

Rule determination

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

Proponent

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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.

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Citation

To cite this document, please use the following:

AEMC, Calculation of system strength quantity, Rule determination, 29 February 2024

Summary

- 1 The Australian Energy Market Commission (AEMC or Commission) has made a more preferable final rule (referred to as the final rule) that changes the way the system strength quantity (SSQ) component of the system strength charge is calculated so it is broadly equivalent to the magnitude of general system strength impact that a connection applicant would otherwise need to remediate.
- 2 Making the two options broadly equivalent, as was originally intended, will enable the benefits and efficiencies of the system strength framework to be realised.
- 3 This rule was made in response to a rule change request submitted by the Australian Energy Market Operator (AEMO). The Commission made this rule change under a fast track process since AEMO had already consulted publicly on the nature and content of its proposal. The consultation occurred between January and June 2023 while AEMO was updating its system strength impact assessment guidelines (SSIAG) as part of implementing the *Efficient management of system strength on the power system* Rule made in 2021.
- 4 The fast track process allowed the AEMC to proceed directly to publishing a draft determination on 30 November 2023 seeking stakeholder feedback. Ten submissions were received, which have informed this final determination.

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

- 5 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.
- 6 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.
- 7 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.
- 8 But to make efficient decisions about whether to remediate or pay the charge, connection applicants need the options to be broadly equivalent in terms of the incentives they provide. The final rule makes the two options broadly equivalent as originally intended.

The system strength framework gives connection applicants two options to

address system strength impact, which were not broadly equivalent

- 9 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).
- 10 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.
- 11 AEMO identified, during its public consultation process to update the SSIAG in 2023, that the SSQ component of the system strength charge in place in the NER at the time overstated 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 did 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).
- 12 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.
- 13 The two options for generators (remediation and paying the charge) were therefore not broadly equivalent, as originally intended, which may have resulted in the following outcomes:
- deterring connection applicants that might otherwise do so, from paying the charge in favour of self-remediation,
 - reducing efficiencies from central procurement of system strength,
 - resulting in unnecessary costs being passed onto consumers due to inefficient provision of system strength services.

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

- 14 The final rule addresses the issues raised by AEMO in its rule change request by changing the way SSQ is calculated for connection applicants electing to pay the system strength charge. Specifically, the final 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,
 - makes other minor amendments to improve clarity and understanding of how the system strength framework works.
- 15 Transitional arrangements have been included in the final 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 will 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.

- 16 The final rule will 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 so it can be broadly comparable to the calculation of the system strength impact used for self-remediation.

Our final rule is informed by stakeholder feedback

- 17 The Commission received ten submissions from a broad range of stakeholders. All submissions noted their support for the draft rule, agreeing that it will for example *"bring greater alignment between the two options"* (Shell Energy); *"level the playing field between the two options"* (ENA); *"ensure the two options...are equivalent"* (AGL); allowing for more efficient delivery of system strength services and *"meet[ing] the policy intent of the original rule and...the long-term interests of consumers"* (AER).
- 18 As such the Commission has maintained all key elements from the draft rule to final rule and made only minor changes to improve clarity and understanding.
- 19 While stakeholders broadly supported the draft rule, some issues were raised in submissions. Key issues relate to:
- AEMO's consultation process to update the SSIAG to give effect to this rule
 - application of the rule in the Northern Territory
 - matters relating to other components of the system strength charge or other elements of the system strength framework.
- 20 We have responded to these issues in this determination and, where appropriate, with minor changes to rule drafting
- 21 Overall, based on overwhelming support from stakeholders, the final rule remains consistent with the draft rule but with some minor changes to improve clarity and understanding.

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

- 22 The Commission has considered the NEO¹ and the issues raised in the rule change request and assessed the final rule against three assessment criteria outlined below. We undertook regulatory impact analysis in relation to these criteria.
- 23 The Commission has made a final 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 will better achieve the NEO by more clearly outlining the processes and expected outcomes for stakeholders interacting with the system strength framework.
- 24 The final rule will contribute to achieving the NEO by supporting:

1 Section 7 of the NEL

- **Safety, security and reliability** - the final rule promotes efficient investment in and provision of system strength services by providing two broadly 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 final rule is designed to accommodate changes in knowledge, technology and policy as the power system evolves.
- **Principles of good regulatory practice** - the final rule will interact constructively with other system security reforms underway.

25 While emissions reduction is not the purpose of this final rule and has not been selected as an assessment criteria, the final rule will 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. This final 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

26 The final rule will trigger an update to AEMO's SSIAG. AEMO will 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.

27 Under the final rule, a new version of the SSIAG must be published by **30 June 2024** with the new SSQ calculation applying from **1 July 2024**.

28 The Commission notes that the final 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.

29 To support applicants in progressing their connection applications between the date of this final determination and when the final rule and updated SSIAG take effect, AEMO has indicated that it intends to propose, for consultation, a SSQ calculation methodology that includes a stability coefficient of 1.2 to account for the minimum stability level of system strength provided by NSPs. This reflects the approach:

- used by AEMO to assess the change in available fault level when assessing the general system strength impact for connection applicants electing to self-remediate²
- set out in a guidance paper published by AEMO which outlines an approach to calculating the SSQ it considers best-meets the objectives of the system strength framework.³

30 The Commission notes that on 5 September 2023 the AER issued a letter to SSSPs noting that it would not take action for non-compliance if AEMO's proposed alternative SSQ methodology was followed. The AER noted it would re-evaluate its position on compliance once the AEMC issues the final rule change determination.⁴

31 In its submission to the draft determination and draft rule, the AER stated that it *"is supportive of the direction taken in the draft rules and determination. We consider that shifting determination of the SSQ methodology from the Rules to AEMO's SSIAG both meets the policy intent of the original*

2 see section 3.4 of the SSIAG available here: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/amendment/system-strength-impact-assessment-guidelines-v21.pdf?la=en

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

4 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>

rule and is also in the long-term interests of consumers.”⁵

- 32 The Commission notes that the transitional provisions that form part of this final rule will provide details on how applicants at different stages of the connections process will transition to the new arrangements from the effective date.

For more information, you can contact us

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5 AER, Submission to ERC0375 draft determination, 18 January 2024, p.2, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AER%20Submission%20to%20ERC0375%20draft%20determination.pdf>

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1 The Commission has made a final determination

This final determination is to make a final, more preferable rule (referred to as the final rule), in response to a rule change request submitted by the Australian Energy Market Operator (AEMO).⁶ The final rule changes the way the system strength quantity (SSQ) component of the system strength charge is calculated.

The purpose was 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.

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.⁷

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.⁸ The assessment includes:⁹

- 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. At the time of the rule change request, the SSQ calculation was set out in the NER and uses the:¹⁰

- short circuit ratio agreed in the performance standards,¹¹ and

6 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>

7 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.

