the difference between the connecting plant's withstand short circuit ratio adjusted for a stability coefficient (*a*) reflecting network limitations⁷².⁷³

$\Delta AFL MVA = -(SCR_{withstand} - \alpha) \times P_{rated}$

In practice, this means that connecting plants only need to account for their own impact on system strength. This is because of the inherent stability level that is provided as default by the network.⁷⁴

C.3 System strength charge under the current framework



⁶⁹ Clause 5.3.4B(a2) of the NER

⁷⁰ Clause 4.6.6(b)(5) of the NER

⁷¹ Ibid.

⁷² The stability co-efficient is given a value of 1.2 because technical literature indicates it is the minimum short circuit ratio (SCR) for which voltage stability can be maintained in the power system. For further information, see https://aemo.com.au/- /media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/amendment/system-strength-impact-assessment-guidelines-v21.pdf?la=en

⁷³ AEMO, SSIAG, p 15 https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nemconsultations/2022/ssrmiag/amendment/system-strength-impact-assessment-guidelines-v21.pdf?la=en.

⁷⁴ AEMC, Efficient management of system strength on the power system final determination, October 2021. p 25. https://www.aemc.gov.au/sites/default/files/2021-10/ERC0300%20-%20Final%20determination_for%20publication.pdf

Under clause 6A.23.5(e) of the NER, the system strength charge is made up of three components multiplied together⁷⁵

1. **The system strength unit price (SSUP):** this component of the system strength charge reflects the change in forward-looking costs of the SSS Provider supplying system strength at each system strength node, as a result of a change in demand for the service.

2. **The system strength locational factor (SSL):** this component reflects the localised nature of system strength. It changes the magnitude of the charge that a particular connection would face depending on its approximate electrical distance (or impedance) from the closest system strength node.

3. **The system strength quantity (SSQ):** this component of the charge is important for determining the efficient allocation of the cost of the system strength services provided by the SSS Provider due to the amount of the service used by the connection. The SSQ for the purposes of the charge is estimated from: the size of the connecting party's plant in megawatts (MW) and its short circuit ratio (MVA/MW) requirements.

⁷⁵ Ibid. p 147.

D Legal requirements to make a rule

This appendix sets out the relevant legal requirements under the NEL for the Commission to make a draft rule determination.

D.1 Draft rule determination and draft rule

In accordance with section 99 of the NEL, the Commission has made this draft rule determination for a more preferable draft rule in relation to the rule proposed by AEMO.

The Commission's reasons for making this draft rule determination are set out in chapter 2.

A copy of the more preferable draft rule is attached to and published with this draft determination. Its key features are described in chapter chapter 3.

D.2 Power to make the rule

The Commission is satisfied that the more preferable draft rule falls within the subject matter about which the Commission may make rules.

The more preferable draft rule falls within section 34 of the NEL as it relates to a rule regulating the activities of persons (including Registered participants) participating in the NEM or involved in the operation of the national electricity system under section 34(1)(iii) of the NEL.

D.3 Commission's considerations

In assessing the rule change request the Commission considered:

- its powers under the NEL to make the draft rule
- the rule change request
- the Commission's analysis as to the ways in which the draft rule will or is likely to contribute to the achievement of the NEO
- the application of the draft rule to the Northern Territory

There is no relevant Ministerial Council on Energy (MCE) statement of policy principles for this rule change request.⁷⁶

The Commission may only make a rule that has effect with respect to an adoptive jurisdiction if satisfied that the proposed rule is compatible with the proper performance of AEMO's declared network functions.⁷⁷ The more preferable draft electricity rule is compatible with AEMO's declared network functions because they would not affect those functions.

D.4 Making electricity rules in the Northern Territory

The NER, as amended from time to time, apply in the Northern Territory, subject to modifications set out in regulations made under the Northern Territory legislation adopting the NEL.⁷⁸ Under those regulations, only certain parts of the NER have been adopted in the Northern Territory.

