The Efficient Management of System Strength Framework

AER Guidance Note

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AUSTRALIAN ENERGY REGULATOR

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1 Introduction

The Australian Energy Regulator (**AER**) exists to ensure energy consumers are better off, now and in the future. Consumers are at the heart of our work, and we focus on ensuring a secure, reliable, and affordable energy future for Australia as it transitions to net zero emissions.

As the independent regulator, the national energy objectives guide the AER's work in the long-term interests of consumers.

The purpose of this guidance note is to provide guidance on these issues to aid system strength service providers (**SSSPs**) to proactively plan for, and procure, system strength – an element of system security.

A new framework for the procurement of system strength in the National Electricity Rules (**NER** or **Rules**) is being implemented which requires SSSPs to proactively plan for and procure system strength. This system strength framework is designed to promote the efficient investment in, and efficient operation and use of, system strength services.

The AER, along with the Australian Energy Market Operator (**AEMO**)[1] and SSSPs have identified several issues about the implementation of the new system strength framework. Several issues have also been raised by SSSPs regarding how they can comply with their system strength obligations while reducing costs to consumers. This guidance note is intended to help SSSPs navigate this new framework.

The guidance note itself will not be binding on any party but will reflect our consideration of how SSSPs might best comply with their obligations at least cost and in the long-term interests of consumers of electricity.

1.1 The AER's role

As the economic regulator of energy networks in all states and territories except Western Australia, we play an important role in the energy transition. We regulate gas and electricity network businesses and have a primary role in setting the maximum revenue and prices that network businesses can recover from end users of their networks. We aim to ensure consumers pay no more than necessary for safe and reliable energy and seek to promote the efficient supply and use of energy through our determinations and monitoring and enforcement role.

The National Electricity Law requires us to perform our economic regulatory functions in a manner that will, or is likely to, contribute to the achievement of the National Electricity Objective (**NEO**).[2] The NEO is:[3]

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[1] AEMO has two distinct roles in respect of system strength. As system operator, AEMO is responsible for preparing and publishing annual system strength reports that set out system strength requirements for the national electricity market. AEMO is also the SSSP in Victoria.

[2] NEL, s. 16.

[3] NEL, s. 7.

> …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

1.2 Consultation

The AER has engaged with SSSPs to inform the development of this draft guidance note. This has included:

- participation in SSSP Working Group meetings,
- a workshop with SSSPs to discuss our proposed guidance,
- one-on-one stakeholder discussions, and
- publication of, and consultation on, draft guidance.

The AER has also engaged with the Australian Energy Market Commission (**AEMC**) and AEMO through the regular Market Bodies System Strength Implementation Working Group to discuss the issues set out in this guidance note and possible solutions.

1.3 Structure of this draft guidance note

This draft guidance note is structured as follows:

- Section 2 provides background and context about the system strength framework and sources of additional system strength.
- Section 3 provides guidance on issues that relate to how SSSPs could interpret the system strength requirements and so identify the investments required to meet those requirements.
- Section 4 provides guidance on issues that relate to how SSSPs could apply the RIT-T when assessing credible options for meeting system strength requirements.
- Section 5 provides guidance on other issues, namely linkages between system strength and inertia.

2 Background and context

System strength is described by AEMO as the ability of the power system to maintain and control the voltage waveform at a given location, both during steady state operation and following a disturbance.[4] It is often approximated by the amount of electrical current that would flow into a fault at a given point in the power system. Historically, system strength has been supplied as a byproduct of energy generation by synchronous generators, such as coal, gas and hydro power. However, as these generators leave the market or operate less frequently due to the transition to inverter-based resources such as wind, solar and batteries, system strength in the power system has reduced.

If there is insufficient system strength in the power system, the risks of system instability and supply interruptions to end consumers increase because:

- protection and voltage control systems may not operate correctly, and the power system may be unable to remain stable following specified events, and
- generators may not be able to meet technical standards and remain connected to the power system at certain times.

2.1 System strength requirements

2.1.1 System strength regulatory reform

The system strength framework under the NER has evolved over time as the understanding of how to address the issues created by reducing levels of system strength has developed.

In 2021, the AEMC made significant changes to the regulatory framework for system strength through the *Efficient management of system strength on the power system* rule change.[5] The rule changes included new obligations relating to the supply of, and demand for, system strength and a new way of charging for system strength supplied. The focus of the rule change was to create a more proactive approach to delivering minimum and efficient levels of system strength to support the connection of inverter-based resources, replacing a framework which was assessed as being too slow and reactive.

On the supply side, the rule change introduced obligations on certain Transmission Network Service Providers (**TNSPs**) in each region of the NEM to proactively plan for, and procure, system strength to meet a planning standard specified in Schedule 5.1 of the NER. These TNSPs (Transgrid, Powerlink, ElectraNet, TasNetworks and AEMO in Victoria) are designated in the NER as SSSPs.

Stages of this framework have been iteratively introduced over the past two years and SSSPs are required to meet the new system strength planning standard for the first time in the year commencing 2 December 2025. This will require SSSPs to procure enough system

[4] AEMO, 2023 System Strength Report, December 2023, p. 10.

[5] AEMC, *Efficient management of system strength on the power system* rule change, Rule determination 21 October 2021

strength to meet system requirements, which are based on AEMO forecasts set three years in advance.

Recently the AEMC made further changes to the system strength framework as part of the *Improving security frameworks for the energy transition* rule change. This rule introduces a role for AEMO to schedule system strength (and other security services), along with adjusting the TNSP cost recovery procedures for such services. These changes will commence from 1 December 2024.[6] In particular, the changes to the cost recovery procedures may impact how SSSPs assess the prudency and efficiency of expenditure on system strength.

2.1.2 Obligations to mitigate system strength impact

Under the NER a new or altered connection (typically a generator or large load) must mitigate its system strength impact:[7]

- through self-remediation, for example, by installing a synchronous condenser or grid forming battery or paying for system strength connection works, or
- by paying a system strength charge to a SSSP.

2.1.3 System strength planning standard

Under clause S5.1.14 of the NER, a SSSP must use reasonable endeavours to plan, design, maintain and operate its transmission network, or make system strength services available to AEMO, to meet the following requirements at system strength nodes on its transmission network in each relevant year:

- maintain the minimum three phase fault level specified by AEMO at the system strength nodes – this is referred to as the "**minimum level**", and
- achieve stable voltage waveforms for the level and type of inverter-based resources and market network service facilities projected by AEMO in steady state conditions and following any credible contingency or protected event – this is referred to as the "**efficient level**".

Each year AEMO is required to publish a System Strength Report that includes its ten-year forecast of:

- the required minimum three phase fault level at system strength nodes, and
- the level and type of inverter-based resources associated with each system strength node.

The relevant year for the purposes of the system strength planning standard is the year commencing 2 December three years after AEMO publishes its System Strength Report.

[6] AEMC, Improving security frameworks for the energy transition, Rule determination, 28 March 2024.

[7] Or, in the case of an embedded generator, to the local Distribution Network Service Provider who collects the system strength charge and pays it to the SSSP.

In this guidance note the requirement to meet the system strength planning standard for a relevant year is referred to as the **binding system strength requirement** and the year to which it applies is referred to as the **compliance year**.