8 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>

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

10 SSQ calculation is set out in clause 6A.23.5(j) of the NER

11 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/ssmiag/amendment/guidance---calculating-system-strength-quantities-in-the-nem.pdf?ia=en

- (as applicable) the agreed rated active power, rated power transfer capability or maximum demand.¹²

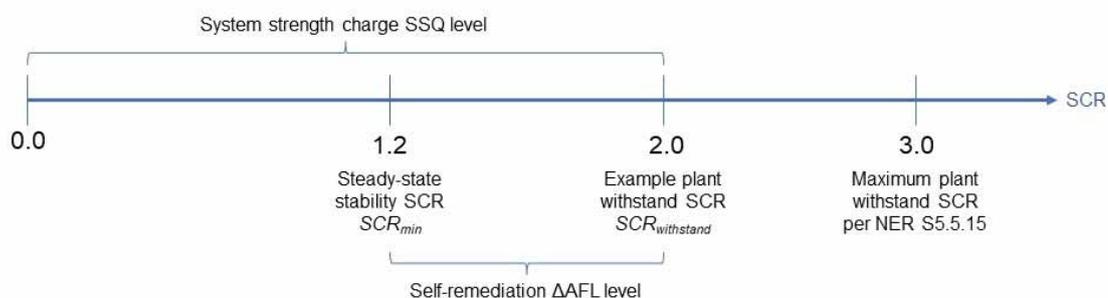
The intent set out in the final determination for the *Efficient management of system strength on the power system*, is for the SSQ to be broadly equivalent to the magnitude of general system strength impact that [a connection applicant] would [otherwise] need to remediate.¹³

The rules-based calculation of SSQ as set out above is 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, were not equivalent.

The NER-based SSQ calculation resulted 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 a 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.¹⁴ As a result, connection applicants electing to pay the charge under the arrangements that were in effect at the time 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 under NER-based calculation of SSQ



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

1.2 Our final rule changes the way SSQ is calculated

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

Specifically the final rule:

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

13 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>

14 A minimum short circuit ratio 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.

- 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,¹⁵
- 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,¹⁶
- 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,¹⁷
- 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 final 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 will allow applicants to change their election and/or recalculate their SSQ under the new rules and SSIAG.

The final rule will trigger an update to AEMO’s SSIAG with a new version to be published by **30 June 2024**. AEMO will 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.¹⁸ The new calculation of SSQ will apply from **1 July 2024**.

The final rule is largely the same as the draft rule with only minor changes made to:

- more clearly separate the impact assessments (done for the purposes of self-remediation) from the calculation of charging parameters (used for the purposes of the system strength charge)
- further differentiate between the indicative and final SSQ
- improve clarity and understanding

Refer to appendix E for more detail on the changes between draft and final.

Chapter 3 provides more detail on each element of the final rule appendix E provides more detail on the changes between draft and final.

1.3 Stakeholder feedback on our draft rule shaped our final determination

The Commission received ten submissions in response to the draft determination and draft rule published on 30 November 2023. The submissions are published on the AEMC’s Calculation of system strength quantity project page.¹⁹ All ten submissions noted their support for the draft rule, agreeing that it will, for example:

- *“bring greater alignment between the two options for system strength remediation when connecting new generation to the grid” - Shell Energy²⁰*

¹⁵ NER clause 4.6.6(a)(1)(ii)

¹⁶ NER clause 4.6.6(b1)(3)

¹⁷ 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 charge 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)

¹⁸ NER clause 11.163.2 in the transitional provisions in the final rule.

¹⁹ AEMC, ERC0375, *Calculation of system strength quantity* project page, link here: <https://www.aemc.gov.au/rule-changes/calculation-system-strength-quantity>

²⁰ Shell Energy Operations Pty Ltd (Shell Energy), Submission to ERC0375 *Calculation of system strength quantity* draft determination, 17 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/Shell%20Energy%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

- “level the playing field between the two options” - **ENA**²¹
- “ensure the two options to address the system strength impact of new connections or alterations to a connection point ...are equivalent” - **AGL**²²
- “result in the same comparative cost of system strength however it is acquired and a return to the ‘No Harm’ principle” - **EUAA**²³
- “meet the policy intent of the original rule and is also in the long-term interests of consumers” - **AER**²⁴

Some stakeholders also recognised that the draft rule would support more efficient delivery of system strength services (**AEMO, EUAA, Shell Energy, Tilt Renewables, AER**).²⁵

A number of submissions also highlighted support for specific elements of the draft rule including:

- moving the SSQ calculation into the SSIAG (**Energy Queensland, AGL, Shell Energy, AER, AEMO**)²⁶
- more clarity regarding the process of moving from an indicative to a final SSQ (**Energy Queensland, AGL**)²⁷
- commencing the rule as soon as possible to provide investment certainty (**ENA**)²⁸

While stakeholders broadly supported the draft rule, some issues were raised in submissions. The issues mainly relate to:

- AEMO’s consultation process to update the SSIAG to give effect to this rule - more detail is in section 3.3
- clarity of the rule drafting - more detail is in chapter 3 and appendix E
- application of the rule in the Northern Territory - more detail is in section 2.2.2
- application of the rule to large loads - more detail is in appendix F
- matters relating to other components of the system strength charge or other elements of the system strength framework- more detail is in appendix F

We have addressed these issues in this determination and, where appropriate, with minor changes to rule drafting. Overall, based on overwhelming support from stakeholders, the final rule remains consistent with the draft rule but with some minor changes to drafting to improve clarity and understanding. See appendix E for more information about how the final rule differs from the draft rule.

21 Energy Networks Association (ENA), *Submission to ERC0375 draft determination*, 16 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/ENA%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

22 AGL, *Submission to ERC0375 Calculation of system strength quantity draft determination*, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AGL%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

23 Energy Users Association of Australia (EUAA), *Submission to ERC0375 Calculation of system strength quantity draft determination*, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/EUAA%20Submission%20to%20ERC0375%20draft%20determination%20%281%29.pdf>

24 Australian Energy Regulator (AER), *Submission to ERC0375 Calculation of system strength quantity draft determination*, 18 January 2024, p.2, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AER%20Submission%20to%20ERC0375%20draft%20determination.pdf>

25 Submissions to ERC0375, *Calculation of system strength quantity draft rule* are available on the AEMC project page here: <https://www.aemc.gov.au/rule-changes/calculation-system-strength-quantity>

26 Ibid

27 Ibid

28 Ibid

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

As well as feedback received in response to our draft rule, we note that our final decision was also informed by previous feedback received by AEMO as part of its consultation on the SSIAG from January - June 2023 (see appendix C.4 for more detail).

In that consultation process, the issue underpinning this final rule change was identified - that is, that:

- assessing the system strength impact for an applicant connecting or altering its connection to the grid, should not include the minimum stability level of system strength, and
- 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.

Submissions to AEMO's process agreed there was an issue and agreed with AEMO's approach to addressing it in the SSIAG for applicants electing to self-remediate. However, with the SSQ calculation under the original framework set out in the NER, AEMO ultimately submitted this rule change request to address the issue of non-equivalence. More information about AEMO's consultation process is in appendix C.4

The Commission agrees with AEMO that the differences between the way the system strength impact is assessed in the SSIAG for the purposes of self-remediation compared to how it was calculated under the original system strength framework in the NER for the purposes of the system strength charge did not achieve the original intent of the system strength framework, and has made this final determination and final rule in response.

1.4 We made this rule under a fast-track process as AEMO had 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.²⁹

The AEMC published the formal notice to commence this rule change process on **9 November 2023** under a fast track process and proceeded directly to a draft determination on **30 November 2023**.³⁰ This was on the basis that AEMO had already consulted on the nature and content of its proposal while developing the SSIAG.³¹

AEMO described the extent of its stakeholder engagement on matters relating to its rule change request in section 2.3 of the request.³² More information including all dates, consultation documents, submissions and versions of the SSIAG can be found on AEMO's website.³³

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

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

31 The AEMC may use the fast track process to progress a rule change request if (as per s. 96A(1)(a) of the NEL) 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.

