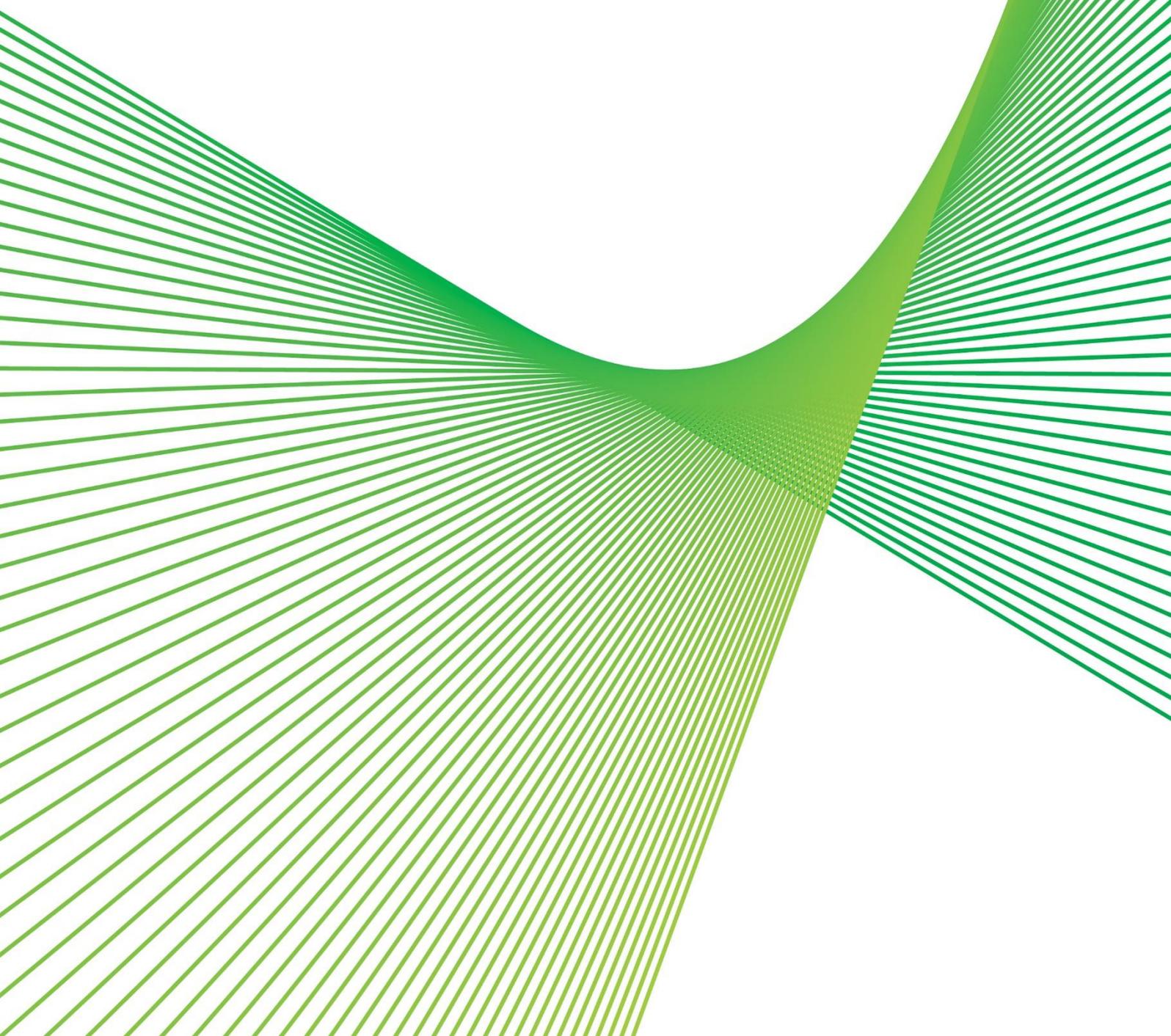


Expression of Interest

Non-network solutions to meet system strength requirements in NSW

Date of issue: 16 December 2022



1. Executive summary

1.1. Context

As thermal generators retire or change their operating patterns, the power system will lose system strength and new sources will be required to ensure the system remains secure. Transgrid, as the System Strength Service Provider for NSW, must ensure sufficient system strength services are available to comply with regulatory standards.

The Australian Energy Market Operator (AEMO) has identified a system strength Shortfall in NSW from 1 July 2025, following the planned retirement of the Eraring Power Station. This gap arises when insufficient system strength is expected to be available, based on projected generation dispatch in the energy market (amongst other factors).

From 2 December 2025, a new system strength framework ('System Strength Rule Change') will begin under the National Electricity Rules (NER), requiring Transgrid to deliver system strength on a forward-looking basis to standards set by AEMO. Under this framework, system strength will be effectively 'unbundled' from the operation of the energy market, and Transgrid is required to establish a portfolio of solutions (network and/or non-network) to ensure minimum three-phase fault level requirements are met in full at all times of the year. This is a departure from the system strength Shortfall methodology, where only the 'Shortfall' or gap in NSW's system strength has to be filled. System strength contributions from synchronous generators will no longer be relied upon as an externality of their dispatch in the energy market, but rather can be considered as a credible non-network solution to meet ongoing system strength requirements.

In addition, Transgrid is required to deploy system strength solutions above the minimum levels to facilitate the stable connection and operation of renewables as they come online in NSW in the coming years.

These requirements will create **a new, sizeable and ongoing market for System Strength** which can be met by a range of different technologies and suppliers – hence this expression of interest (EOI).

1.2. Objective of this EOI

Transgrid is seeking EOI from potential **System Strength Contractors**¹ to provide non-network options to:

- address a system strength Shortfall in the transmission network at Newcastle and Sydney West that is forecast to arise from 1 July 2025 and continue until 1 December 2025; and/or
- deliver system strength services to the NSW power system to meet standards set by AEMO from 2 December 2025, including for the safe and secure operation of the power system and to facilitate the stable voltage waveform of new inverter-based renewable generators (efficient level).

Responses to this EOI will inform the development of Transgrid's Regulatory Investment Test for Transmission (RIT-T) for '[Meeting System Strength Requirements in NSW](#)', including the technical and economic assessment of credible options to meet Transgrid's system strength requirements across NSW and over different time horizons. The RIT-T is a whole-of-market economic benefits test and optimisation; its

¹ System Strength Contractors are defined as third party businesses that provide system strength services to Transgrid under a network support contract.

conclusions will rank potential network and non-network solutions and identify the preferred option (or portfolio of options) that will maximise net market benefits.

Where non-network solutions (i.e. services procured from third parties) form part of the preferred option selected through the RIT-T process, Transgrid will run a competitive procurement process and/or commercial negotiations to establish network support contracts with these proponents.

This EOI should be read in conjunction with the Project Specification Consultation Report (PSCR) for the 'Meeting System Strength Requirements in NSW' project.

1.3. What we are seeking

This EOI offers System Strength Contractors the potential to secure a network support contract with Transgrid, including long-term agreements.

We welcome submissions from potential System Strength Contractors with solutions located in NSW or in other states, who are capable of providing system strength services to Transgrid, such as:

- **Existing synchronous generators** – such as coal, gas and hydro. System strength services may be provided as part of typical dispatch in the energy market, or additional (out-of-merit-order) generation services. **This EOI (and subsequent procurement process) offers the potential to be paid for a service that is currently provided, but not explicitly valued, in the energy market.**

or companies providing:

- Existing synchronous **hydro units** that can operate in '**synchronous condenser**' mode, generators who are considering **converting coal units into synchronous condensers** or **existing synchronous condensers**;
- **New synchronous generators or synchronous condensers**;
- **Emerging technologies** – such as batteries or renewable generation with grid-forming inverters.

1.4. Requirements for the system strength Shortfall (1 July 2025 to 1 December 2025)

Transgrid is **seeking non-network solutions to meet or contribute to meeting a 1,190 MVA fault level Shortfall at Newcastle 330kV and a 1,026 MVA Shortfall at Sydney West 330kV, from 1 July 2025 to 1 December 2025.** Non-network solutions would be requested to come online if AEMO or Transgrid assesses that system strength support is required. It is predicted that these services will be called upon to provide system strength support at Newcastle and Sydney West for around 10% of time.

Given that the Shortfall arises at times when the system strength contributions of generators dispatched in the energy market are not sufficient to meet minimum requirements, solutions to resolve the Shortfall (or the portfolio of solutions) must be *additional* to the operation of the energy market.