2.2 Sources of additional system strength

There are currently three main sources of additional system strength that SSSPs can consider when determining how to meet system strength requirements, each with benefits and drawbacks. In practice, SSSPs are likely to need to procure a portfolio of system strength solutions from multiple sources to meet their binding system strength requirements in an economically efficient manner.

2.2.1 Synchronous generators

SSSPs can contract with synchronous generators to provide system strength at times when they would not otherwise be generating electricity. Because system strength is a localised issue, synchronous generators must be in sufficient proximity to the relevant system strength node to effectively contribute system strength to meet the system strength requirements. This limits the pool of potential providers in any given area. However, contracting with synchronous generators has the benefit of not requiring a significant capital outlay. As such, this option provides flexibility and option value as contracts can be structured in different ways to manage uncertainty about the level of system strength that may be required in operational and planning timeframes.

2.2.2 Synchronous condensers

Synchronous condensers can help maintain stable system voltage by providing or absorbing reactive power. They require considerable capital outlay but have low ongoing operating costs. Therefore, synchronous condensers may be appropriate where system strength requirements are well understood and likely to be needed on an ongoing basis. However, there is a risk of asset underutilisation if lower cost sources of system strength become available and/or the demand for system strength is less than forecast.

There is currently high demand for synchronous condensers to meet system strength requirements globally, resulting in increased costs and lead times for procurement. Our understanding from SSSPs is that they are therefore unlikely to be able to rely on synchronous condensers to meet the first years of binding system strength requirements.

2.2.3 Batteries with grid-forming inverters

Grid-forming inverter technology is a relatively new technology that is continuing to evolve. The ability of batteries with grid-forming inverters to provide system strength is still being proven. However, it is anticipated that, as this technology continues to develop, the option of SSSPs contracting with providers of grid-forming batteries will broaden the pool of potential providers of system strength services beyond synchronous generators. Additionally, new inverter-based resources which opt for grid-forming technology will not 'consume' system strength and therefore avoid the need for additional system strength procurement.[1]

3 Defining the system strength requirements

This section provides guidance on issues that relate to how SSSPs could interpret the system strength requirements and so identify the investments required to meet those requirements. The issues include how SSSPs can use 'reasonable endeavours' to manage:

- the reasonableness of costs to meet their obligations,
- uncertainty of inverter-based resources forecasts within the three-year compliance window,
- uncertainty of system strength requirements beyond the compliance year, and
- cross-border contributions to system strength.

3.1 Satisfying the 'reasonable endeavours' obligation

3.1.1 Problem statement

The NER requires SSSPs to use 'reasonable endeavours' to meet the system strength standard. This gives SSSPs a degree of flexibility in considering what steps are necessary to comply with the obligation.

Given the highly locational aspect of provision of system strength, the relative lack of options for supply, and the typically long lead-times for implementing network solutions, SSSPs may find themselves with only limited options to meet part of their system strength requirements. However, the cost of securing these options may be high. This raises the issue of whether a SSSP has used reasonable endeavours to meet its system strength obligation even if it decides not to adopt any of the available options, and even if a system strength shortfall therefore remains.

3.1.2 Relevant aspects of the framework

The system strength standard is set in NER clause S5.1.14(b):

> *A Transmission Network Service Provider who is a System Strength Service Provider must use **reasonable endeavours** to plan, design, maintain and operate its transmission network, or make system strength services available to AEMO, to meet the following requirements at system strength nodes on its transmission network in each relevant year:*
>
> *(1) maintain the minimum three phase fault level specified by AEMO for the system strength node in the system strength standard specification for the relevant year; and*
>
> *(2) achieve stable voltage waveforms for the level and type of inverter-based resources and market network service facilities projected by AEMO in the system strength standard specifications for the system strength node for the relevant year:*
>
> *(i) in steady state conditions; and*

> *(ii) following any credible contingency event described in clause S5.1.2.1 or any protected event.*

In its draft determination for the *Efficient management of system strength in the NEM* rule change, the AEMC provided the following context to the inclusion of using 'reasonable endeavours' to meet the standard[8]:

The Commission has qualified the standard with the use of the words 'reasonable endeavours' to reflect the consideration that SSS Providers should not undertake activities, at all costs, to meet the standard at all times and in all circumstances. For example, we consider it in the long-term interest of consumers that AEMO might constrain off (or down) some inverter-based resources plant if stable voltage waveform is not able to be achieved through the investments made by a SSS Provider at all times and in all circumstances, rather than have potential over-investment by the SSS Provider. That is, if the costs required to meet the standard would not be what a prudent and reasonable operator would do, it may not be 'reasonable' for the SSS Provider to meet the standard just in time, as opposed to slightly later, for example.

The AEMC also provided context as to the applicability of 'reasonable endeavours' as understood in other uses in Schedule 5.1 of the NER[9]:

> *This is to be distinguished with alternative words like 'best endeavours' and without any qualification if the standard stated that the SSS Provider 'must plan, design, maintain....' Similar approaches are taken in other standards in Schedule 5.1 of the NER, e.g. S5.1.5 for voltage fluctuations.*

3.1.3 Guidance

As noted by the above context from the AEMC, the qualification of 'reasonable endeavours' means that the system strength standard does not need to be met at any cost and in all circumstances. In the context of the system strength framework, the AER considers that an assessment of whether 'reasonable endeavours' has been satisfied can only be made with reference to the total package of steps that the SSSP has taken, or is proposing to take, to meet the standard in time. In this regard, if a SSSP takes a reasonable package of steps, but ultimately fails to meet the standard in time, it may still have used reasonable endeavours to meet the standard.

The quality of the planning process used by a SSSP in making decisions around system strength procurement will be an important consideration for the AER in assessing whether a SSSP has complied with its obligations under the NER. Further, the AER considers that the context set out in section 3.1.2 above leaves it open for a SSSP to consider the financial costs and impact of AEMO using operational measures to address system strength when determining which steps it would be reasonable to take to meet the system strength standard, and when negotiating a potential contract for the provision of system strength.

SSSPs should take a holistic approach in assessing whether a package of steps is reasonable. For example, in forming a view on the reasonableness of costs to meet the

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[8] AEMC, Draft rule determination | Efficient management of system strength, 29 April 2021, p. 74

[9] Ibid

standard, it may be relevant for SSSPs to consider whether the costs would be prudent and efficient expenditure as discussed in the AER's *System Security Network Support Payment Guideline*.[10] However, the SSSP should then also consider the further steps it might take if it decided not to incur those unreasonable costs and what the outcome might be if the shortfall was left unplanned for (e.g. consideration of any possible measures that AEMO and / or the SSSP might take to address shortfalls in the operational timeframe). The AER does not consider that this should only result in a comparison of the directly quantifiable costs of adopting a solution in the planning timeframe with the directly quantifiable costs of AEMO taking operational timeframe measures. For example, it may also be relevant for the SSSP to accept reasonable additional costs in implementing a solution in the planning timeframe in order to avoid the uncertainties and complexities of AEMO addressing a shortfall in the operational timeframe.