32 AEMO, *Calculation of system strength quantity rule change request*, 19 September 2023, available at: <https://www.aemc.gov.au/rule-changes/calculation-system-strength-quantity>

33 SSIAG consultation page: <https://aemo.com.au/en/consultations/current-and-closed-consultations/ssriag>.

1.5 AEMO has provided guidance on how to calculate SSQ while it updates the SSIAG.

This final rule will substantially decrease the value of the SSQ compared to the previous rule. This in turn will decrease the total system strength charge paid by connecting generators electing that option. The decrease will be formally realised once the final rule comes into effect on 1 July 2024.

AEMO has published a guidance paper, proposing a methodology for calculating the SSQ that, in AEMO's view, better aligns with the intended outcomes of the NER.³⁴

AEMO intends for the approach set out in the guidance paper to form the basis of the SSQ methodology it will propose to stakeholders when consulting on the SSIAG to give effect to this final rule. The Commission considers AEMO's guidance paper will support applicants in progressing their connection applications until the new arrangements formally take effect on 1 July 2024.

The Commission notes that the AER issued a letter to SSSPs, noting that it did 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 and that it would re-assess its position once this final determination was made.³⁵

In its submission to the draft rule, the AER stated that it *"is supportive of the direction taken in the draft rules and determination. We [the AER] consider that shifting determination of the SSQ methodology from the Rules to AEMO's System Strength Impact Assessment Guideline both meets the policy intent of the original rule and is also in the long-term interests of consumers."*³⁶

The Commission notes that the transitional provisions that form part of this final rule will provide details on how applicants at different stages of the connections process will transition to the new arrangements from the effective date.

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

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

Choosing between two broadly equivalent options will 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,

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

35 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>

36 AER, Submission to ERC0375 draft determination, 18 January 2024, p.2, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AER%20Submission%20to%20ERC0375%20draft%20determination.pdf>

- 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 2021³⁷ and can now be achieved under the final rule. See section 2.3.1 for more information.

Some stakeholders acknowledge the changes to the way SSQ is calculated may contribute to efficient system strength outcomes, with submissions noting:

- “the proposed rule change will allow purchasers of system strength to choose between self-remediation or SSSP provided system strength...[creating] quasi-competition in the market which we hope will lead to more efficient outcomes for consumers.”* - **EUAA**³⁸
- “alignment [of the options] will give connection applicants a more cost reflective choice – promoting efficient investment in the NEM consistent with the intention of 2021 efficient management of system strength rule.”* - **AEMO**³⁹
- “Equivalent calculations applied for generators who elect to pay the system strength charge and those electing self remediation have the potential to enhance the efficiency of the market.”* - **Shell Energy**⁴⁰

In a much broader context, the final rule will 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.

Stakeholders acknowledged this point with submissions noting:

- [the rule change] *“introduces a fair and equitable approach, allowing connection applicants to choose between self-remediation and opting to pay the SSC. This decision-making process is critical for our sector’s efficient operation and sustainable growth.”* - **Sungrow**⁴¹
- “the AEMC’s draft rule will also lower the charge for procuring system strength services. This allows connections (that might be otherwise financially unviable) to proceed where system strength can be efficiently provided by system strength service providers. This supports the connection of new generation and storage to meet future demand for electricity and deliver on Government commitments to reduce carbon emissions”* - **AEMO**⁴²
- “requiring AEMO to determine an appropriate SSQ methodology that is equivalent to the methodology applied to self remediation requirements will assist TNSPs and help support efficient investment in lower carbon technologies.”* - **Shell Energy**⁴³

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

38 Energy Users Association of Australia (EUAA), Submission to ERC0375 Calculation of system strength quantity draft rule, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/EUAA%20Submission%20to%20ERC0375%20draft%20determination%20%281%29.pdf>

39 AEMO, Submission to ERC0375, Calculation of system strength quantity draft rule, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AEMO%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

40 Shell Energy Operations Pty Ltd (Shell Energy), Submission to ERC0375 draft determination, 17 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/Shell%20Energy%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

41 Sungrow Power Supply Co., Ltd. (Sungrow), Submission to ERC0375 Calculation of system strength quantity draft rule, 3 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/SUNGROW%20Submission%20to%20ERC0375%20draft%20determination.pdf>

42 AEMO, Submission to ERC0375, Calculation of system strength quantity draft rule, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AEMO%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

43 Shell Energy Operations Pty Ltd (Shell Energy), Submission to ERC0375 Calculation of system strength quantity draft determination, 17 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/Shell%20Energy%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

- *“ENA supports giving priority to this Rule and any updates to Guidelines needed to ensure networks and connection applicants have certainty to implement the system strength framework and ensure the faster transition to a lower emissions future.”- ENA⁴⁴*

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.

44 Energy Networks Association (ENA), Submission to ERC0375 draft determination, 16 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/ENA%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

2 The Final rule will contribute to the energy objectives

This final rule will promote efficient investment in, and efficient operation and use of, system strength services because it will 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 applicants connecting or altering their connection to the grid, will 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.⁴⁵

For this rule change, the relevant energy objective is the NEO, which is:⁴⁶

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.⁴⁷

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.⁴⁸

For this rule change, the Commission has made a more preferable final rule that will 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

⁴⁵ Section 88(1) of the NEL.

⁴⁶ Section 7 of the NEL.

⁴⁷ Section 32A(5) of the NEL.

⁴⁸ 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 will 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 will apply in the Northern Territory

In developing the final 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.

In its submission, ENA questioned the application of the draft rule in the Northern Territory noting that the Commission may wish to work with Northern Territory Power & Water to develop a differential rule instead.⁴⁹

The Commission considered ENA’s suggestion but confirms that a uniform rule remains appropriate, though it does not have any effect in practice. A new connection or alteration request under rule 5.3 of the NT NER triggers the system strength framework under the NT’s Network Technical Code and not the NT NER. The Network Technical Code requires Power and Water Corporation to have its own version of the SSIAG.⁵⁰

On this basis, the Commission is satisfied that the NER system strength framework does not apply in practice in the NT so there is no need for a differential rule.

See appendix D.4 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 final rule promotes efficient investment in and provision of system strength services by providing two broadly 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 final rule is designed to accommodate changes in knowledge, technology and policy as the power system evolves.
- **Principles of good regulatory practice** - the final rule will interact constructively with other system security reforms underway.

49 Energy Networks Association (ENA), Submission to ERC0375 draft determination, 16 January 2024, p.2, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/ENA%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

50 Version 1.2 of the Northern Territory SSIAG is available here: https://www.powerwater.com.au/_data/assets/pdf_file/0029/57467/System-Strength-Impact-Assessment-Guidelines-V1.2-clean.pdf

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 final rule will 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 final rule will 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 final rule best promotes the long-term interest of consumers when compared to other options and assessed against the criteria.

2.3.1 **The final 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 identified 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.⁵¹ The Commission considers this will likely lead to inefficient decision-making by connection applicants if not addressed.

Providing broadly equivalent incentives under both options connecting applicants may use 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 a broadly 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.⁵² However, 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:

51 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>

52 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.

- 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 a broadly 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.

For the avoidance of doubt, the intent of the system strength framework is for the most efficient option to be chosen. This 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, will also allow efficiencies to be captured as knowledge and technology improve.