Table 1, Summary of system strength Shortfall requirements

Node	System strength need	Need date	Estimated need duration
Newcastle 330 kV	1,190 MVA of additional fault current	1 July 2025 to 1 December 2025	10% of the time
Sydney West 330 kV	1,026 MVA of additional fault current	1 July 2025 to 1 December 2025	10% of the time

1.5. Requirements for the System Strength Rule Change (from 2 December 2025)

Minimum level of system strength

Transgrid is **seeking non-network solutions to meet or contribute to meeting the entire pre- and post-contingency** minimum fault level requirements at each NSW node at all times of the year, from 2 December 2025 onwards. Transgrid anticipates that a portfolio of services will be needed, with combined availability to ensure sufficient system strength coverage 100% of the time.

Under the System Strength Rule Change, the provision of system strength will be unbundled from the operation of the energy market. System strength solutions may therefore be provided as either a function of generation dispatched in the energy market, or from services that are additional to the energy market.

Table 2, New South Wales minimum fault level requirements²

Node	System strength need (fault level, MVA)		Need date	Estimated need duration
	Pre-contingency	Post-contingency		
Armidale 330 kV	3,300	2,800	From 2 December 2025 onwards	100% of time
Buronga 220 kV	1,755	To be determined		
Darlington Point 330 kV	1,500	600		
Newcastle 330 kV	8,150	7,100		
Sydney West 330 kV	8,450	8,050		
Wellington 330 kV	2,900	1,800		

Efficient level of system strength

Over and above the minimum levels of system strength, Transgrid is **seeking non-network solutions to facilitate the stable operation of inverter-based renewables connecting to the power system in NSW** from 2 December 2025. Based on the Integrated System Plan Step Change scenario, AEMO has established a 10-year projection of the efficient level and type of inverter-based renewable capacity that will be connected in the region of each system strength node, as per Table 3. Transgrid must make available sufficient system strength service to facilitate their stable voltage waveform. For example, system strength services are

² AEMO, 1 December 2022, 2022 System Security Report, <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/system-security-planning>

required to stabilise 5.8 GW of new renewable capacity in NSW from 2 December 2025, and up to 15 GW in FY30.

Table 3, Summary of new inverter-based renewable connections projected for NSW (GW generation capacity)³

Financial year	Total new inverter-based renewable capacity in NSW (GW)	System strength need date	Need duration
FY23	-	From 2 December 2025 onwards	Variable ⁴
FY24	1.8		
FY25	2.3		
FY26	5.8		
FY27	6.9		
FY28	11.8		
FY29	14.2		
FY30	15.4		
FY31	16.4		
FY32	17.3		
FY33	18.4		

AEMO has not specified ‘fault level’ as the metric for the efficient level of system strength, but rather defined four criteria that must be met to ensure a stable voltage waveform can be maintained (related to voltage magnitude, change in voltage phase angle, voltage waveform distortion and voltage oscillations).

Voltage waveform stabilisation can be **supplied by both conventional system strength technologies** that provide fault current (e.g. synchronous generators or synchronous condensers), **as well as new innovative technologies including grid forming batteries and grid forming renewable generators.**

Transgrid envisages that a range of these solutions will be required.

1.6. EOI submission

Transgrid invites you to propose solution(s) that can meet, or help to meet, Transgrid’s system strength requirements for the NSW power system.

EOI proposals and the Returnable Schedule are to be emailed to systemstrength@transgrid.com.au **no later than 6pm, 30 March 2023.**

³ AEMO, 1 December 2022, 2022 System Security Report, <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/system-security-planning>

⁴ Co-optimised via the proposed Operational Security Mechanism (OSM) to maintain system security and maximise the value of energy trade.

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2. Disclaimer

2.1. Notice

You must read this section before reading or making any use of this document, including any information contained in this document and any related discussion or information provided as part of, or in connection with, the processes contemplated in this document (together “**the EOI material**”). By continuing to read, use or otherwise act on the EOI material, you agree to be bound by the following terms and conditions (including as amended). You consent to submit to the laws and courts of Australia in respect of any proceedings arising out of or relating to the EOI material.

2.2. Disclaimer

You acknowledge and agree that:

- a. the EOI material has been provided by Transgrid for your information only;
- b. Transgrid:
 - i. does not give any express or implied warranties or make any representation as to the accuracy, completeness, adequacy and sufficiency of the EOI material or the assumptions on which it is based or that it has the right to disclose the EOI material; and
 - ii. does not owe you or any other person any duty of care in connection with the EOI material;
- c. except where otherwise agreed in writing, you must not rely upon any of the EOI material as being accurate, complete, adequate or sufficient in entering into or performing any of your obligations under any document in connection with EOI or the Project;
- d. you must make your own independent evaluation of the accuracy, completeness, adequacy and sufficiency of the EOI material (and any other information);
- e. you have no rights to appeal, object or make a claim against Transgrid in respect of any decision, determination, evaluation or analysis by Transgrid as part of the EOI, the Project or the EOI material;
- f. Transgrid reserves the right, but is under no obligation, to review or amend the EOI material to account for any additional information not reflected in this document, whether in existence on or after the date of its publication; and
- g. Transgrid may rely on the acknowledgements made by you in this **clause 2.1** in entering into any further document/agreement with you in connection with the EOI or the Project.

2.3. Release

You irrevocably and unconditionally release and indemnify Transgrid from and against:

- a. any claim against Transgrid; and
- b. any liability, cost, loss or damage suffered or incurred by you (or your associates),

arising out of, or in connection with:

- c. your (or your associates’) receipt or use of, or purported reliance upon, the EOI material; and
- d. Transgrid exercising or failing to exercise any discretion or right it has or may in the future have in connection with the EOI or the Project.

2.4. Rights

In addition to its rights set out elsewhere in this EOI, Transgrid may at any time and without giving reasons:

- a. extend the EOI proposals closure date at any time before the closure date by notice to potential participants;
- b. extend the Information enquiries closure date at any time by notice to all potential participants (before the closing time) or all participants (after the closing time);
- c. shortlist one or more participants;
- d. reject any or all EOI proposals;
- e. not accept any EOI proposals;
- f. negotiate a private agreement with one or more participants;
- g. enter into a contract with one or more participants or any other person at any time;
- h. request one or more participants to review, improve and/or enhance any or all part(s) of its EOI proposal;
- i. request any participant to submit an offer;
- j. amend, suspend, discontinue or terminate the process set out in this EOI by notice in writing to one or more participants whose EOI proposal(s) have been excluded from further evaluation and assessment;
- k. provide additional information or clarification to participants;
- l. not proceed with this EOI, in the manner set out in clause 2, or at all;
- m. terminate a participant's involvement in the EOI process and/or discontinue the evaluation and assessment of an EOI proposal where Transgrid determines that the EOI proposal is unsuitable, unsatisfactory, substantially incomplete or clearly uncompetitive;
- n. negotiate with one or more participants or any other person, and enter into transaction documents with any participant or other person;
- o. accept or reject any EOI proposal which:
 - i. is late;
 - ii. is in any way incomplete or irregular;
 - iii. does not comply with any requirements of this clause 2;
- p. Transgrid's decision to exercise any or none of the rights in this clause 2 is final and Transgrid will not be liable to any participants because Transgrid has exercised any or none of its rights in this clause 2; and
- q. Transgrid may exercise its rights in this clause with respect to one participant only or to multiple participants at the same time.

3. Context

3.1. System Strength

What is system strength?

System strength is a fundamental service required for the power system to operate in a secure state. System strength can broadly be described as the ability of the power system to maintain and control the voltage waveform at any given location in the power system, both during steady state operation and following a disturbance⁵. It is one determinant of how well the power system can return to normal operation following a disturbance or fault⁶.

To ensure that protection systems operate correctly and voltages stay within acceptable levels, a minimum amount of system strength is required. Three phase fault levels are used to define minimum system strength requirements, measured in MVA, which is proportional to the fault current (in Amps) and the voltage (in Volts). The fault current is the electrical current that flows during a fault (also known as the short circuit current)⁷.

A power system with inadequate system strength raises the risk of system instability and supply interruptions to energy consumers. In a system with low system strength⁸:

- generators may be unable to remain connected during disturbances on the power system;
- control of the system voltage becomes more difficult; and/or
- protection systems that ensure safe operation of the network may not operate correctly.

How will its provision change during the energy transition?

System strength in Australia's electricity system has traditionally been provided by synchronous generators, as an intrinsic by-product of producing energy and reserves⁹. The NSW electricity system has historically relied on a minimum combination of thermal generation units being online at all times to keep the grid operating within its safe technical envelope.

As thermal generators retire or change their operating patterns, the power system will lose system strength (and inertia) and new sources will be required to replace those leaving the system to ensure the power system remains secure. AEMO has identified a system strength Shortfall from 1 July 2025 following the planned retirement of the Eraring Power Station. Gaps in system strength will grow as other coal generators retire, are mothballed, experience outages, or choose to 'economically-decommit' in response to changing energy market conditions.