The AER does not intend to give advance endorsement that a SSSP's approach is or will be compliant. Any compliance assessment will be made by the AER based on the steps actually taken by the SSSP. It is therefore incumbent on SSSPs to assess for themselves whether the package of steps they propose to take constitutes 'reasonable endeavours' before they are committed to them. This includes SSSPs making a decision on whether the reasonable endeavours requirement necessitates implementing a particular element (e.g. entering into a particular contract for provision of system strength) would be reasonable. However, we encourage SSSPs to engage the AER in transparent, bilateral conversations which may assist SSSPs in considering this issue further.

3.2 Managing uncertainty of inverter-based resources forecasts within a three-year window

3.2.1 Problem statement

Under clause S5.14.1(b) of the NER SSSPs must use reasonable endeavours to plan, design, maintain and operate their transmission networks, or make system strength services available to AEMO, to meet a system strength planning standard set three years in advance of the compliance year.

The system strength planning standard is based on AEMO's forecast of the level and type of inverter-based resources associated with each system strength node that will be connected in that compliance year (the binding system strength requirement). For example, the forecast level and type of inverter-based resources that forms the basis for the binding system strength requirement for the 12 months commencing 2 December 2025 was specified in AEMO's 2022 System Strength Report. Each year AEMO forecasts the level and type of inverter-based resources associated with each system strength node for the following 10 years (including any years to which a binding system strength requirement applies).

Two issues may arise as a result:

- The forecasts for a given compliance year (and later years) in the forecast period can change substantially within the three-year window.

[10] AER, System security network support payment guideline | AER guideline, November 2024

- During the period in which a SSSP is undertaking a RIT-T process, there may be more than one applicable binding system strength requirement (i.e. for successive compliance years) and the requirement for an earlier compliance year may be higher (or lower) than for a later compliance year because of changes to AEMO's forecast.

See Box 1 below for an example.

In addition, a SSSP may have access to information from connection processes that indicates that the forecast of the level and type of inverter-based resources that forms the basis for the binding system strength requirement is unlikely to eventuate. For example, a SSSP may become aware of a significant new generator that is likely to connect within the three-year compliance period and which is not included in AEMO's inverter-based resources forecast.

Also, the forecast inverter-based resources specified in AEMO's system strength report assumes all projects will opt in to the NER system strength charge (see section 2.1.2) unless project proponents:

- have elected to self-remediate through their connection application,
- apply the old framework (if eligible), or
- are part of a Renewable Energy Zone (**REZ**) development project that has committed to self-remediation.

While these actions by connecting generators would not change the inverter-based resources forecast, they would reduce the level of system strength to be procured.

Box 1. Changes to AEMO's forecasts for inverter-based resources

Binding system strength requirements are set annually and must be met three years after the requirement is set. However, RIT-Ts can take 18 months to two years to complete. This means that when a SSSP is conducting a RIT-T process, there may be more than one applicable binding system strength requirement.

For example, as at July 2024, a SSSP will have binding system strength requirements for compliance years 2025 and 2026, set in 2022 and 2023 respectively.

AEMO's 2023 System Strength Report[11] has materially revised the forecast inverter-based resources for the compliance year commencing 2 December 2025, in which the binding system strength requirement was set in December 2022[12].

As an example, the table below shows total utility-scale inverter-based resources projections (in MW) from the 2022 and 2023 System Strength Reports for 2022 and 2023 for two nodes in South Australia: Para and Robertson.[13] The highlighted cells are the relevant compliance years.

South Australia

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Para											
2022 report	387	498	498	562	562	1089	1107	1107	1107	1107	N/A
2023 report	72	72	72	343	538	538	538	538	733	733	733
Robertstown											
2022 report	0	135	954	954	954	1163	1163	1163	1163	1163	N/A
2023 report	209	724	724	1182	1187	1328	1312	1282	1290	1511	1412

In 2022, AEMO projected 498 MW of inverter-based resources at the Para node by the end of the 2025 financial year. This is the forecast inverter-based resources that informs the binding system strength requirement for 2025. In 2023, AEMO updated the projection for 2025 from 498 MW to 72 MW. Based on this projection, significantly less system strength would be required compared to what is reflected in the binding system strength requirement for 2025.

On the other hand, in 2022 AEMO projected 135 MW of inverter-based resources at the Robertstown node by the end of the 2025 financial year. In 2023, AEMO updated the projection to 724 MW for 2025, suggesting significantly more system strength would be required compared to what is reflected in the binding system strength requirement for 2025. However, the AER understands this increase in inverter-based resources does not require additional system strength investment due to an existing surplus of system strength at the node.

If SSSPs cannot take into account how the actual level and type of inverter-based resources connected may differ from that reflected in the binding system strength requirement, SSSPs could over-invest or under-invest in system strength, leading to inefficient outcomes that are not in the long-term interests of consumers.

Under-investment may impact the stable operation of connected inverter-based resources, requiring AEMO to curtail generation until sufficient system strength is available and creating costs for curtailed generators and potentially consumers. Over-investment may result in inefficient costs for consumers.

In its determination on the *Efficient management of system strength on the power system* rule change, the AEMC considered that[14]:

> "*a slight over-procurement of the service to support connecting inverter-based resources is likely to provide greater benefits for consumers than under procurement. This is because due to the particular characteristics of system strength, the market impacts of having a unit less of the required amount of system strength is more significant than the cost of having an extra unit procured earlier than is needed*."

The AEMC also noted that considering the scale of the transformation, the risks of over-procurement are low. However, the market has continued to evolve rapidly and outcomes such as the rapid development of grid-forming technology, and the global constraint on synchronous condenser supply, were not reasonably foreseeable at the time the rule was made.

The 2022 and 2023 System Strength Reports have since demonstrated that there may be material reductions to AEMO's forecast level and type of connected inverter-based resources for a compliance year. For example, as noted in Box 1, the forecast inverter-based resources in the 2022 System Strength Report (on which the binding system strength requirement for the 12 months commencing 2 December 2025 is based) was materially revised down in the 2023 System Strength Report. In addition, technology that may reduce system strength demand from inverter-based resources (e.g. grid forming inverters) is rapidly evolving. In this context, not considering subsequent adjustments to the forecast that formed the basis for the binding system strength requirement based on updated information might lead to a significant, rather than slight, over procurement of system strength for a compliance year.

The negative impacts of such an approach to consumers may be exacerbated where investment to meet the need is in capex solutions. For example, over-investment in synchronous condensers to meet a standard for inverter-based resources that is unlikely to materialise may result in consumers bearing higher than efficient costs if:

- capital assets are no longer required to meet system strength requirements in a particular area and cannot be repurposed (e.g. if future inverter-based resources connections have low system strength demand due to evolving grid forming inverter technology), or;
- use of synchronous condensers crowds out non-network solutions (such as contracting with an existing generator or grid-forming battery) that could have enabled the stable

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[11] AEMO, 2023 System Strength Report, December 2023 https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/system-strength-requirements/2023-system-strength-report.pdf

[12] AEMO, 2022 System Strength Report, December 2022 https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/system-strength-requirements/2022-system-strength-report.pdf

[13] AEMO, 2022 System Strength Report, December 2022, p. 49 and AEMO, 2023 System Strength Report, December 2023, pp. 38-39.