⁷⁶ Under s. 33 of the NEL and s. 73 of the NGL the AEMC must have regard to any relevant MCE statement of policy principles in making a rule. The MCE is referenced in the AEMC's governing legislation and is a legally enduring body comprising the Federal, State and Territory Ministers responsible for energy. On 1 July 2011, the MCE was amalgamated with the Ministerial Council on Mineral and Petroleum Resources. In December 2013, it became known as the Council of Australian Government (COAG) Energy Council. In May 2020, the Energy National Cabinet Reform Committee and the Energy Ministers' Meeting were established to replace the former COAG Energy Council.

⁷⁷ Section 91(8) of the NEL.

⁷⁸ These regulations under the NT Act are the National Electricity (Northern Territory) (National Uniform Legislation) (Modifications) Regulations 2016

As the more preferable draft rule relates to parts of the NER that apply in the Northern Territory, the Commission is required to assess Northern Territory application issues, described below.

Test for scope of "national electricity system" in the NEO

Under the NT Act, the Commission must regard the reference in the NEO to the "national electricity system" as a reference to whichever of the following the Commission considers appropriate in the circumstances having regard to the nature, scope or operation of the proposed rule:⁷⁹

- 1. the national electricity system
- 2. one or more, or all, of the local electricity systems⁸⁰
- 3. all of the electricity systems referred to above.

Test for differential rule

Under the NT Act, the Commission may make a differential rule if it is satisfied that, having regard to any relevant MCE statement of policy principles, a differential rule will, or is likely to, better contribute to the achievement of the NEO than a uniform rule.⁸¹ A differential rule is a rule that:

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

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

A uniform rule is a rule that does not vary in its terms between the national electricity system and one or more, or all, of the local electricity systems, and has effect with respect to all of those systems.⁸²

The Commission's draft determinations in relation to the meaning of the "national electricity system" and whether to make a uniform or differential rule are set out in chapter 2.

D.5 Civil penalty provisions and conduct provisions

The Commission cannot create new civil penalty provisions or conduct provisions. However, it may recommend to the Energy Ministers' Meeting that new or existing provisions of the NER be classified as civil penalty provisions or conduct provisions.

The more preferable draft rule does not amend any clauses that are currently classified as civil penalty provisions or conduct provisions under the National Electricity (South Australia) Regulations - see section 3.4 for details of a correction relating to civil penalties.

The Commission does not propose to recommend to the Energy Ministers' Meeting that any of the proposed amendments made by the more preferable draft rule be classified as civil penalty provisions or conduct provisions.

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⁷⁹ Clause 14A of Schedule 1 to the NT Act, inserting section 88(2a) into the NEL as it applies in the Northern Territory.

⁸⁰ These are specified Northern Territory systems, listed in schedule 2 of the NT Act.

⁸¹ Clause 14B of Schedule 1 to the NT Act, inserting section 88AA into the NEL as it applies in the Northern Territory.

⁸² Clause 14 of Schedule 1 to the NT Act, inserting the definitions of "differential Rule" and "uniform Rule" into section 87 of the NEL as it applies in the Northern Territory.

D.6 Review of operation of the rule

The more preferable draft rule does not require the Commission to conduct a formal review of the operation of the rule. The Commission may however self-initiate a review of the operation of the rule at any time if it considers such a review would be appropriate, pursuant to section 45 of the NEL.

Abbreviations and defined terms

α	Coefficient representing minimum stability level of system strength
AFL	Available fault level
ΔAFL	Change in available fault level
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
Commission	See AEMC
NEL	National Electricity Law
NEO	National Electricity Objective
NER	National Electricity Rules
NERL	National Energy Retail Law
NERO	National Energy Retail Objective
NERR	National Energy Retail Rules
NGL	National Gas Law
NGO	National Gas Objective
NGR	National Gas Rules
NSP	Network service provider
NT Act	National Electricity (Northern Territory) (National Uniform Legislation) Act 2015
Prated	rated active power, the rated power transfer capability, or the maximum demand - dependent on whether the connection is a generator, transmission line, or load
Proponent	The individual / organisation who submitted the rule change request to the Commission
SCR	Short circuit ratio
SCR _{withstand}	Withstand short circuit ratio
SSL	System strength locational factor
SSQ	System strength quantity
SSIAG	System strength impact assessment guidelines (developed by AEMO)
SSUP	System strength unit price
SSSP	System strength service provider
TNSP	Transmission network service provider