⁵ AEMO, 2022, System Strength Requirements Methodology, <https://aemo.com.au/consultations/current-and-closed-consultations/ssrmiag>

⁶ AEMO, March 2022, System strength in the NEM explained, <https://aemo.com.au/-/media/files/electricity/nem/system-strength-explained.pdf>

⁷ AEMO, March 2022, System strength in the NEM explained, as above

⁸ AEMO, March 2022, System strength in the NEM explained, as above

⁹ Australian Energy Regulatory, 2022, Compliance update – provision of essential system services, <https://www.aer.gov.au/wholesale-markets/compliance-reporting/compliance-update-provision-of-essential-system-services>

Existing 'grid following' inverter-based renewables do not contribute positively to system strength. Additional system strength services will be required, over and above minimum levels, to facilitate the stable connection of approximately 15GW of new inverter-based renewables projected to be connected in NSW by FY30.

A range of new and existing technologies can be deployed to provide new sources system strength – such as synchronous condensers, the conversion of existing thermal generators into synchronous condensers, the operation of suitable hydro units in 'synchronous condenser' mode and grid forming batteries.

The operation of generation in the energy market can no longer be relied upon to provide system strength (and other system security services) as an unvalued externality. These services will need to be actively planned and managed throughout the energy transition, optimising contributions from existing, retiring and new sources.

3.2. Existing and emerging technologies will be pivotal to close the gap

Transgrid expects that a portfolio of existing and emerging network and non-network solutions will best meet the needs of the NSW power system and energy consumers throughout the energy transition. This may involve contracting with new and existing energy market participants and establishing new technologies and system strength services to ensure ongoing power system security. These could include:

- **Synchronous condensers** – A cost-effective, proven technology that can be developed as a network or non-network solution. Synchronous condensers have recently been deployed in South Australia to meet a system strength gap.
- **Existing synchronous generators** dispatched in the energy market, such as coal, gas and hydro. System strength services may be provided as part of typical dispatch in the energy market, or additional generation services. Existing generators may have a low incremental capital cost to provide system strength, but operating costs may be high reflecting fuel and variable costs, particularly when operating out-of-merit-order. Existing generators may play an important role in meeting the 1 July 2025 Shortfall, but contributions from these sources are expected to decrease over time as thermal units retire from the system.
- **Services outside the energy market** such as existing synchronous hydro units that may be able to operate in 'synchronous condenser' mode, or generators considering converting coal units into synchronous condensers. The availability, capital and operating costs of these solutions are unknown.
- **Emerging technologies** such as batteries or renewable generation with grid-forming inverters. If widely adopted and appropriately tuned, these technologies could make a substantial system strength contribution in the medium-to-long term, however the timing and cost are uncertain and technical capabilities will need to be confirmed.

4. Opportunity to support Transgrid's system strength obligations

4.1. Transgrid's role in maintaining system strength

Under the NER, Transgrid is responsible for meeting specified levels of power system security services on the NSW power system, including system strength, inertia and voltage control. As the System Strength Service Provider for NSW, Transgrid must ensure sufficient system strength services are available to maintain the stability of the power system.

4.2. CURRENT: Fault Level Rule (until 1 December 2025)

The 2017 Fault Level Rule put in place requirements for transmission network service providers (TNSPs) to meet specified minimum three-phase fault levels, and requires new connecting renewable generators to self-remediate any adverse system strength impacts resulting from their connection (the 'do no harm' provision).

Under the current NER:

- AEMO determines the system strength requirements in each region at specified fault level nodes on the transmission network.
- The system strength requirement is that the three-phase fault level at a fault level node must be maintained at or above the minimum three phase fault level determined by AEMO.
- If AEMO assesses a likely fault level Shortfall at a fault level node, the System Strength Service Provider must use reasonable endeavours to make a range and level of system strength services available to address the fault level Shortfall, taking into account planned outages, the risk of unplanned outages and the potential for the system strength services to impact typical patterns of dispatched generation in central dispatch (NER 11.143.15). The System Strength Service Provider must make available the least cost option or combination of options that will address the Shortfall.
- The System Strength Service Provider must prepare and publish information to enable potential providers of system strength services to develop non-network options for consideration by the System Strength Service Provider. This EOI and the related RIT-T process for the Shortfall is intended to achieve this.

Following a Shortfall declaration, Transgrid must put in place network and/or non-network solutions to fill the gap between the projected minimum fault levels that is expected to be available as a result of typical market dispatch, and minimum fault level requirements.

4.3. NEW: System Strength Rule Change (from 2 December 2025)

Under the AEMC's 2021 final determination for the *Efficient management of system strength on the power system* (System Strength Rule Change), Transgrid is responsible for delivering system strength on a forward-looking basis to standards set by AEMO, including:

1. for the safe and secure operation of the power system (minimum level); and
2. to facilitate the stable voltage waveform of the efficient level of new inverter-based renewable generators surrounding specified system strength nodes.

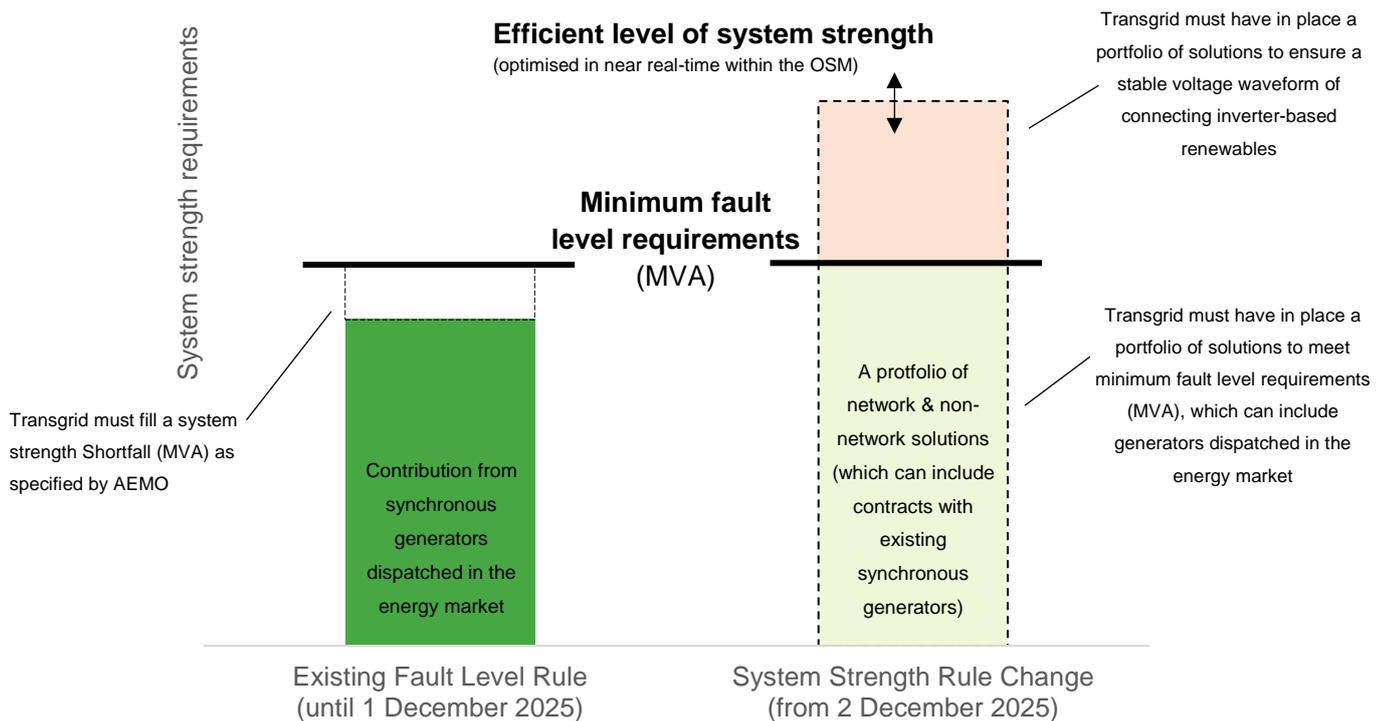
As the System Strength Service Provider for NSW, Transgrid must meet NSW's entire minimum three-phase fault level requirements at all times of the year (rather than just filling a declared Shortfall). Under this framework, system strength will be effectively 'unbundled' from the operation of the energy market, and contributions from synchronous generators will no longer be relied upon as an externality of their dispatch in the energy market, but rather can be considered as a credible non-network solution to meet ongoing system strength requirements.