[14] AEMC, Efficient management of system strength on the power system, Rule determination, 21 October 2021, p. vii

operation of the actual level and type of inverter-based resources connected at lower cost or with higher efficiencies e.g. due to value stacking.

3.2.2 Relevant aspects of the framework

The obligation on SSSPs under clause S5.1.14(b) of the NER is an obligation to use *reasonable endeavours* to plan, design, maintain and operate its transmission network, or make system strength services available to AEMO, to meet the standard.

The planning standard under clause S5.1.14(b) of the NER is directed at a desired outcome, being the achievement (under specified conditions) of stable voltage waveforms for the level and type of inverter-based resources forecast by AEMO in the System Strength Report made three years before relevant compliance year.

In other words, a SSSP's obligation under clause S5.1.14(b) is an obligation to take steps that a reasonable person in the circumstances would take to plan, design, maintain and operate its transmission network, or make system strength services available to AEMO. These steps are taken to enable the level and type of inverter-based resources forecast by AEMO that will be connected in the relevant compliance year to operate stably under specified conditions.

AEMO's 2022 and 2023 System Strength Reports include a forecast of the level and type of inverter-based resources associated with each system strength node. However, AEMO has stated in both the 2022 Report and 2023 Report that it supports SSSPs, when preparing system strength services, adjusting those forecasts using up-to-date information:

> *The near-term years of the forecast may require adjustment by the SSSP when preparing system strength services, as more information becomes available about newly-committed inverter-based resources and MNSF.*[15]

> *AEMO is supportive of SSSPs considering the latest available information and announcements to adjust these values for use in their system strength RIT-Ts between publications of the System Strength Report.*[16]

3.2.3 Guidance

A SSSP's starting point for considering the steps it should take to meet the standard in clause S5.1.14(b) of the NER should be the level and type of inverter-based resources that AEMO forecasts (as part of determining the binding system strength requirement) will be connected in the compliance year. However, in considering what package of steps is reasonably required to meet the standard in the compliance year, one matter the SSSP could consider is the degree of certainty that the type and level of inverter-based resources reflected in the standard will materialise. This should take into account the best information available to the SSSP. In taking this matter into consideration, the SSSP should complete a holistic assessment using AEMO's forecast as a starting point.

[15] AEMO, 2022 System Strength Report, December 2022, p. 28

[16] AEMO, 2023 System Strength Report, December 2023, p. 27

In undertaking a holistic assessment, the types of information the SSSP may consider includes:

- AEMO's updated forecasts of the level and type of inverter-based resources that will connect for relevant compliance years.
- Information from the SSSP's current connection processes and joint planning with distribution network service providers about:
  - when inverter-based resources projects are likely to connect,
  - the types of technology likely to be utilised by the inverter-based resources that is forecast to connect, e.g. the likelihood that standalone batteries or integrated resource systems that include batteries will install grid forming inverters that reduce system strength demand, and
  - intentions of connecting inverter-based resources to self-remediate their system strength impact rather than opting into the system strength charge.
- Information from REZ planning entities on centralised remediation of system strength demand from inverter-based resources connecting in REZs (see further discussion on this in section 3.4.3.1.).

If the SSSP considers that there is material uncertainty that AEMO's forecast level and type of inverter-based resources for a relevant compliance year will materialise (whether this increases or decreases the forecast of the amount of system strength needed), the SSSP should document:

- what information it has considered in addition to AEMO's forecast for the relevant compliance year(s),
- its reasons for considering there is material uncertainty that AEMO's forecast level and type of inverter-based resources for a relevant compliance year will materialise,
- how it has taken this uncertainty into account in developing its proposed steps to meet the standard under clause S5.1.14(b) of the NER,
- the likelihood that the steps proposed will meet the standard, and
- if relevant, how it has maintained option value though a package of steps that provide flexibility to manage uncertainty at efficient cost, for example:
  - inclusion of system strength services at low fixed cost, higher variable cost, which can be activated if required to meet the standard, or acquiring an option to procure a synchronous condenser or a slot in a production queue that can be exercised if required.

3.3 Managing uncertainty of system strength requirements beyond the compliance year

3.3.1 Problem statement

As described in section 2.1, under clause S5.14.1 of the NER SSSPs must use reasonable endeavours to plan, design, maintain and operate their transmission networks, or make system strength services available to AEMO, to meet a system strength planning standard set three years in advance of the compliance year (binding system strength requirement).

Each year AEMO forecasts minimum fault level requirements and the level and type of inverter-based resources associated with each system strength node for the following 10 years (including any years to which a binding system strength requirement applies).

While there are a number of different options for providing system strength (as discussed in section 2.2), these options are deliverable in different timeframes. For instance, SSSPs have indicated that synchronous condensers may not be able to be put in place within the three-year compliance period due to high worldwide demand. Additionally, AEMO indicate that grid-forming technology still needs time to demonstrate that it can satisfy protection-quality requirements before it can be deployed to meet the minimum level of system strength.[17]

If SSSPs cannot consider the forecast system strength requirements beyond the relevant compliance year, they may not be able to identify the most efficient solution to meet system strength requirements in the medium to longer term.

A related issue is what SSSPs can assume about whether the forecast of the level and type of inverter-based resources that underpins a binding system strength requirement for a relevant compliance year will be connected and continue to demand system strength into the future. If SSSPs cannot make assumptions about system strength demand in the future, they may not be able to invest in the most efficient solution to meet system strength requirements in the medium to long term. However, it is possible that some inverter-based resources may choose to self-remediate in the future to avoid the system strength charge e.g. by installing a grid-forming inverter. Such a decision could be made on the basis that the cost of installing a grid-forming inverter and re-negotiating their generator technical performance standards is, at some point in the future, less than the system strength charge payable to the SSSP. As such, it is possible that system strength demand could reduce in the future.

3.3.2 Relevant aspects of the framework

The aspects of the framework described in section 3.1.2 are also relevant to this issue.

In its final determination for the *Efficient management of system strength on the power system* rule change, the AEMC expected that SSSPs would plan to meet the system strength standard over 10 years and that this information would be in the SSSP's Transmission Annual Planning Report.[18]

In the final determination for the *Improving security frameworks* rule change, the AEMC did not accept a proposal from Transgrid and the ENA to change the three-year compliance period to six years to allow SSSPs to credibly consider the full range of network and non-network solutions. The AEMC did not consider the proposal would "be in the best long-term interests of consumers as it would:

- severely affect the current implementation date of 2 December 2025 of the system strength framework, and

[17] AEMO, Electricity Statement of Opportunities, August 2024, p. 107

[18] AEMC, *Efficient management of system strength on the power system*, Final Determination, p 108.

- likely result in materially increased forecasting uncertainty, thereby compromising economic efficiency."[19]

3.3.3 Guidance

It may be in the best long-term interests of consumers for a SSSP to procure long-term solutions for system strength, where these solutions are part of the credible option that maximises the present value of net economic benefit. While SSSPs have an obligation under Schedule 5.1 of the NER to procure system strength to meet the standard in each compliance year, procurement for periods beyond any compliance years would be required to deliver net economic benefits.