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

The final 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 chapter 3 for more information on how the final 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.⁵³

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.⁵⁴

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.

53 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>

54 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>

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 final rule strikes a balance between the need for certainty, and the need for flexibility. By introducing new policy principles, the final 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 final rule will interact constructively with other reforms underway.

The final rule adheres to principles of good regulatory 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.

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.⁵⁵

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.⁵⁶

The final 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.

55 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

56 For example, the AEMC is considering another rule change request from Powerlink Queensland proposing that it be allowed to re-set its SSUPs for Queensland nodes. More information here: <https://www.aemc.gov.au/rule-changes/resetting-powerlinks-system-strength-unit-prices>

3 How our Final rule will operate

The final rule will change the way SSQ 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.⁵⁷ AEMO has identified that the calculation does not account for the minimum level of system strength provided by the NSP.⁵⁸ 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 final rule will 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 final rule delivers the intent of AEMO's proposal but with some structural and wording adjustments. It incorporates stakeholder feedback provided in response to the draft rule published on 30 November 2023. Key elements of the final rule are explained below.

3.1 Changing the way the SSQ is calculated

Box 1: The final 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 final 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.

⁵⁷ 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'

⁵⁸ 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 final rule, like the draft rule, moves the calculation of SSQ from the NER, into AEMO's SSIAG. This changes the calculation of SSQ from 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.⁵⁹

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).

While all ten stakeholder submissions to the draft rule provided broad support for the approach taken, a number of stakeholders provided specific support for this element of the rule change, for example:

- ***Energy Queensland** is generally supportive of the proposed changes to remove the SSQ calculation from the NER and place it in the SSIAG.*⁶⁰
- ***AGL** also supports actions under the draft rule to... Shift responsibility for determining the SSQ calculation from the NER to AEMO as part of the SSIAG.... Introduce new policy principles to guide AEMO and provide clarity to stakeholders about what SSQ should represent.*⁶¹
- ***Shell Energy** considers requiring AEMO to determine an appropriate SSQ methodology that is equivalent to the methodology applied to self remediation requirements will assist TNSPs and help support efficient investment in lower carbon technologies.*⁶²
- ***Tilt Renewables** agrees that some flexibility could be desirable to account for future technologies, knowledge and policies.*⁶³

59 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)

60 Energy Queensland Pty Ltd, Submission to ERC0375 *Calculation of system strength quantity* draft rule, 18 January 2024, p. 1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/EQL%20Submission%20to%20ERC0375%20draft%20determination.pdf>

61 AGL, Submission to ERC0375 draft determination, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AGL%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

62 Shell Energy Operations Pty Ltd (Shell Energy), Submission to ERC0375 *Calculation of system strength quantity* draft determination, 17 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/Shell%20Energy%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

63 Tilt Renewables, Submission to ERC0375 *Calculation of system strength quantity* draft determination, 19 January 2024, p.3, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/Tilt%20Renewables%20Submission%20to%20ERC0375%20draft%20determination%20-%20Recieved%2019%20January%202024.pdf>

A principles-based approach is also used for the system strength locational factor (SSLF) 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)).⁶⁴

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.

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 final 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 final 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*.⁶⁵
- 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*.⁶⁶

The final 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.⁶⁷

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

64 SSLF reflects the electrical distance between the connection and the system strength node. Projects farther away will have a higher SSLF. Δ AFL 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.

65 Clause 4.6.6(b1)(3)(i) of the final rule

66 Clause 4.6.6(b1)(3)(ii) of the final rule

67 Clause 4.6.6(b1)(3)

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 point⁶⁸

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.⁶⁹

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
- *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 will be to propose, for consultation, a stability coefficient of 1.2 to account for the minimum stability level of system strength provided by NSPs.⁷⁰ 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 3.3.2.

3.2 Clarifying the process of calculating an indicative and final SSQ

68 AEMO, *Calculating system strength quantities in the NEM*, May 2023, available at: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssriag/amendment/guidance—calculating-system-strength-quantities-in-the-nem.pdf?la=en

69 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.

70 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>

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

The final 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 SSLF and SSQ (NER cl. 4.6.6(b1))
- removing reference to SSLF and indicative SSQ from NER cl. 4.6.6(b)(1)(i), to make it clear that the preliminary and full impact assessments are not used for the purposes of calculating the system strength charge
- specifying at NER cl. 4.6.6(b1)(4) that AEMO will provide guidance on the inputs and assumptions that may be used by a NSP when calculating an indicative SSQ given that these inputs may differ from those agreed in the connection agreement and used by the SSSP to calculate the final SSQ
- clarifying in NER cl. 5.3.4B(a3) that a NSP is not required to calculate an indicative SSQ if it is not required to calculate the SSLF
- clarifying at NER cl. 5.3.4B(a2)(2A) and (a4) that the SSQ calculated and (if relevant) revised remains an "indicative SSQ"
- clarifying at NER cl. 5.3.4B(a5) that a NSP may recover the costs of providing a revised SSQ or SSLF
- clarifying that the NSP must notify the SSSP of its calculation of indicative SSQ (NER cl. 5.3.4C(b)), as well as the short circuit ratio and rated active power as agreed in the connection agreement (NER cl. 5.3.4C(b1))
- adding reference to SSLF and indicative SSQ to NER cl. 5.3.9(c1) and 5.3.12(d) to ensure connection alterations may request the NSP to undertake both a preliminary assessment and calculate these charging components at an appropriate time.

Implicit in the final rule is the fact that:

- the final SSQ is the quantity calculated by the SSSP, 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 SSLF is not required to be calculated, because it is not technically feasible, the SSQ also need not be calculated. The final rule does not explicitly reference SSQ in each instance the SSLF is referenced, as proposed by AEMO, but instead makes it clear in NER cl. 5.3.4B(a3)(2).

Note: while under the final rule, SSQ is generally treated the same as SSLF, the main exception is that TNSPs and DNSPs publish SSLFs 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 SSLF and SSQ

Consistent with AEMO's proposed rule, the Commission has made a final 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 SSLF 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
 - a 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.⁷¹
- The calculation of SSLF 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 final rule makes minor adjustments to the wording proposed by AEMO. As well as separating the two processes in NER cl. 4.6.6(b) and (b1), the final rule also removes the reference to the SSLF and indicative SSQ from NER cl. 4.6.6(b)(1)(i) to further clarify that the calculation of these two components for use in the system strength charge is not linked to impact assessments that are done for the purposes of self-remediation.