Requirement 1: Minimum fault level requirements

AEMO sets the minimum three-phase fault level (MVA) required for a secure system at each node in the NEM – with six declared in NSW at: Darlington Point, Buronga (new node), Sydney West, Newcastle, Wellington and Armidale.

From 2 December 2025, Transgrid must have in place a portfolio of solutions (network and/or non-network) to meet the minimum three-phase fault level requirements at each system strength node, in full, at all times of the year. This may include contracting with existing synchronous generators to provide system strength services, who currently provide system strength as an unvalued by-product of their generation. This is a departure from the system strength Shortfall methodology, where only the ‘Shortfall’ or gap in NSW’s system strength has to be filled, as described in Figure 1.

Figure 1, Transgrid responsibilities for meeting system strength requirements in NSW (conceptual)



Requirement 2: Efficient level of system strength

The System Strength Rule Change introduces a new obligation on System Strength Services Providers (Transgrid in NSW) to provide additional amounts of system strength above the minimum to support the connection of new inverter-based resources. New connecting generators will have the choice to procure system strength services from Transgrid (**which in turn may be procured from System Strength Contractors**), or to provide their own system strength.

AEMO has not specified ‘fault level’ as the metric to ensure a stable voltage waveform, instead defined four criteria that must be met, relating to voltage magnitude, change in voltage phase angle, voltage waveform distortion and voltage oscillations. This allows Transgrid to innovate in the way that system strength services are provided and provides greater flexibility to value system strength support. For example, studies published by Powerlink indicate that grid forming batteries hold significant promise to maintain stable voltage waveforms¹⁰ and AEMO has contracted with a grid forming battery for system strength services¹¹.

¹⁰ Powerlink, 2021, PSCAD assessment of the effectiveness of grid forming batteries, <https://arena.gov.au/knowledge-bank/pscad-assessment-of-the-effectiveness-of-grid-forming-batteries/>

¹¹ Edify, June 2022, Financial Close on the largest approved grid forming battery, <https://edifyenergy.com/energy-storage-systems/financial-close-on-the-largest-approved-grid-forming-battery/>

4.4. Contracts will operate in the new Operational Security Mechanism market

The Australian Energy Market Commission (AEMC) is currently consulting on the Operational Security Mechanism (OSM) rule change and has released a [draft determination](#). The OSM will operationalise contracts that Transgrid enters into with System Strength Contractors, including services contracted under the current NER Fault Level Rule and the future System Strength Rule Change.

Based on the draft determination, the OSM is envisaged to be a near real-time market that will operate alongside the electricity spot market to ensure sufficient resources are available to maintain power system security. It is proposed to commence in October 2025. The OSM will dispatch services to ensure that sufficient system strength levels are always met and will co-optimize additional levels of system strength to enable the economically optimal level of renewable generation to operate stably. The efficient level of system strength will vary in near-real-time, based on factors such as the renewable generation availability, electricity spot prices and the cost of system strength services.

The draft determination envisages that:

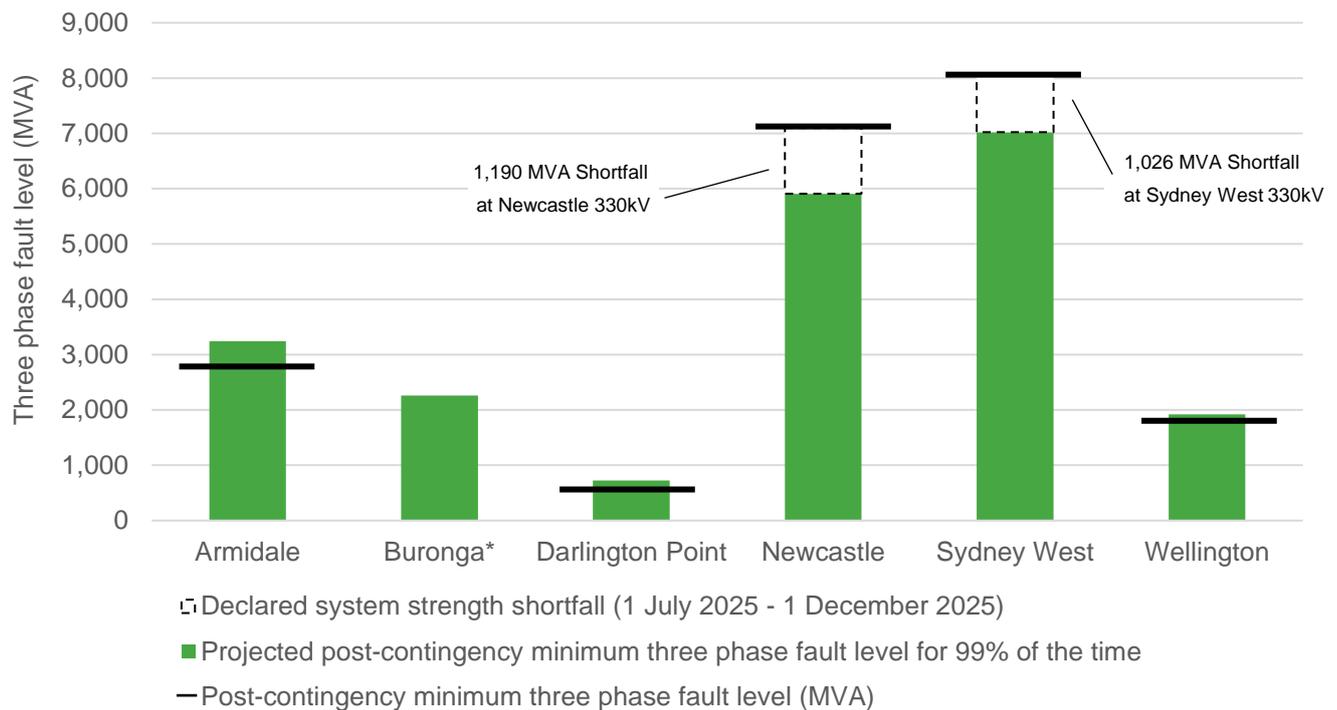
- **Transgrid** will be responsible for entering into System Strength Contracts under the System Strength Rule Change, including specifying the availability that services are required, and making availability (or similar) payments;
- **AEMO** will be responsible for dispatching services in the operational time horizon, and making operating payments (variable \$/MWh or \$/h and enablement payments) as part of the OSM.

5. Statement of requirement

5.1. System strength Shortfall (1 July 2025 – 1 December 2025)

Following the publication of AEMO's 2022 System Security Reports, AEMO gave notice to Transgrid on 15 December 2022 that a system strength Shortfall is projected to occur from 1 July 2025 at Newcastle 330kV and Sydney West 330kV nodes. AEMO has requested Transgrid to make system strength services available to address the Shortfalls in accordance with NER clause 11.143.15. The 'Shortfall Period' under the existing Fault Level Rule will be 1 July 2025 to 1 December 2025 (with the new System Strength Rule Change commencing from 2 December 2025).

Figure 2, New South Wales fault level requirements, 2025-26 post contingency fault level projections and Shortfalls from AEMO¹²



Transgrid is seeking EOI for non-network solutions that can meet or contribute to meeting a 1,190 MVA fault level Shortfall at Newcastle 330kV and a 1,026 MVA Shortfall at Sydney West 330kV for the period 1 July 2025 to 1 December 2025¹³, as set out in Table 4. Non-network solutions would be requested to come online if AEMO or Transgrid assesses that system strength support is required.

Table 4, Summary of system strength Shortfall requirements

Node	System strength need	Need date	Estimated need duration
Newcastle 330 kV	1,190 MVA of additional fault current	1 July 2025 to 1 December 2025	10% of the time
Sydney West 330 kV	1,026 MVA of additional fault current	1 July 2025 to 1 December 2025	10% of the time

Note that:

- The estimated need durations presented in Table 4 are based on the proportion of time that fault levels at each node are projected to fall below the minimum levels required (see Figure 3 and Figure 4, below). Depending on the constraints and capabilities of different technologies to start-up and

¹² * Note that the Buronga node was recently added, and the minimum post-contingency value has not been determined. No Shortfall has been declared for Buronga.