In RIT-Ts related to system strength requirements, SSSPs should document what assumptions they have made regarding system strength demand for the relevant compliance year(s) and future years in defining the identified need and the basis for those assumptions. If changes to those assumptions could have a material impact on the identified need (and therefore the credible options to meet the identified need) SSSPs should conduct sensitivity analysis. For example, sensitivity analysis could be undertaken where assumptions have been made regarding the timing of synchronous generator retirement, the technology mix and likelihood of self-remediation beyond the three-year compliance period.

SSSPs may consider option value in developing their credible options to retain flexibility to meet system strength requirements beyond the three-year window at efficient cost. If option value is considered, SSSPs should document:

- how they have considered that option value in developing and assessing credible options,
- the extent to which the option value is dependent on assumptions regarding system strength requirements beyond the three-year window, and
- how they have assessed likely technology changes and the risks of locking in, or not locking in, capex solutions to meet system strength requirements.

The AER notes that this approach may not be available in all circumstances, such as where all available sources of system strength must be procured in order to meet the binding system strength requirement.

Finally, the AER acknowledges that there is a level of complexity involved in assessing procurement over multiple years. Such procurement may incorporate a number of existing compliance years as well as years where the system strength standard has not yet been set (i.e. more than three years beyond the current year, where AEMO has not yet released the relevant System Strength Report).

[19] AEMC, Improving security frameworks, Final Determination, p 38

Box 2. Using option value to preserve flexibility

Given long lead times for synchronous condensers, SSSP could procure an option to purchase, and procure a quantity of system strength from synchronous generators and/or grid-forming batteries until such time as that system strength can be provided by synchronous condensers. This approach would provide the SSSP with flexibility to delay a decision on purchasing a synchronous condenser and so make a significant capital outlay until better information is available on future system strength requirements.

3.4 Cross-border contributions to system strength

3.4.1 Problem statement

System strength is largely a locational issue, meaning that local solutions are typically required to address system strength requirements. However, activities in one region to meet the system strength standard requirements at system strength nodes electrically close to a jurisdictional border could potentially contribute to system strength requirements at system strength nodes in a neighbouring region.

Without coordination between neighbouring SSSPs, two risks could arise. First, SSSPs may each individually meet their own system strength standard specification at each system strength node. This could lead to over-procurement, resulting in higher costs to consumers than is efficient. Second, SSSPs may rely on system strength being provided in another jurisdiction. This could result in under-procurement, potentially resulting in system strength requirements not being met (with consequent impacts on the power system impacting consumers and generators) and SSSPs not meeting their obligations under clause S5.1.14 of the NER.

Complicating this issue, SSSPs have commenced their first system strength RIT-Ts[20] at different times. This may make it more difficult to take a coordinated approach to system strength as SSSPs are defining the identified need and identifying credible options at different times.

Similarly, REZ planning entities may procure system strength from parties other than the SSSP to support inverter-based resources forecast to connect in the REZ, which contribute system strength to the broader network to the extent that it is not fully utilised by connections within the REZ. Taking these contributions into account will reduce the need for a SSSP to procure system strength services, reducing costs for consumers. However, the potential availability of system strength contributions from the REZ would need to be coordinated with the REZ entity so that system strength requirements can be met.

3.4.2 Relevant aspects of the framework

The system strength framework places an obligation on SSSPs to consult with neighbouring TNSPs on their system strength activities as part of the Transmission Annual Planning Report (**TAPR**) process. NER clause 5.20C.3(f) requires SSSPs to publish a range of

[20] RIT-Ts to meet the binding system strength requirements for the first compliance years under the framework introduced in the *Efficient management of system strength on the power system* rule change.

information in their TAPRs about the system strength nodes for which they are the SSSP. NER clause 5.20C.3(f1) then requires the SSSP to consult with other NSPs that are connected to their transmission network when preparing that information.

The information SSSPs must provide in their TAPRs about system strength nodes includes:

- the activities undertaken or planned to satisfy its obligations under clause S5.1.14 in relation to each system strength node (i.e. its system strength obligations),
- modelling methodologies, assumptions and results used by the SSSP in planning those activities, and
- the SSSP's forecast of the available fault level at each system strength node over the period for which AEMO has determined system strength requirements.

This provides an opportunity for SSSPs to take a joint approach where cross-border contributions to system strength may arise.

Currently there are no joint planning obligations between REZ entities and SSSPs. However, this is primarily an issue in NSW, where the REZ planning entity (EnergyCo) is different from the SSSP for NSW (Transgrid). The NSW framework is still evolving and it is possible that new joint planning obligations on EnergyCo and Transgrid as the SSSP for NSW could be considered in the future.[21]

AEMO recognises that there may be efficiencies from working collaboratively across jurisdictions and with REZ planning entities, and its system strength report encourages SSSPs to work together to identify investment efficiencies.[22]

3.4.3 Guidance

As noted above, SSSPs are required to consult with neighbouring TNSPs in preparing information about system strength nodes in their TAPR. The outcomes of this consultation with neighbouring TNSPs should be reflected in the identified need in a SSSP's system strength RIT-T to the extent reasonably practicable. An explanation of how this has been done should be included in the RIT-T documentation.

In defining the identified need for system strength for the purposes of the RIT-T the SSSP should consider the best available information on relevant investments or activities expected to be undertaken by neighbouring TNSPs and assess the degree of certainty that the investment will materialise. In making this assessment SSSPs should consider the expected date, and other possible dates, for the commissioning of the relevant investment and the likelihood that the expected investment will be commissioned by the relevant compliance year. The SSSP should document how it has made the assessment.

[21] The NSW Government has indicated its intention to "commission an expert review of current Transmission Planning arrangements in NSW to reduce duplication and advise on the best approach to ensuring coordination between the Roadmap bodies (EnergyCo, TransGrid, AEMO, AEMO Services)". See NSW Office of Energy and Climate Change, *Electricity Supply and Reliability Check Up: NSW Government response*, September 2023, p. 12.

[22] See, for example, AEMO, 2023 System Strength Report, December 2023, p. 16.

Finally, the NER sets out the minimum requirements for SSSPs in respect of system strength and consultation requirements as part of the RIT-T. It is also open to SSSPs to cooperate and consult with each other if they choose to, as recommended by AEMO. The AER supports this approach and encourage SSSPs to document the outcomes of any such discussions and how they have been taken into account in their plan to meet binding system strength requirements.

3.4.3.1 Renewable Energy Zones

To the extent any joint planning obligations emerge in the future or such joint planning is happening in practice, SSSPs should describe the process and outcomes of any joint approach to system strength between the SSSP and the relevant REZ planning entity.

It is reasonable for the SSSP to consider the best available information on relevant investments or activities expected to be undertaken in a REZ and assess the degree of certainty that the investment will materialise. In making this assessment SSSPs should consider the expected date, and other possible dates, for the commissioning of the relevant investment. The SSSP should document how it has made the assessment.

For example, an entity may be considered to be highly likely to commit to an option where it has undertaken significant planning towards that option and there is no, or very limited, reasons to believe that the choice of option will change at the end of the decision-making process. Therefore, where it is highly likely that a REZ planning entity will make firm commitments to procure a system strength solution, a SSSP should take that into account in defining the identified need or provide an explanation as to why it has not been accounted for in the RIT-T documentation.