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

In its rule change request, and again in its submission to the draft rule, AEMO noted that the difference between an indicative SSQ and a final SSQ should be made clear(er). Other stakeholders agreed:

- **Energy Queensland** stated that they *"agree with the proposal to include an 'indicative' SSQ, which recognises the changes that occur through the connection process."*⁷²
- **AGL** *"supports actions under the draft rule to...Clarify the process of moving from an indicative to a final SSQ, noting the final SSQ remains in place unless plant is altered."*⁷³

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

1. by the NSP in response to a connection enquiry,⁷⁴
2. by the NSP or AEMO as part of stability assessments,⁷⁵

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

72 Energy Queensland Pty Ltd, Submission to ERC0375 Calculation of system strength quantity draft rule, 18 January 2024, p. 1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/EQL%20Submission%20to%20ERC0375%20draft%20determination.pdf>

73 AGL, Submission to ERC0375 draft determination, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AGL%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

74 NER cl.5.3.3(b5)(3)(i)

75 NER cl.5.3.4B(a2)(4)

3. by the NSP at the request of the applicant.⁷⁶

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

The final rule makes it clear that the final value for SSQ is the quantity calculated by the SSSP following the negotiation of performance standards 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.⁷⁷

The final rule, in response to a suggestion from AEMO in its submission to the draft rule, further clarifies the difference between an indicative compared with a final SSQ with reference to the inputs and assumptions used to calculate it. An indicative SSQ is calculated in response to a connection enquiry, and will frequently use assumptions on the plant short circuit ratio (SCR) and rated active power if not provided by the party making the connection enquiry. Final values recorded in the connection agreement and performance standards are used to determine the actual system strength charge. Though the same methodology to calculate the SSQ applies in both instances, the indicative SSQ uses inputs and assumptions that may change. To clarify this further, the final rule includes a new clause to specify that AEMO, when developing the SSIAG, must provide guidance on the inputs and assumptions that may be used by a NSP when calculating an indicative SSQ.⁷⁸

The final rule makes a number of other changes to clarify which SSQ applies, including that it is the:

- indicative SSQ calculated by the NSP at NER cl. 5.3.4B(a2)(2A) and that can be requested under NER cl. 5.3.9(c1) and NER cl. 5.3.12(d)
- indicative SSQ revised in response to a connection applicant request at NER cl. 5.3.4B(a4)
- indicative SSQ calculated by the NSP that must be notified at NER cl. 5.3.4C(b)(2)
- short circuit ratio, rated active power (as agreed in the connection agreement) that should be notified at NER cl.5.3.4C(b1) so that the SSSP can calculate the final SSQ value.

As a result of these additions and clarifications, the Commission considers the final rule achieves the intent of the AEMO proposal; making it clear that an indicative SSQ can result from multiple processes of negotiation and assessment using a range of inputs and assumptions, but the actual 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 relevant version of 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.⁷⁹

⁷⁶ NER cl. 5.3.4B(a4), NER cl. 5.3.9(c1) and NER cl. 5.3.12(d)

⁷⁷ Final rule cl. 6A.23.5(j), supported by cl. 6A.23.5(j1) and NER cl. 6A.23.5(k)

⁷⁸ Final rule cl. 4.6.6(b1)(4)

⁷⁹ This is set out in NER cl. 6A.23.5(j), NER cl. 6A.23.5(j1) and NER cl. 6A.23.5(k)

3.3 Updating the SSIAG in consultation with stakeholders

Box 3: Updating the SSIAG to give effect to the final rule

The final rule includes arrangements to:

- require AEMO to consult with stakeholders and publish an updated SSIAG by **30 June 2024**
- provides that the new arrangements for calculating SSQ come into effect on **1 July 2024**.

3.3.1 Updating the SSIAG to give effect to the final rule

The final rule will trigger an update to AEMO's SSIAG. While AEMO's proposal noted it will commence consultation as soon as practicable after a final rule is made, the final rule includes a fixed date on which new arrangements will take effect. The Commission considered this to be particularly important given the impact the changes proposed by the final rule may have on industry investment decisions.

As such, the final 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**.

In its submission to the draft rule, ENA noted its support for "giving priority to this Rule and any updates to Guidelines needed to ensure networks and connection applicants have certainty to implement the system strength framework and ensure the faster transition to a lower emissions future. ENA strongly support the Final Rule being effective no later than 1 July 2024, accompanied by a requirement for the AEMO to consult on an updated System SSIAG to be published by 30 June 2024."⁸⁰

In its submission AEMO indicated that it "aims to commence consultation on the necessary amendments to the system strength impact assessment guidelines as soon as possible after the AEMC's final determination"⁸¹

3.3.2 Consulting with stakeholders on updates to the SSIAG

AEMO will consult with stakeholders to update the SSIAG and intends to commence consultation soon after the final determination is published.

A number of submissions provided specific views relating to AEMO's consultation process to update the SSIAG:

- "**Vestas** understands that the updated NER should not allow AEMO to include any additional variable in SSQ calculation that is not clearly justified and discussed with stakeholders in a public consultation, in order to reduce the level of uncertainty for generators...[and] would like to highlight that the revised Rule should clearly state that AEMO must consult the stakeholders and

80 Energy Networks Association (ENA), Submission to ERC0375 draft determination, 16 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/ENA%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

81 AEMO, Submission to ERC0375, Calculation of system strength quantity draft rule, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AEMO%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

incorporate their feedback, following the standard consultation process, before publishing the new version of the SSIAG.”⁸²

- “...it is very important that the calculation methodology is not left open to different interpretations and results as time goes by. The AER should carefully monitor AEMO’s SSQ methodology to verify it complies with the identified policy principles.” - **Tilt Renewables**⁸³
- “**Sungrow** seeks: robust mechanisms for ongoing stakeholder engagement and feedback and structured monitoring and evaluation process”⁸⁴

The Commission agrees that stakeholders should be consulted in relation to this and future updates of the SSQ methodology and the SSIAG more broadly. The NER provides that AEMO must comply with the rules consultation procedures when making or amending the SSIAG. The Commission considers this provides an appropriate mechanism for stakeholder engagement and feedback

AEMO intends to utilise an expedited process to meet the 30 June 2024 publication date for the updated SSIAG as set out in the final rule. This 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.⁸⁵

The Commission agrees that the 10 week expedited process gives stakeholders sufficient time to comment on AEMO’s proposed updates, and should provide AEMO sufficient time to review submissions, clarify any matters raised in consultation, and prepare and approve a final decision and updated SSIAG by 30 June 2024.

The Commission notes that future updates to the SSIAG may utilise the standard, expedited or minor rules consultation procedures as appropriate.⁸⁶ AEMO has noted in its submission that there are likely further updates to the SSIAG on the horizon saying “*Market Bodies System Strength Implementation Working Group, led by the AEMC, is working closely with industry to identify and prioritise other changes to the system strength framework that may be needed. AEMO will work closely with the working group to implement additional improvements to the SSIAG as a separate package of work.*”

As noted in section 3.1.2, AEMO has indicated that its intention is to propose, for consultation, a stability coefficient of 1.2 to account for the minimum stability level of system strength provided by NSPs.^{87,88, 89} 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.