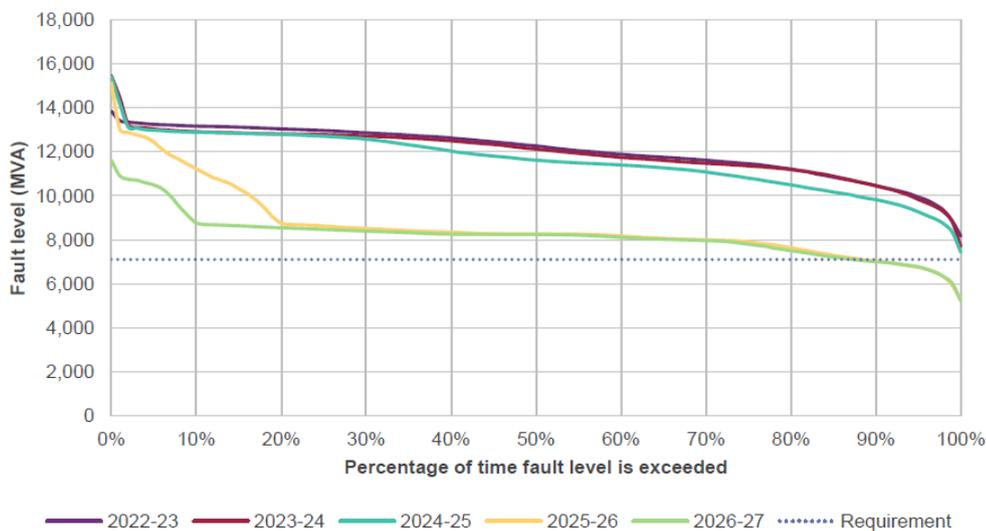
¹³ Due to recent changes in assumptions regarding timing of future projects (following the publication of AEMO's 2022 System Security Reports), Transgrid and AEMO expect that the Shortfall sizes declared in the 2022 System Security Reports will now increase to be at the values set in the Update to the 2021 System Strength Report. Transgrid and AEMO will undertake joint planning to refine the shortfall size and appropriate solutions.

respond instantaneously, System strength Contractors may be required to operate for longer periods of time to meet these needs.

- Depending on the solutions proposed, Transgrid may determine that it is necessary to procure system strength services in larger volumes than implied by the levels of the declared Shortfalls. For example, if existing synchronous generators form part of the optimal solution, Transgrid would need sufficient confidence that the aggregate system strength services provided are *additional* to what would otherwise have been dispatched in the energy market.

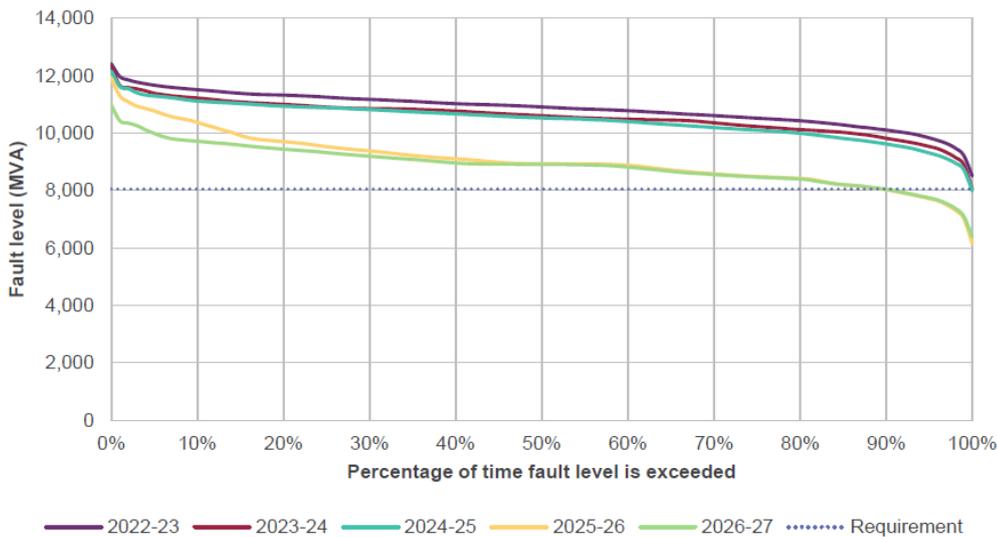
Figure 3 and Figure 4 present the projected fault level duration curves for Newcastle 330kV and Sydney West 330kV, respectively. AEMO’s modelling suggests that the Shortfall is expected to materialise for approximately 10% of the year in 2025-26 at both locations.

Figure 3, Projected post-contingency fault level at Newcastle 330kV¹⁴



¹⁴ AEMO, May 2022, Update to 2021 System Security Reports, https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/operability/2022/update-to-2021-system-security-reports.pdf?la=en

Figure 4: projected post-contingency fault level at Sydney West 330kV¹⁵



5.2. Minimum level of system strength (from 2 December 2025)

From the 2 December 2025, Transgrid, as NSW's System Strength Service Provider, must meet NSW's entire minimum fault level requirements (rather than just filling a declared Shortfall). AEMO has specified the pre- and post-contingency minimum requirements for the existing five NSW nodes, which remain unchanged from previous years, and has added one node at Buronga, as described above in Table 5. For example, network solutions and/or contracts with non-network proponents must be in place to meet a pre-contingency fault level of 8,150 MVA and a post-contingency fault level of 7,100 MVA at the Newcastle fault level for all period of the year.

Transgrid is seeking EOI for non-network solutions capable of contributing to meet minimum fault level requirements in full at each node at all times of the year, from 2 December 2025 onwards. These solutions may be located within NSW, or interstate and may include existing synchronous generators dispatched in the energy market.

Table 5, New South Wales minimum fault level requirements¹⁶

Node	System strength need (fault level, MVA)		Need date	Estimated need duration
	Pre-contingency	Post-contingency		
Armidale 330 kV	3,300	2,800	From 2 December 2025 onwards	100% of time
Buronga 220 kV	1,755	To be determined		
Darlington Point 330 kV	1,500	600		
Newcastle 330 kV	8,150	7,100		
Sydney West 330 kV	8,450	8,050		

¹⁵ AEMO, May 2022, Update to 2021 System Security Reports, https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/operability/2022/update-to-2021-system-security-reports.pdf?la=en

¹⁶ AEMO, 1 December 2022, 2022 System Security Report, <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/system-security-planning>

Wellington 330 kV	2,900	1,800		
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5.3. Efficient level of system strength (from 2 December 2025)

Above and beyond minimum system strength levels, the System Strength Rule Change also requires Transgrid to provide sufficient strength services to ensure the efficient amount of new inverter-based renewables will remain stable in steady state conditions and remain synchronised following credible contingency events¹⁷.

AEMO provides a 10-year projection of the efficient level and type of inverter-based renewable capacity surrounding each node. Transgrid is seeking EOI for non-network solutions capable of facilitating the stable operation of some or all of the inverter-based renewables expected to connect in NSW over this period, including up to 5.8GW of additional renewables from 2 December 2025 (FY26) and up to 15.4GW in FY30, as specified in Table 6.

Table 6, Summary of the efficient level of inverter-based renewables projected for NSW (GW generation capacity, cumulative)¹⁸

System strength need date	From 2 December 2025 onwards						
Need duration	Variable. Co-optimised via the OSM to maintain system security and maximise the value of energy trade ¹⁹						
Cumulative Inverter-based renewable capacity (GW) in NSW	Darlington Point region	Wellington region	Sydney West region	Buronga region	Armidale region	Newcastle region	Total
FY23	-	-	-	-	-	-	-
FY24	0.2	0.6	0.7	-	0.2	-	1.8
FY25	0.7	0.7	0.7	-	0.2	-	2.3
FY26	1.7	2.1	0.8	-	0.7	0.6	5.8
FY27	1.7	3.1	0.8	0.1	0.7	0.6	6.9
FY28	1.7	3.1	0.8	0.1	4.8	1.3	11.8
FY29	1.7	4.2	0.8	0.1	5.7	1.7	14.2
FY30	1.7	5.1	0.8	0.1	5.7	1.9	15.4
FY31	1.7	5.1	0.8	0.1	5.7	2.9	16.4
FY32	1.7	5.6	0.8	0.1	6.0	3.0	17.3
FY33	1.8	6.1	1.3	0.2	6.0	3.0	18.4

¹⁷ AEMC, 21 October 2021, Efficient management of system strength on the power system, rule determination, <https://www.aemc.gov.au/rule-changes/efficient-management-system-strength-power-system>

¹⁸ AEMO, 1 December 2022, 2022 System Security Report, <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/system-security-planning>

¹⁹ Through the OSM, AEMO will assess in near real-time cost effectiveness of bringing on additional system security services to enable inverter-based renewables to operate stably. Where it is not economic to bring on additional system strength services to cover higher levels of renewable generation, renewables will be spilled.