4 Applying the RIT-T for system strength

This section provides guidance on issues that relate to how SSSPs could apply the RIT-T when assessing credible options for meeting the system strength requirement. The issues include how SSSPs could:

- consider costs associated with a credible option where the economic cost is expected to be significantly lower than the ultimate contract price,
- account for generator bidding behaviour,
- define the base case scenario,
- conduct modelling, noting that it may be impossible to run every sensitivity or combination of options,
- treat anticipated projects, and
- take into account Integrated System Plan (**ISP**) scenarios.

4.1 Consideration of costs in the RIT-T

4.1.1 Problem statement

The RIT-T requires SSSPs to compare the cost of credible options for meeting the system strength requirements against their market benefits to determine the preferred option that maximises net economic benefits or, in the case of a reliability corrective action, minimises net economic costs. SSSPs can undertake a reliability corrective action RIT-T for where the identified need is to meet binding system strength requirements, and therefore the credible options to meet that identified need may have a net economic cost.[23]

The NER specifies the classes of costs that are required to be quantified and permits other classes of costs to be specified in the RIT-T developed and published by the AER. The costs to be included are:[24]

- Costs incurred in constructing or providing the credible option.
- Operating and maintenance costs over the credible option's operating life.
- Costs of complying with relevant laws, regulations and administrative requirements.
- Any other classes of costs that are:
  - Determined to be relevant by the RIT-T proponent and agreed to in writing by the AER.
  - Specified as a class of cost in the RIT-T.

The RIT-T does not currently specify any additional classes of cost.

[23] The requirement to meet the system strength standard specification is set out in Schedule 5.1 of the NER. The definition of “reliability corrective action” in NER clause 5.10.2 includes investment by a TNSP in its transmission network for the purpose of meeting the service standards linked to the technical requirements of Schedule 5.1.

[24] NER clause 5.15A.2(b)(8).

SSSPs are not able to use actual prices for the purposes of assessing net economic benefit. The RIT-T application guidelines state that "funds that move between Participants count as a wealth transfer and should not affect the calculation of the final net economic benefit under the RIT-T".[25]

However, the actual price paid for a preferred option may introduce significant inefficiency if it is not cost reflective, but this outcome will not become known until after the RIT-T has been completed.

The outturn contract price for system strength services could diverge from the economic cost estimated at the time the RIT-T is undertaken for two reasons.

First, non-network proponents may offer prices above the economic costs estimated for the purposes of the RIT-T analysis to compensate for unanticipated risk allocations under contracts. For example, these risks could include contractual penalties for non-performance. If the potential penalties are not well understood in advance, proponents are not able to effectively hedge against those risks or efficiently reflect those expected prices in their response to the EOI. This can increase the discrepancy between the eventual contract price and the cost estimated at the time the RIT-T is undertaken.

Second, credible options with sunk assets can have low economic costs, but the market for system strength services may not be sufficiently competitive for prices to reflect economic cost. As noted in section 2.2, system strength can be provided by a limited pool of synchronous generators and potentially grid-forming batteries in sufficient proximity to the system strength node. However, the ability of batteries to provide system strength is still being tested. As such, there is a risk that the pool of providers of system strength services is too small to elicit competitive offers and so the outturn contract prices may be higher than the economic cost.

It is possible that the economic cost estimated at the time of the RIT-T and the final contract price are sufficiently different that the preferred option identified in the Project Assessment Conclusions Report (**PACR**) is no longer the option that would be the most beneficial for consumers. This could lead to:

- a dispute being raised by an interested party in respect of the SSSP's application of the RIT-T, resulting in delays and the potential need for the RIT-T to be re-applied in part or in whole, and/or
- consumers paying more than necessary for system strength.

4.1.2 Relevant aspects of the framework

In the RIT-T application guidelines[26], the AER considers that an option is commercially feasible under NER clause 5.15.2(a)(2) if a reasonable and objective operator, acting

[25] AER, RIT-T Application Guidelines, October 2023, p. 60. "Participants" in this context is defined as "a Registered Participant under the NER or any other party in their capacity as a consumer, producer or transporter of electricity in the market".

[26] AER, Regulatory investment test for transmission | application guidelines, November 2024, p. 17

rationally and in accordance with the requirements of the RIT-T, would be prepared to develop or provide the option in isolation of any substitute options.

NER clause 5.16.2(c)(9) requires the RIT-T application guidelines to provide guidance on when a person is sufficiently committed to a credible option for reliability corrective action to be characterised as a proponent.

The RIT-T application guideline states[27]:

> *We consider a person can be characterised as a proponent of an option where they have identified themselves to the RIT-T proponent in writing that they are a proponent of an option and have reasonably demonstrated a willingness and potential ability to devote or procure the required human and financial resources to:*
>
> - *refine and develop the technical specifications of the option if the RIT-T proponent agrees to consider the option as a credible option under the RIT-T application*
> - *develop the option if it is identified as the preferred option under the RIT-T. This requires, for example, that the person has expressed a willingness to accept a reasonable network support agreement to develop the credible option for a price no higher than what reasonably reflects the costs of the credible option applied in the relevant RIT-T assessment.*

Other relevant aspects of the framework are described above as part of the problem statement.

4.1.3 Guidance

The economic cost of a credible option must be used for the purposes of the RIT-T to preserve the integrity of the analysis. However, we consider there are steps that SSSPs may be able to take to help manage the risk that the preferred option identified in the PACR is no longer the lowest cost option.

In relation to unclear contract terms, we expect SSSPs to manage the potential for contract prices to increase above economic cost to compensate for unanticipated risk allocations under contracts. SSSPs should be transparent about the expected contract terms with non-network proponents, allowing them to incorporate this information in any cost estimates provided to inform the RIT-T process. This includes, for example, setting out expected penalties for non-performance and risk allocation. Similarly, SSSPs should be transparent about the assumptions they make about the costs to non-network providers of managing contract risks in estimating the economic cost of non-network options.

Additionally, economic costs may be informed by proponents of non-network options in response to a SSSP's project specification consultation report and/or the project assessment draft report. The SSSP may also issue a request for Expressions of Interest (**EOI**) to test the feasibility of credible options.

The ability for SSSPs to manage a divergence between economic cost and contract price is more limited where there is limited competition in the provision of non-network system

[27] *Ibid*, p. 19

strength services. One option open to SSSPs is to run a tender for services in parallel with undertaking their RIT-T.

Finally, SSSPs should give consideration as to the inclusion of a RIT re-opening trigger in the RIT-T. This could be based on the divergence between the economic cost of a solution and the final price of implementing that option or material change in position by the proponent of the credible option. For example, if after reasonable negotiations the non-network proponent has not expressed a willingness to accept a contract which reasonably reflects the costs of the credible option, this may represent a material change in circumstances.

Otherwise, the reasonableness of implementing the preferred solution may need to be considered post RIT-T completion, as per section 3.1.

4.2 Assumptions about generator operation

4.2.1 Problem statement

As noted in section 2.2, synchronous generators are expected to be an important source of system strength. Synchronous generators can provide system strength in two ways:

- as a byproduct of generating energy in the normal course of operating in the energy market (essentially providing system strength for free), or
- via a contract with a SSSP to provide additional system strength above the level that would be expected in the normal course of operation.