82 Vestas, Submission to ERC0375 *Calculation of system strength quantity* draft determination, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/Vestas%20Submission%20to%20ERC0375%20draft%20determination.pdf>

83 Tilt Renewables, Submission to ERC0375 *Calculation of system strength quantity* draft determination, 19 January 2024, p.3, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/Tilt%20Renewables%20Submission%20to%20ERC0375%20draft%20determination%20-%20received%2019%20January%202024.pdf>

84 Sungrow Power Supply Co., Ltd. (Sungrow), Submission to ERC0375 *Calculation of system strength quantity* draft rule, 3 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/SUNGROW%20Submission%20to%20ERC0375%20draft%20determination.pdf>

85 NER cl. 8.9.3.

86 See NER cl. 8.9.1 for more information on the rules consultation procedures

87 The stability co-efficient is given a value of 1.2 because technical literature indicates it is the minimum short circuit ratio 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

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

89 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>

In its submission to the draft rule, **ENA** supported the approach of using the 1.2 coefficient noting that it “welcomes AEMO...utilising the already updated SSIAG of 6 June 2023.”⁹⁰ **AGL** also noted in its submission that it supports “consultation on an appropriate minimum stability coefficient in the SSQ so it can be broadly comparable to the calculation of the system strength impact used for self-remediation.”⁹¹

However, the **EUAA** noted in its submission that it “is concerned that this coefficient will be set to 1.2 in the rules to be used in the SSQ calculation without any real justification, rather than an actual number set by the NSP and AEMO for each location. Having a single value for the coefficient across the NEM may result in over or under allocation of system strength requirements.”⁹²

The 1.2 stability coefficient has been proposed by AEMO because technical literature indicates it is the minimum short circuit ratio for which voltage stability can be maintained in a power system. The Commission acknowledges that this may not represent the actual short circuit ratio at any or every connection point across the NEM and could, at its extreme, lead to over- or under-allocation of system strength requirements. However, noting that the SSQ is meant to be a straightforward option to assess system strength impact for applicants electing to pay the system strength charge, and also that the objective of this final rule is to make the charging option broadly equivalent to the remediation option, the Commission considers 1.2 to be a reasonable starting point for AEMO’s consultation.

Also, by moving the SSQ out of the NER and into guidelines the final rule allows the methodology to be adapted, in consultation with stakeholders, as engineering knowledge improves, and technologies, the power system and policy frameworks change. There may not be sufficient time for AEMO to fully consider alternate views on the 1.2 coefficient in this update of the SSIAG given the 30 June 2024 publication date prescribed in the Rules, however there will be future opportunities to update the SSIAG.

3.4 Transitional arrangements for applicants mid-way through a connections process.

Box 4: Transitional arrangements to support the final rule

The final rule includes arrangements:

- to allow most connecting parties that have begun a connection application under existing arrangements, to recalculate their SSQ under the new arrangements

3.4.1 Transitional arrangements for applicants mid way through a connections process

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

90 Energy Networks Association (ENA), Submission to ERC0375 draft determination, 16 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/ENA%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

91 AGL, Submission to ERC0375 draft determination, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/AGL%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

92 Energy Users Association of Australia (EUAA), Submission to ERC0375 Calculation of system strength quantity draft rule, 18 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/EUAA%20Submission%20to%20ERC0375%20draft%20determination%20%281%29.pdf>

- 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 will 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 will have occurred in advance of the new arrangements taking effect. The Commission notes also that to mitigate the risk of SSQ values being markedly different under the NER-based SSQ calculation compared with the new arrangements, AEMO has published a guidance paper, proposing a methodology for calculating the SSQ that, in AEMO's view, better aligns with the intended outcomes of the NER.⁹³ AEMO intends to use the approach set out in this guidance paper as the basis for its consultation on the SSIAG to give effect to the final rule.

3.5 The final rule makes other minor corrections

The final rule also makes minor corrections to the NER to make the NER clearer to stakeholders.

3.5.1 Clarifying that NSP must calculate indicative SSQ and SSLF for new connections and alterations to existing connections

The final rule adds references to SSLF and indicative SSQ to NER cl. 5.3.9(c1) and 5.3.12(d) to ensure connection alterations can request the NSP to both undertake a preliminary assessment and calculate these charging components at the appropriate time. The changes do not otherwise affect the operation of the connections process for new or altered connections.

These references were added in response to a suggestion made by AEMO in its submission to the draft rule. AEMO identified that the draft rule clause that required an NSP to calculate the indicative SSQ (draft rule version of NER cl. 5.3.4B(a2)(2A)) referred to a notification clause (5.3.3(b5)(3)) that applied to new connections only. AEMO suggested and the Commission agrees that the NSP's obligation to calculate the indicative SSQ (and the SSLF), applies to both new connections and altered connections. The Commission has therefore added references to each of these charging components to NER cl. 5.3.9(c1) and 5.3.12 (d) and made a consequential change to NER cl 5.3.4B(a2)(2A).

3.5.2 Correcting location of civil penalty provision

The final rule will 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.

⁹³ AEMO, *Calculating system strength quantities in the NEM*, May 2023, available at: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssrmiag/amendment/guidance--calculating-system-strength-quantities-in-the-nem.pdf?la=en

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.⁹⁴

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 will be to use a stability coefficient of 1.2 to account for the minimum stability level of system strength provided by NSPs.⁹⁵

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 considered 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 suggested that because of this, the system strength charge option does not achieve the intent of the original rules because:⁹⁶

- 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.

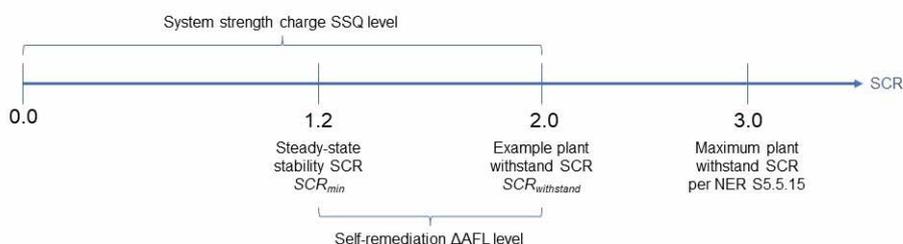
Figure A.1 below illustrates this point using a plant with a withstand short circuit ratio of 2.0 at the connection point.

⁹⁴ See our website for more information on the rule change process: <https://www.aemc.gov.au/our-work/changing-energy-rules>

⁹⁵ 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>

⁹⁶ 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 under NER-based calculation of SSQ



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

AEMO explained 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 suggested 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 requested 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 will 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 suggested 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 will also align SSQ with other technical elements of the system strength framework (like SSLF) which can evolve, in consultation with stakeholders, by updating the SSIAG. AEMO noted that this approach will 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.⁹⁷ 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 request⁹⁸

97 This notice was published under section 95 of the NEL

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

Accordingly, the Commission went straight to publishing a draft rule determination on **30 November 2023**, without first consulting on a consultation paper. The Commission received **ten submissions** on the draft rule determination. Issues raised in submissions are discussed and responded to throughout this final rule determination. A summary of other issues raised in submissions and the Commission's response to each issue is contained in appendix F.

B Regulatory impact analysis

The Commission has undertaken regulatory impact analysis to make its final 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 section 3.1.

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	Primary benefits	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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Market participants that must comply with new obligations • AEMO 	QL: stakeholder feedback to assess all benefits and costs.

C Additional background and context

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' arrangements at the time were not fit for purpose to achieve efficient investment in system strength services⁹⁹

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.¹⁰⁰

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 components¹⁰¹:

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)¹⁰². The choice for connecting parties to either self-remediate 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.