AEMO has not specified ‘fault level’ as the metric for the efficient level of system strength, but rather several criteria that must be met to ensure a stable voltage waveform can be maintained. Voltage waveform stabilisation can be supplied by both conventional system strength technologies that provide fault current (e.g. synchronous generators or synchronous condensers), as well as new innovative technologies including grid forming batteries and grid forming renewable generators. Transgrid considers that grid forming batteries and grid forming renewable generation could play a significant role in meeting the efficient level of system strength.

Transgrid must provide sufficient system strength services to ensure that the efficient level of new connecting inverter-based renewable generators have stable voltage waveforms. The requirement for stable voltage waveforms is such that:²⁰

- in steady state conditions, *plant* does not create, amplify, or reflect instabilities; and
- avoidance of *voltage* waveform instability following any *credible contingency event* or *protected event* is not dependent on *plant disconnecting* or varying *active power* or *reactive power* transfers, other than in accordance with *performance standards*.

A stable voltage waveform is defined by four criteria:²¹

1. **Voltage magnitude:** the positive-sequence RMS voltage magnitude at a connection point does not violate the limits in the operational guides for the relevant network.
2. **Change in voltage phase angle:** changes in the steady-state RMS voltage phase angle at a connection point should not be excessive following the injection or absorption of active power at a connection point.
3. **Voltage waveform distortion:** the three-phase instantaneous voltage waveform distortion at a connection point should not exceed acceptable planning levels of voltage waveform distortion for pre- and post-contingent conditions.
4. **Voltage oscillations:** any undamped steady-state RMS voltage oscillations anywhere in the power system should not exceed an acceptable planning threshold as agreed with AEMO.

Transgrid has estimated the approximate fault level that may be required to ensure a stable voltage waveform for new connecting renewables, as an indicative proxy for the quantum of system strength services required to meet the efficient level, above and beyond the minimum fault level requirements – see Figure 5. Fault levels required for the efficient level represents an upper limit, as our analysis assumes the coincident operation of all wind and solar generators. Due to the variable nature of renewable generation, some quantum of these system strength services may be required most of the time, and others less frequently, as determined through the Operational Security Mechanism.

²⁰ AEMO, 2022, System Strength Requirements Methodology, <https://aemo.com.au/consultations/current-and-closed-consultations/ssrmiag>

²¹ AEMO, 1 December 2022, 2022 System Security Report, <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/system-security-planning>

Figure 5, NSW's combined minimum post-contingency fault level requirements from 2 December 2025 and efficient fault level projections to FY33, as a proxy for stable voltage waveform²²

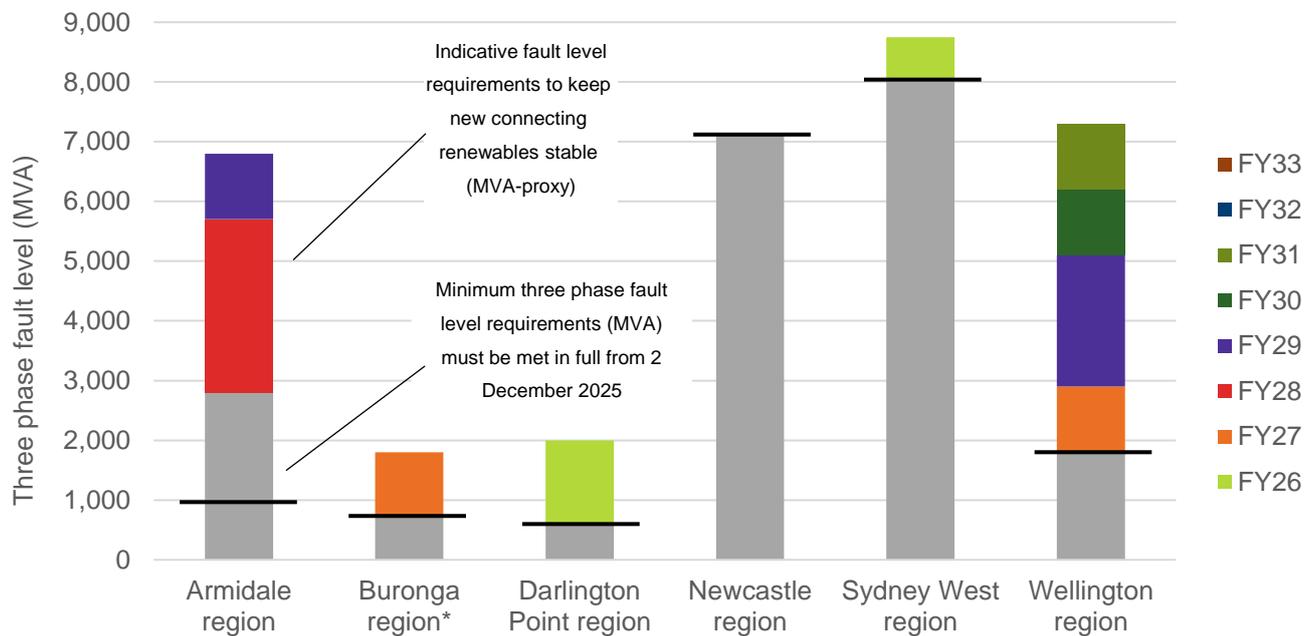


Figure 5 suggests that from 2 December 2025 (FY26), up to 2,100 MVA of fault current provision may be needed at various locations in NSW to ensure the stable operation of new renewable generation, and up to 11,500 MVA of fault current by FY30. Eventually, system strength services to support the stable voltage waveform of new renewables may be of a similar magnitude to the minimum fault level requirements at some nodes.

6. What we are seeking

6.1. Eligible non-network options

Transgrid is seeking EOI for non-network solutions to address its system strength obligations including the Shortfall and requirements under the System Strength Rule Change.

At a minimum, potential non-network options submitted through this EOI process must:

- if submitted to **address the Shortfall** (between 1 July 2025 and 1 December 2025):
 - address the Shortfall, in part or full, at the Newcastle 300kV and/or Sydney West 330kV fault level nodes;
 - be available on or after 1 July 2025. New projects must be sufficiently progressed to provide confidence that services will be available on or soon after 1 July 2025;

²² Analysis is on a post-contingency basis, using the Available Fault Level methodology, assuming Short Circuit Ratio (SCR) requirements of 3 for renewables prior to renewable energy zones (REZs) being developed (minimum access standards under the System Strength Rule Change) and 2.2 for renewables within REZs (Minimum access standards within [NSW Government](#) REZs. Minimum fault levels provide some fault current support to stabilise new connecting renewables. Synchronous condensers (200MVA or 125 MVA) were used to remediate SCR requirements, in turn facilitating the estimate of the three phase fault level proxy-requirements. * Note that Buronga's minimum post-contingency fault level requirements have not been set – for this chart an estimate has been used.

- be available until at least 1 December 2025 and may be submitted for a longer period of service (e.g. up to 30 years);
- if submitted to **address the System Strength Rule change** (from 2 December 2025 onwards):
 - in part or full, address minimum fault level requirements and/or support a stable voltage waveform for new connecting inverter-based renewables surrounding NSW fault level nodes (efficient level);
 - be available on or after 2 December 2025 for a defined period of service (e.g. up to 30 years);
- meet the requirements set out in section 6.4 (as applicable);
- be commercially and technically feasible;
- provide a material quantity of system strength services, for example from solutions with a rated capacity greater than 50MVA; and,
- be in the name of one contracting party.

6.2. Potential non-network options

Potential non-network options may be existing plant or new plant and can include but are not limited to:

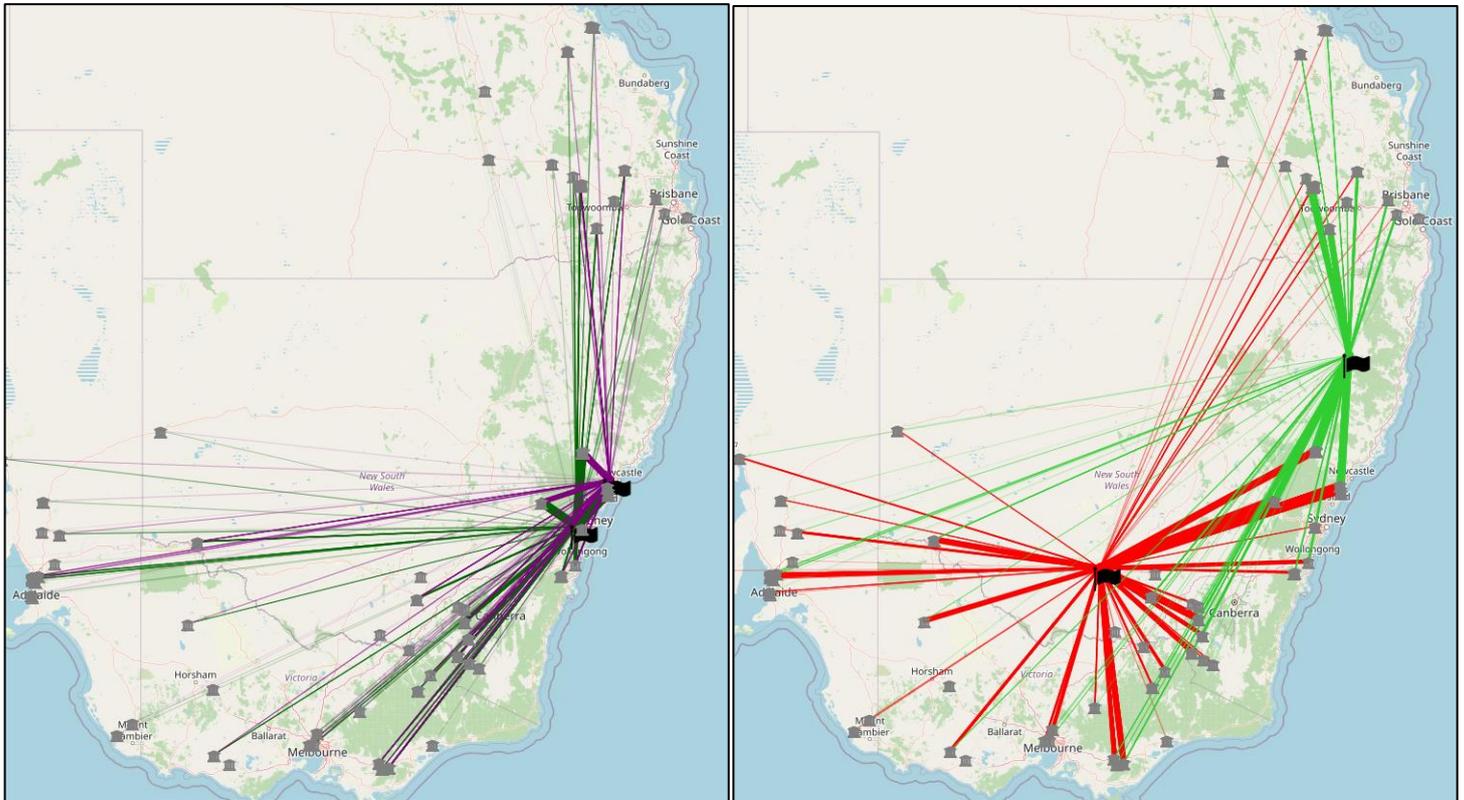
- synchronous generators;
- synchronous hydro units operating in ‘synchronous condenser’ mode;
- conversion of existing synchronous generators to synchronous condensers;
- synchronous condensers (with or without fly wheels);
- grid forming battery energy storage systems;
- grid forming inverter-based renewable generators;
- grid forming SVCs or STATCOMs; and
- other modifications to existing plant.

6.3. Location of non-network options

Non-network options that provide system strength services are not restricted by state boundaries. Solutions which contribute to meeting NSW’s needs can be located outside of NSW.

System strength naturally diminishes with electrical distance as a result of the network’s impedance, which is a function of physical distance and the capacity of the network. As such, non-network options that are located closer (electrically) to the system strength need will provide a greater system strength contribution. Solutions may also contribute to meeting system strength requirements at more than one system strength node. Figure 6 presents a visualisation of indicative fault level contributions that existing synchronous generators in the NEM make to four fault level nodes in NSW.

Figure 6, Visualisation of indicative fault current contributions of each synchronous generator in the NEM to NSW's Newcastle (purple lines) and Sydney West (dark green lines) fault level nodes in the left map and Darlington Point (red lines) and Armidale (light green lines) fault level nodes in the right map. Thicker lines indicate a greater system strength contribution



6.4. Characteristics of non-network options

Potential non-network options should meet the following criteria as applicable to the technology type:

- Be available for enablement for 95% of each year or part of a year for which the service is offered. Transgrid will, at its discretion, consider lower availability measures where significant cost savings can be demonstrated as a result of lower availability measures;
- upon notification from AEMO or Transgrid to enable the services, proposed services must commit and continuously maintain the service as soon as possible from the time of the enablement request;
- once the system strength response is enabled, the service shall remain activated until a signal to disable is received;
- continue to meet any relevant Generator Performance Standards (GPS) when providing the system strength support services;
- have facilities to transmit specified measured quantities via SCADA to AEMO and/or Transgrid's control room which conform to the required standards of reliability, accuracy and latency as would be applied to a scheduled generating system;
- have metering facilities suitable for resolving any compensation payments associated with the provision of system strength services;
- if new solutions, be supported by simulation models that comply with the requirements stipulated in AEMO's Power System Model Guidelines. This includes the provision of Electromagnetic Transient

(EMT) models for power electronic interfaced equipment, including Battery Energy Storage Systems; and

- if a generation service is proposed (either standalone or in conjunction with other services), the system strength service will be required to operate “on demand” at certain times to satisfy Transgrid’s requirements. During the Shortfall period (1 July 2025 – 1 December 2025), such operation will be required regardless of the pool price at the time.²³

6.5. Mandatory information to be provided

Responses to this EOI will inform Transgrid’s RIT-T for ‘[Meeting System Strength Requirements in NSW](#)’, including the technical and economic assessment of credible options to meet Transgrid’s system strength requirements across NSW and over different time horizons.

Proponents should provide the following information in their responses (as applicable), using the Returnable Schedule which can be found on the project [webpage](#).

Project details

Parameter	Applicable technology	Description
Company name	All	Name of the company submitting this EOI
ABN	All	ABN of the company submitting this EOI
Key contact name	All	Name of the key contact for this EOI
Contact email address	All	Email address for the key contact
Contact phone number	All	Phone number for the key contact
Solution name / address	All	Name and/or address of the solution (or multiple units that form part of the solution)
Location	All	Substation of connection to the transmission network
Commissioning date	New or modified solutions	Expected date for a proposed new project to have completed construction, grid connection, testing and all commissioning activities and be available to provide the proposed system strength service

Technical

Parameter	Applicable technology	Description
Technology type	All	e.g. synchronous generator, grid forming battery, grid forming renewables, synchronous condenser

²³ During the Shortfall period (1 July 2025 to 1 December 2025) generators providing system strength services cannot set the electricity pool price. Following the introduction of the OSM, the AEMC envisages that the pool price would be considered in calculating payments to OSM participants.

Parameter	Applicable technology	Description
Asset life	All	Expected operating life for (new and existing) assets that will provide proposed system strength services
Details	All	Details of equipment, including multiple units if appropriate, and any other relevant information describing the solution (existing or new)
Rated Capacity	All	Rated capacity of the solution in MVA
Minimum stable operating level	Synchronous generators	If the solution is a synchronous generating unit(s), the minimum stable operating level of each unit in MW
Overload capacity	Inverter-based solutions	If the solution is an inverter-based solution, the overload capacity of the inverter in MVA or percent of Rated Capacity
Duration of fault current contribution	All	In the event of a fault in the system, duration that the solution can sustain the fault current contribution in seconds
Fault current contribution at the point of connection	Existing units	If the solution is an existing unit(s), fault current contribution at the point of connection to the network in MVA
Sub transient impedance of the machine	New synchronous machine	If the solution is a new synchronous machine, sub transient impedance of the machine, in per unit (p.u.)
Impedance of the transformer	New inverter-based solutions	If the solution is a new inverter-based solution, impedance of the transformer, in per unit (p.u.)
Vector group of the transformer	All	For example, Star/Delta, Delta/Star, Star/Delta/Delta etc.
Line impedance to the point of connection	New solutions	If the solution is new, an estimate of line impedance to the point of connection of the transmission network, in per unit (p.u.)
Communications	All	Proposed dispatch communications protocol with AEMO and/or Transgrid's control room
Inertia contribution ²⁴	All	Inertia or synthetic inertia contribution of the solution in MWs

Availability and activation

Parameter	Applicable technology	Description
Start-up time	All	Expected time following a request for enablement before the solution can provide contracted system strength services
Continuous running time	All	Maximum period of time the solution can be run continuously when providing system strength services

²⁴ Note that this EOI is not seeking inertia support. However, Transgrid is likely to have future inertia needs as synchronous generators retire (See Transgrid's 2022 [TAPR](#), page 98), and will seek to co-optimize these needs where possible.