Some SSSPs are concerned that some synchronous generators with system strength contracts may be able to change their bidding behaviour to create a gap in system strength, requiring additional system strength to be scheduled in real time. As such, in modelling system strength requirements, it is not clear what assumptions should be made about how much system strength must be procured via contracts versus how much system strength will be provided in the normal course of operation.

4.2.2 Relevant aspects of the framework

Consistent with the use of economic cost discussed above, the RIT-T requires a RIT-T proponent to apply competitive short-run marginal cost bidding for the purpose of assessing market benefits. However, it also provides for 'realistic' bidding approaches to be used as a reasonable scenario where generators and other market participants may have a degree of market power relative to the base case.[28]

When assessing the quantity of system strength to be procured, the AEMC provides the following context in the *Efficient management of system strength* draft determination[29]:

> *The proposed standard would result in SSS Providers procuring the whole amount of system strength required to meet the requirements of the standard. That is, a SSS Provider must coordinate the procurement of a portfolio of solutions to satisfy the standard, and it cannot rely on any system strength services that may be*

[28] AER, RIT-T Application Guidelines, October 2023, p. 96.

[29] AEMC. Efficient management of system strength – Draft rule determination, April 2021, p. 74

coincidentally provided by generators as a result of them being dispatched in the energy markets in the operational timeframe.

4.2.3 Guidance

When assessing the quantity of system strength which must be procured SSSPs should not assume that a quantity of system strength will be provided for free as a byproduct of being dispatched in the energy market in the operational timeframe.

It would be reasonable for SSSPs to assume competitive bidding for the purposes of assessing the costs of procuring system strength at different periods of time. If more realistic bidding approaches could have a material impact on the amount of system strength that the SSSP must procure to meet the system strength requirements, SSSPs should conduct a sensitivity analysis.

In addition, we note that the AER's wholesale market monitoring and reporting functions have recently been enhanced.[30] Greater access to information will support our analysis of whether outcomes in wholesale markets reflect effective competition, and whether wholesale markets are operating efficiently.

4.3 Defining the base case

4.3.1 Problem statement

Defining the base case for the purposes of comparing credible options against a "do nothing" scenario is challenging for system strength. Since system strength requirements must be met (i.e. it is a reliability corrective action), a "do nothing" scenario may not be relevant if it would result in the standard not being met.

Currently, it is possible that minimum system strength levels to maintain power system security could be maintained through AEMO issuing directions for synchronous generators to run and/or constraining off inverter-based resources.[31] However, this may not be possible in all jurisdictions depending on the mix of generation available. Further, as synchronous generators retire, in the future there may not be sufficient sources of system strength for AEMO to direct on to maintain system stability. This impact may be mitigated through the proposed Orderly Exit Management Framework whereby a retiring generator can be kept in the market if its early retirement would lead to a reliability or security gap.[32]

4.3.2 Relevant aspects of the framework

As noted in section 2.1.3, the requirement to meet the system strength standard specification is set out in clause S5.1.14 of the NER. Meeting the system strength requirement is therefore

[30] The National Energy Laws Amendment (Wholesale Market Monitoring) Bill 2023 (Amendment Bill) was proclaimed on 8 May 2024.

[31] Noting that this would not constitute meeting the NER S5.1.14 standard

[32] In November 2023, Energy Ministers agreed to an opt-in Orderly Exit Management (OEM) Framework. The Draft Exposure Bill and Rule have been consulted on and the Bill is expected to be considered by the South Australian Parliament by the end of 2024. See https://www.energy.gov.au/energy-and-climate-change-ministerial-council/working-groups/system-planning-working-group/orderly-exit-management-framework-draft-exposure-bill-and-rule-june-2024.

a reliability corrective action, meaning that where the identified need is to meet a binding system strength requirement a preferred option may have a negative net economic benefit.

NER clause 5.15A.2(b)(1) requires that credible options be compared to a situation where no option is implemented. This requirement applies irrespective of whether the RIT-T is being undertaken for a reliability corrective action or where an investment is expected to have a net market benefit.

The RIT-T Application Guidelines expand on this requirement, stating:[33]

> *Where the identified need for a credible option is to meet any of the service standards linked to the technical requirements of schedule 5.1 or in applicable regulatory instruments, the base case may reflect a state of the world in which those service standards are violated. However, this does not alter the need to use a state of the world in which no credible options are incorporated to provide a consistent point of comparison across all credible options for meeting those mandatory requirements. This is consistent with the requirement in NER clause 5.15A.2(b)(1) that the RIT–T be based on a cost benefit analysis that includes an assessment of a situation in which no option is implemented*.

4.3.3 Guidance

Both the NER and the RIT-T Application Guidelines clarify that SSSPs must develop a base case in which no credible options are implemented, even where this implies that the standard would be violated. The base case must then be used to compare the credible options.

However, in practice, the way in which the base case is defined will not change the outcome of the RIT-T. SSSPs are required to use their reasonable endeavours to meet the binding system strength requirement. As such, the “do nothing” or business as usual approach is not an option that would allow a SSSP to comply with its regulatory obligations. Further, the definition of the base case will not impact the ranking of the credible options.

For this reason, the AER considers SSSPs have some flexibility in how they define the base case, provided an internally consistent approach is used. For example, SSSPs could define the base case with reference to the actions that AEMO would be obliged to take to maintain system strength, such as directions to synchronous generators, or constraining inverter-based resources off. Where these actions are not possible (e.g. due to a lack of synchronous generation in the system), minimum system strength levels may not be maintained in the base case scenario.

4.4 Modelling complexity

4.4.1 Issue

As noted in section 2.2, it is possible that SSSPs will require a portfolio of sources of system strength to meet system strength requirements. This means there are numerous combinations of options, involving different proportions of contributions from different

[33] AER, RIT-T Application Guidelines, October 2023, p. 24.

sources. The quantum of potential solutions means that it will be impossible to run every sensitivity or combination of options that may be desired within the RIT-T market modelling.

4.4.2 Relevant aspects of the framework

NER 5.15A.2(b)(2) requires RIT-T proponents to apply the RIT-T to a level of analysis that is proportionate to the scale and likely impact of each credible option.

Section 3.8 of the RIT-T Application Guidelines provides some guidance on reasonable scenarios and sensitivities and conducting modelling that is proportionate to the scale of the RIT-T.

4.4.3 Guidance

The NER does not require the analysis in the RIT-T to be exhaustive, but rather proportionate to the identified need and credible options. SSSPs should transparently explain any approach taken and how it is proportionate to the scale of the identified need.

For example, it would be open to SSSPs to group together variations to a portfolio of solutions as one credible option where the costs and benefits of those variations are sufficiently similar. Similarly, SSSPs could develop a set of assumptions that assist in narrowing down the number of potential options, provided the assumptions are clearly stated and tested via sensitivity analysis, to the extent that it is proportionate to the scale and likely impact of each credible option, to demonstrate the reasonableness of the assumptions.

4.5 Treatment of anticipated projects

4.5.1 Problem statement

A RIT-T analysis must capture the future evolution of and investment in generation, network and load. A project may be captured in all states of the world, or only relevant states of the world, depending on whether a project is committed, an actionable ISP project, anticipated or modelled.