99 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_request_pending.pdf

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

101 Ibid. p. 1.

102 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).¹⁰³

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 impact¹⁰⁴ and any additional amount the plant reduces the available fault level at the connection point, assessed in accordance with AEMO’s SSIAG.¹⁰⁵

Calculating adverse system strength impact

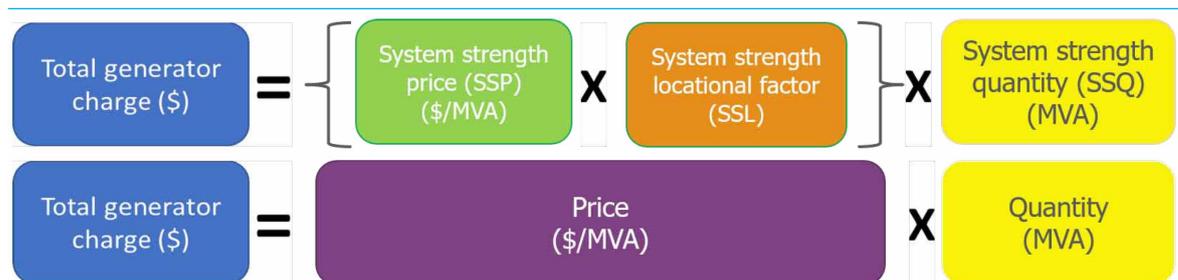
The change in the available fault level (ΔAFL) is currently determined in the SSIAG as a function of the plant’s incremental impact on the available fault level. This is currently calculated as a function of the difference between the connecting plant’s withstand short circuit ratio adjusted for a stability coefficient (α) reflecting network limitations^{106, 107}.

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

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.¹⁰⁸

C.3 System strength charge under the current framework

Figure C.1: Components of the system strength charge



Source: AEMC

103 Clause 5.3.4B(a2) of the NER

104 Clause 4.6.6(b)(5) of the NER

105 Ibid.

106 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

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

108 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 together¹⁰⁹

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 (SSLF):** 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.

C.4 AEMO's previous consultation on the SSIAG

As part of its consultation on the SSIAG from January - June 2023 AEMO 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 2023.¹¹⁰ 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 will be appropriate to implement the alternative approach for calculating SSQ.

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.¹¹¹

AEMO addressed most of these concerns in its final report, published on 15 March 2023.¹¹²

AEMO ultimately submitted a rule change request in response to the fact that its alternative approach to calculating SSQ is not consistent with the NER. This final determination has been made in response to AEMO's rule change request.

109 Ibid. p 147.

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

111 TasNetworks, Submission to AEMO's draft SSIAG, 10 February 2023, available at: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/ssmiag/second-stage-submissions--ssiag/tasnetworks.pdf?la=en

112 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/ssmiag/final-report/ssiag-final-report-and-determination.pdf?la=en

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 final rule.

D Legal requirements to make a rule

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

D.1 Final rule determination and final rule

In accordance with section 102 of the NEL, the Commission has made this final rule determination for a more preferable final rule in relation to the rule proposed by AEMO.

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

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

D.2 Power to make the rule

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

The more preferable final 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 final rule
- the rule change request
- the Commission's analysis as to the ways in which the final rule will or is likely to contribute to the achievement of the NEO
- the application of the final rule to the Northern Territory

There is no relevant Ministerial Council on Energy (MCE) statement of policy principles for this rule change request.¹¹³

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.¹¹⁴ The more preferable final 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.¹¹⁵ Under those regulations, only certain parts of the NER have been adopted in the Northern Territory.

¹¹³ 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.

¹¹⁴ Section 91(8) of the NEL.

¹¹⁵ These regulations under the NT Act are the National Electricity (Northern Territory) (National Uniform Legislation) (Modifications) Regulations 2016

As the more preferable final 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:¹¹⁶

1. the national electricity system
2. one or more, or all, of the local electricity systems¹¹⁷
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.¹¹⁸ 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.¹¹⁹

The Commission’s final 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.

Chapter 2 notes that in its submission, ENA questioned the application of the draft rule in the Northern Territory noting that the Commission may wish to work with Northern Territory Power & Water to develop a differential rule instead.¹²⁰

The Commission considered ENA’s suggestion but confirms that a uniform rule remains appropriate, though it does not have any effect in practice. A new connection or alteration request under rule 5.3 of the Northern Territory NER triggers the system strength framework under the Northern Territory’s Network Technical Code and not the NT NER. The Network Technical Code requires Power and Water Corporation to have its own version of the SSIAG.¹²¹

On this basis, the Commission is satisfied that the NER system strength framework does not apply in practice in the NT so there is no need for a differential rule.

¹¹⁶ Clause 14A of Schedule 1 to the NT Act, inserting section 88(2a) into the NEL as it applies in the Northern Territory.

¹¹⁷ These are specified Northern Territory systems, listed in schedule 2 of the NT Act.

¹¹⁸ Clause 14B of Schedule 1 to the NT Act, inserting section 88AA into the NEL as it applies in the Northern Territory.

¹¹⁹ 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.

¹²⁰ Energy Networks Association (ENA), Submission to ERC0375 draft determination, 16 January 2024, p.1, available here: <https://www.aemc.gov.au/sites/default/files/2024-01/ENA%20-%20Submission%20to%20ERC0375%20draft%20determination.pdf>

¹²¹ Version 1.2 of the Northern Territory SSIAG is available here: https://www.powerwater.com.au/_data/assets/pdf_file/0029/57467/System-Strength-Impact-Assessment-Guidelines-V1.2-clean.pdf

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 final 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 3.5.2 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 final rule be classified as civil penalty provisions or conduct provisions.

D.6 Review of operation of the rule

The more preferable final 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.

E Changes from draft to final

A range of minor changes were made to the draft rule in response to stakeholder suggestions. These are listed in the table below. Some are described in more detail in sections of the determination as noted in the table.

Table E.1: Summary of key changes from draft to final

Stakeholder	Stakeholder suggestion	AEMC response
AEMO	Further separation of impact assessments from the calculation of charging parameters	Changes made to NER cl. 4.6.6(b)(1). See section 3.2.
AEMO	Recognising that the values of the inputs and assumptions used to calculate the indicative and final charging parameters may differ.	New clause added at NER cl. 4.6.6(b1)(4). See section 3.2.2
AEMO	Obliging network service providers to calculate and notify the indicative SSQ to both new generation connections and connection alterations	Changes made to clauses 5.3.9 and 5.3.12 See section 3.5.1
AEMO	More clearly specify how and when the process for determining the final system strength charge relates to the broader process for negotiating a connection agreement - i.e. that the final charging parameters and therefore the final system strength charge is to be calculated after a connection agreement is finalised.	Changes made throughout rule. See section 3.2.
ENA and Vestas	Suggest 5.3.4B(a2)(2A) could be more simply drafted.	Changes made to 5.3.4B improve clarity of clauses.
ENA	Suggest draft transitional 11.xxx.5(c) could instead refer to subparagraph (b)	Changes made as suggested.
Vestas	Suggests 5.3(a)(a4) could be drafted more simply	Changes made to 5.3(a)(a4) improve clarity of clause.
Vestas	Suggest minor changes for clarity to transitional clauses 11.163.3 and 11.163.4 (a)	Changes made to improve clarity of clauses.

Source: AEMC

F Summary of other issues raised in submissions

Many of the issues raised in submissions are addressed throughout the determination. Below are several issues raised by stakeholders that were not specifically or fully address in sections above.