If a project is captured in the base case then the costs associated with its initial capital outlay are treated as sunk for the purposes of assessing the cost of credible options. Only the incremental costs that are required for the project to deliver the service required are included in the credible option.

Where a project is not included in the base case, the full capital costs of the investment must be assessed if it is included in a credible option, even where some of those costs will be recovered from other revenue streams and so the expected price may be lower than the economic cost reflected in the RIT-T. This means that sources of system strength from projects already included in the base case will be lower cost in the RIT-T assessment, even where anticipated or modelled projects may be able to deliver services at a lower cost in practice.

4.5.2 Relevant elements of the framework

The RIT-T sets out how committed, actionable ISP, anticipated and modelled projects are defined.[34] Five criteria must be met for a project to be committed. An anticipated project is one that is in the process of meeting at least three of those criteria.

The RIT-T also specifies how committed, actionable ISP, anticipated and modelled projects must be treated in determining which states of the world they should be included in.[35] For anticipated projects[36]:

> "*The RIT–T proponent must use the ISP and, where absent from the ISP, its reasonable judgement to include anticipated projects in all relevant states of the world*."

4.5.3 Guidance

As stated in the RIT-T, SSSPs should include anticipated projects in the base case where they are captured in the ISP scenarios.

Where an anticipated project that is a generation or battery project is not in the ISP scenarios, it would be reasonable to include it in the base case, for example, if it is classified as an anticipated project on AEMO's generation information page.[37] This might occur, for example, if a project becomes classified as anticipated in the intervening years between ISPs being published. It is also open for a SSSPs to take into account the best information available to them in determining the anticipated status of a project.

If a project is not a generation or battery project, the SSSP should use its reasonable judgement to determine whether an anticipated project should be included in the base case. The SSSP should explain in its RIT-T documentation how it has exercised its reasonable judgement and the rationale for including (or not including) the project in the base case.

4.6 ISP scenarios

4.6.1 Issue

SSSPs are required to consider relevant ISP scenarios in developing reasonable scenarios as part of their RIT-T assessment. AEMO's forecasts of the level and type of inverter-based resources that forms the basis of the binding system strength requirements for the efficient level of system strength is based on the most likely scenario published in the ISP, which for the draft 2024 ISP is the "Step Change" scenario. However, SSSPs have indicated they are uncertain as to whether they should consider the other ISP scenarios (e.g. Progressive Change and Green Energy Export) in their modelling and, if so, whether the level and type of inverter-based resources forming the basis for the system strength should change in response to the inverter-based resources built into those alternative scenarios.

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[34] AER, Regulatory Investment Test for Transmission, glossary.

[35] AER, Regulatory Investment Test for Transmission, paras 25-28.

[36] AER, Regulatory Investment Test for Transmission, para 27.

[37] See https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information

4.6.2 Relevant aspects of the framework

For RIT-T projects that are not actionable ISP projects, SSSPs are required to include any of the ISP scenarios from the most recent inputs, assumptions and scenarios report that are relevant, unless it provides demonstrable reasons for why adding, omitting or varying a relevant ISP scenario is necessary.[38] If a SSSP decides to vary, omit or add a scenario, the variation must be consistent with the requirements for reasonable scenarios set out in the RIT-T. The RIT-T also caters for circumstances where no ISP scenarios are relevant.

The RIT-T Application Guidelines provide further guidance on circumstances where no ISP scenario may be relevant and factors that SSSPs should consider in determining the appropriate number and choice of reasonable scenarios.

4.6.3 Guidance

The efficient level of system strength is typically based on the most likely scenario published in AEMO's most recent ISP.[39] For the 2023 System Strength Report, this was the draft 2024 ISP "Step Change" scenario.

The RIT-T requirement is to include *relevant* ISP scenarios in the RIT-T assessment. In the case of system strength, the AER considers "relevant" to mean the scenarios used by AEMO to project the forecast and type of inverter-based resources in the binding system strength requirement. As such, it would be reasonable for SSSPs to conduct scenarios for the binding system strength requirement established in the most likely scenario presented in the relevant ISP.

[38] AER, Regulatory Investment Test for Transmission, para 20(b). https://www.aer.gov.au/system/files/AER%20-%20Regulatory%20investment%20test%20for%20transmission%20-%2025%20August%202020.pdf

[39] AEMO, 2023 System Strength Report, p. 11.

5 Other issues

5.1 Planning for inertia requirements

5.1.1 Problem statement

System strength can often contribute to the provision of inertia, and vice versa. For example, with the addition of a relatively low-cost flywheel, a synchronous condenser can provide inertia as well as system strength.[40] Therefore there are efficiencies from considering the procurement of system strength and inertia together.

It is challenging to coordinate the procurement of system strength and inertia under the current regulatory framework as the planning frameworks are not aligned. This has been recognised as an issue, and the AEMC has now made a rule aligning the two frameworks[41]. However, the first compliance year for inertia is not until 1 December 2027. Until then, co-optimising system strength and inertia is difficult.

5.1.2 Relevant elements of the framework

Once the RIT-T has been finalised and the PACR published, the SSSP must submit a contingent project application (**CPA**) to the AER for an amendment to its revenue determination to enable the costs of the preferred option to be recovered.

Upon commencement of the new inertia framework in December 2027, SSSPs will be required to plan for and procure inertia in the same timeframes as system strength and will therefore be able to coordinate procurement where a common source may provide both services.

5.1.3 Guidance

If a synchronous condenser is identified as the preferred option (or part of a portfolio of solutions that together form the preferred option) to meet the system strength requirements, it is open to the SSSP to include the additional costs of including a flywheel in its CPA. The SSSP would need to justify the addition of the flywheel in its CPA or accompanying material.

The AER must consider whether the amount of forecast capex and incremental opex associated with the addition of the flywheel reasonably reflect the capex criteria and opex criteria, taking into account the capital expenditure factors and the operating expenditure factors respectively, in the context of the contingent project.[42] However, given the marginal cost of addressing inertia is typically relatively low[43],theAER'sexpectationisthatincludinga flywheel where a synchronous condenser has been found to be the preferred option (or part

[40] AEMO states in its 2023 System Strength Report that "the incremental costs of adding a typical 1,000 megawatt seconds (MWs) flywheel to an synchronous condenser are in the order of approximately 3% if the decision is made up front. Retrofitting a flywheel is understood to be substantially more expensive." See p. 5.

[41] AEMC, National Electricity Amendment (Improving security frameworks for the energy transition) Rule 2024

[42] NER clause 6A.8.2(f)(2).

[43] ElectraNet, Addressing the system strength gap in SA, Economic Evaluation Report, 18 February 2019, p. 29

of a portfolio of solutions that together form the preferred option) would be considered to be prudent and efficient expenditure.

6 Abbreviations & Glossary

Term	Definition
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CPA	Contingent Project Application
ISP	Integrated System Plan
NEO	National Electricity Objective
NER	National Electricity Rules
PACR	Project Assessment Conclusions Report
REZ	Renewable Energy Zone
RIT-T	Regulatory Investment Test for Transmission
SSSP	System Strength Service Provider
TAPR	Transmission Annual Planning Report
TNSP	Transmission Network Service Provider

Appendix A – Example decision tree