Table F.1: Summary of other issues raised in submissions

Stakeholder	Issue	Response
Tilt Renewables	Concern that self-remediation must occur behind the meter. The SSIAG, states that a System Strength Remediation Service (SSRS) must be installed behind the new renewable generator's connection point. Tilt Renewables consider these hybrid connections to be problematic and suggests more cost-effective options are likely to be available in front of the meter in certain situations.	This matter is not within the scope of this rule change project to address. The AEMC coordinates a Market Bodies System Strength Implementation Working Group, that is working closely with AER, AEMO, and industry to understand issues with the system strength framework and identify and prioritise appropriate actions as separate pieces of work.
Tilt Renewables	Importance of balancing flexibility and stability in the methodology and approach to calculating SSQ. Tilt Renewables consider it is important that the calculation methodology is not left open to different interpretations and results as time goes by and that the AER should carefully monitor AEMO's SSQ methodology to verify it complies with the identified policy principles.	AEMO must follow the rules consultation procedures when updating the SSIAG. In its role as regulator, the AER monitors compliance with all aspects of the NER and undertakes enforcement action as appropriate.
EnergyQueensland	EQL anticipates that this rule and the SSIAG will require future changes to accommodate the expanded Commonwealth Investment Scheme (CIS) and incorporate the specific technical considerations that will apply to the CIS-related projects as they are approved from April/May 2024. EQL considers the scale, mix and pace at which investments are made, may influence the technical elements of this rule and should be considered.	The AEMC coordinates a Market Bodies System Strength Implementation Working Group (working group), that is working closely with AER, AEMO, governments and industry to understand issues with the system strength framework and identify and prioritise appropriate actions as separate pieces of work. The working group is also working with governments to understand any interactions between the system strength framework and government policies and programs

Stakeholder	Issue	Response
Sungrow	<p>Sungrow considers a thorough and transparent explanation of SSUP and SSLF is essential before updating the SSIAG. Sungrow seeks:</p> <ol style="list-style-type: none"> 1. sophisticated SSQ formula that precisely reflects the capabilities and impacts of inverter-based Resources, 2. detailed and comprehensive framework for transitioning from the current SSQ calculation method to the new one 3. clear communication of SSUP and SSLF 4. increased transparency and communication in the SSUP setting process 5. extending the SSUP forecasting horizon beyond the current 5-year term 6. mechanism for adjusting SSUPs downward 7. robust mechanisms for ongoing stakeholder engagement and feedback 8. structured monitoring and evaluation process 	<p>1. The system strength charge - specifically the SSQ component that represents a connecting applicant's impact - is designed to be a straightforward and comparably quicker option for a connection applicant to meet its system strength mitigation requirements compared to the alternative which is to remediate impact. The SSQ calculation is meant to provide an <i>approximation</i> of impact based on some key technical parameters. Applicants that wish to address their precise impact can elect to do so under the remediation option.</p> <p>2. The final rule includes transitional arrangements</p> <p>3-6. These matters are not within the scope of this rule change project to address. The AEMC coordinates a Market Bodies System Strength Implementation Working Group, that is working closely with AER, AEMO, and industry to understand issues with the system strength framework and identify and prioritise appropriate actions as separate pieces of work.</p> <p>7. The NER provides that AEMO must comply with the rules consultation procedures when making or amending the SSIAG. The Commission considers this provides an appropriate mechanism for stakeholder engagement and feedback</p> <p>8. In its role as regulator, the AER monitors compliance with all aspects of the NER and undertakes enforcement action as appropriate.</p>
EUAA	<p>EUAA has concerns about the implementation of the rule for large loads and recommends a consistent trigger across requirements for large loads, i.e. technical requirements for connection for large loads under NER 5.3.</p>	<p>Where a large load meets the definition of inverter based load in the relevant version of the SSIAG, this final rule applies as it would to any connection applicant.</p> <p>Section 2.2 of version 2.1 of AEMO's SSIAG sets the criteria for classification of a load as an inverter based load (IBL). The key</p>

Stakeholder	Issue	Response
		<p>criterion is that the load must be, a minimum capacity of 5 MW or 5 MVA, supplied by power electronics, including inverters; and potentially susceptible to inverter control instability.</p>
<p>ENA</p>	<p>Providing clear transitional arrangements will facilitate efficient and consistent implementation of the system strength framework. If the 6 June 2023 SSIAG can continue to be used after the Final Rule is made, the effective date for the new Rule can be the same as the commencement date. This would also better align to the Australian Energy Regulator's (AER's) letter of 5 September 2023 to ENA enabling SSSPs to depart from clause 6A.23.5(j) until the AEMC makes the Final Determination.</p>	<p>Transitional arrangements provided as part of the final rule give NSPs and applicants at all stages of the application and connection process certainty as to how to transition to the new arrangements. While AEMO must conduct a formal rules consultation process to formally update the SSIAG to give effect to the final rule, we understand the approach set out in the 6 June 2023 SSIAG will form the basis for AEMO's consultation process.</p>
<p>Vestas</p>	<p>Suggests changes to 4.6.6(b1)(3) and 6A.23.5 (j) to add to the description of short circuit ratio and include reference to the stability coefficient.</p>	<p>Changes not made. Short circuit ratio is a defined term from Chapter 10. The stability coefficient has deliberately not been referenced in the NER. While we understand that AEMO intends to include a stability coefficient in the SSQ methodology to give effect to this rule, we consider it important to keep the rule principles-based as much as possible to provide flexibility for the SSQ methodology to adapt, in consultation with stakeholders, as knowledge, technology and policy frameworks change.</p>
<p>Vestas</p>	<p>Suggests 5.3.4C(b) could include reference to the connection applicant.</p>	<p>Not amended in the manner proposed. The clause lists information to be provided to the SSSP under 5.3.4C(a). Changes have been made to this clause to make it clear what information the SSSP must provide at which stage.</p>
<p>Vestas</p>	<p>Suggests changes to draft rule transitional 11.[XXX].2 in relation to AEMO's consultation obligations.</p>	<p>No changes made. AEMO's consultation process and obligations in that context are set out elsewhere in the NER.</p>
<p>Vestas</p>	<p>Suggest replacing "as soon as practicable" with "10 business days" for NSP to notify at draft rule transitional 11.[XXX].4(b).</p>	<p>Change not made. This clause applies where there is an existing connection enquiry and requires the NSP to notify the connection</p>

Stakeholder	Issue	Response
		<p>applicant of the new indicative SSQ value. We did not consider the additional regulatory burden of applying a business day limit on this obligation to be adequately offset by the benefit to an applicant. The likelihood of a material change in the value of indicative SSQ is low, and the applicant would likely be in regular discussion with the NSP, aware of the new arrangements, and in many cases, able to calculate the new value themselves in reference to the new SSIAG.</p>
Shell Energy	<p>Concerned that updating the calculation of SSQ does not address many of the fundamental difficulties introduced by the system strength framework which remains a sub-optimal policy for the NEM. The draft rule does not address the system needs and acts as a disincentive for investment in wind, solar, large scale electric vehicle charging, HVDC transmission and hydrogen projects reliant on inverter interface with grid. Shell Energy suggests the Commission should reconsider whole framework. Key points:</p> <ul style="list-style-type: none"> - one size fits all is not appropriate - AFL calculation subtracts fault level contribution of GFMI - AFL and minimum fault level are inconsistent - framework should target efficient/optimal mix of grid forming, grid following and synchronous - all tuned to avoid oscillation vents - need better governance of NSPs. 	<p>These matters are not within the scope of this rule change project to address. The AEMC coordinates a Market Bodies System Strength Implementation Working Group, that is working closely with AER, AEMO and industry to understand issues with the system strength framework and identify and prioritise appropriate actions as separate pieces of work.</p>

Abbreviations and defined terms

α	Coefficient representing minimum stability level of system strength
AFL	Available fault level
Δ AFL	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	<i>National Electricity (Northern Territory) (National Uniform Legislation) Act 2015</i>
P_{rated}	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
SSLF	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