Annual availability	All	Annual availability of the solution to provide system strength services, represented as a percentage of a year. 95% is proposed, but proponents may choose to propose an alternative value
Annual maintenance duration	All	Duration of a year in which the solution would be offline for maintenance (represented in hours or a percentage)
Periods of unavailability	All	Likely month/day/time that the solution will be unavailable to provide contracted system strength services (if any)
Additionality of system strength services (Shortfall period only)	Existing generators	During the period of the system strength Shortfall (1 July 2025 to 1 December 2025 only), indicate how the proposed solution will provide additional system strength services, beyond what is already likely to be available as a result of electricity market dispatch

Economic

The RIT-T is a whole-of-market economic benefits test which seeks to identify the transmission investment option(s) that maximises net market benefits – which may include network and/or non-network solutions. In August 2020 the Australian Energy Regulator (AER) published an update to its RIT-T Application Guidelines²⁵ which clarified that RIT-T analysis should reflect total costs and market-wide benefits of credible non-network options (a change from the previous approach, in which costs of non-network options were estimated based on costs that could be expected in a tender process). As a result, in this EOI Transgrid is seeking information about both the expected *economic cost* (regardless of ownership) and the expected *contract price* of proposed non-network options.

Note: Existing and committed assets are considered to have no capital costs (although modifications to existing facilities may include incremental capital investment which should be included).

Parameter	Applicable technology	Description
Available to meet all or part of the system strength Shortfall (1 July 2025 to 1 December 2025)	All	Yes/no Please specify expected availability dates during this period
Available to meet the System Strength Rule Change (on or after 2 December 2025)	All	Yes/no Please specify expected availability dates during this period
Service start date	All	Proposed start date for providing the system strength service to Transgrid
Service end date	All	Proposed end date for providing the system strength service to Transgrid

²⁵ AER, 2020, Final decisions – Guidelines to make the Integrated System Plan Actionable, p25, <https://www.aer.gov.au/system/files/AER%20-%20Final%20decision%20-%20Guidelines%20to%20make%20the%20ISP%20actionable%20-%202025%20August%202020.pdf>

Parameter	Applicable technology	Description
Capital cost	All	<p>Total capital cost (regardless of ownership)²⁶ for the proposed solution, including costs of plant/equipment, land, civil works, grid connection assets and development costs.</p> <p>If possible, please reflect the actual spend profile for the project (otherwise, lump sum).</p> <p>These costs must exclude a rate of return on capital, and should not subtract any:</p> <ul style="list-style-type: none"> • Expected payments from Transgrid • Expected payments or revenues from energy (and related) markets • External funding contributions (e.g. grants) <p>Existing or committed assets are considered to have zero capital cost (i.e. are a sunk cost). However, capital costs associated with modifying or upgrading existing facilities to provide system strength services should be included.</p>
Committed project	New solutions	<p>Yes/no</p> <p>Will the proposed system strength services be provided by assets that meet the definition of 'committed project' under the AER's RIT-T Application Guidelines, using the following criteria:</p> <p>a) The proponent has obtained all required planning consents, construction approvals and licenses, including completion and acceptance of any necessary environmental impact statement</p> <p>b) Construction has either commenced or a firm commencement date has been set</p> <p>c) The proponent has purchased/settled/acquired land (or commenced legal proceedings to acquire land) for the purposes of construction</p> <p>d) Contracts for supply and construction of the major components of the necessary plant and equipment (such as generators, turbines, boilers, transmission towers, conductors, terminal station equipment) have been finalised and executed, including any provisions for cancellation payments</p> <p>e) The necessary financing arrangements, including any debt plans, have been finalised and contracts executed.</p>
External contributions	New projects	<p>Has the project that is proposed to provide system strength services received any external funding (or is expected to receive external funding) such as from ARENA or government?</p>
Fixed operating cost	All	<p>Annual fixed operation and maintenance (FOM) costs of the underlying resource</p>

²⁶ As per RIT-T guidelines, capital costs are considered \$0 for existing or committed assets, and for new assets the total capital cost of the underlying resource for the non-network solution (i.e. regardless of ownership).

Parameter	Applicable technology	Description
Variable operating cost	All	Expected running costs (\$/MWh or \$/hour) of the underlying resource, including fuel costs and variable operations and maintenance (VOM)
Greenhouse gas emissions (scope 1)	All	Estimated scope 1 greenhouse gas emissions from providing system strength services (tCO ₂ e/MWh or tCO ₂ e/hour)
Greenhouse gas emissions (scope 2)	All	Estimated scope 2 greenhouse gas emissions from providing system strength services (tCO ₂ e/MWh or tCO ₂ e/hour)
Project benefits	All	Beyond system strength services, describe other services that the assets/project will provide in energy and related markets (e.g. wholesale energy market, ancillary services markets, other network support services).
Expected system strength contract price (paid by AEMO and/or Transgrid)	All	<p>Proposed fees payable for the provision of system strength services. The fee structure should include the following components (in line with the draft OSM structure):</p> <ul style="list-style-type: none"> • Establishment Fee: one-off setup cost, if applicable. • Availability Fee: monthly payment for the service to be made available to Transgrid. This is intended to cover fixed costs for providing the service. • Enablement Fee: \$ per event, intended to cover the cost of the service being enabled/activated. • Variable Fee: \$/MWh fee to operate at the minimum stable operating level for synchronous generators, or \$/hour for other solutions <p>Please specify whether fees are in real or nominal terms, and any indexation methodology that applies.</p>

6.6. Other supporting information to be provided

Please also provide other relevant information that Transgrid should consider in its assessment. This may include:

- Technical specifications of the service/technology/equipment being offered.
- Details of any material assumptions used to prepare your submission to this EOI, including in relation to the legal terms provided in Appendix A.
- Evidence of the capability and capacity to deliver the proposed non-network option to Transgrid, including:
 - experience in delivering system strength or related services;
 - expected project delivery timeframes, where relevant; and
 - evidence of technical maturity and economic feasibility (cost-effectiveness) of proposed solution.

7. Legal terms

An outline of the legal terms applicable to Transgrid's contracting of system strength services are set out in Attachment A.

8. Proposal evaluation

8.1. Evaluation criteria

The purpose of this EOI is to enable Transgrid to identify and assess credible non-network options for the provision of system strength, including to inform the RIT-T for ['Meeting System Strength Requirements in NSW'](#). Transgrid may elect to supplement, verify or clarify information submitted through this EOI in the preparation of technical and economic assessments for the RIT-T.

Proposals that meet the eligibility criteria (section 6.1) will be evaluated using the following criteria. The criteria are not listed in any specific order and will not be accorded equal weight:

- ability to meet Transgrid's system strength requirements under the NER (Shortfall and System Strength Rule Change);
- lead time to deliver system strength services;
- magnitude of system strength services to be provided;
- total expected economic cost, and contract price to Transgrid, which will be calculated using information submitted by proponents and the expected timing, frequency, and probability of enablement. Where there are network costs associated with a proposed non-network option, these costs will form part of the option's economic assessment;
- technical feasibility of the proposed solutions(s);
- firmness/reliability of the solution proposed;
- degree to which the proponent appears capable of delivering the amount of system strength services offered within the desired timeframe for availability for those services; and
- demonstrated track record of the proponent in similar undertakings.

Given the recent commitment by State Energy Ministers to include an emissions objective in the National Electricity Objective, we propose to consider emissions implications of each option.

Transgrid is also assessing the viability of network options, specifically the installation of synchronous condensers, to address the system strength needs. This will provide one benchmark against which proposals are assessed.

Through this EOI and the related RIT-T processes, Transgrid will identify the optimal timing and requirements of non-network options and/or network options which deliver the lowest overall cost to consumers, and the highest net economic benefits.

9. EOI process and submission

9.1. General

All valid proposals will be evaluated in accordance with the process set out below:

1. Proponents will submit proposals and supporting information by email;
2. Transgrid will evaluate responses as per the criteria set out in Section 8.1; and
3. Proponents may be requested to present their complete proposal.

Where non-network solutions (i.e. services procured from third parties) form part of the preferred option selected through the RIT-T process, Transgrid intends to run a competitive procurement process (including issuing a Request for Proposal) and/or commercial negotiations to put in place network support contracts with these proponents.

Transgrid reserves the right to engage and negotiate with proponents as a result of this EOI on a bilateral basis.

9.2. EOI Process

The key milestones for this EOI are:

Milestone	Expected time frame
EOI released	16 December 2022
Information enquiries close	24 March 2023
EOI proposals close	6pm, 30 March 2023

Transgrid reserves the right to vary the timetable at any time.

Transgrid is not obliged to make an offer to contract with a proponent as a result of this EOI.

Proponents will bear all costs incurred in responding to this EOI and are not entitled to claim for reimbursement of time, materials or expenses incurred.

Transgrid will use submissions to enable an assessment and comparison of network and non-network solutions to meet system strength needs, required as part of the RIT-T process. Proponents should clearly identify any confidential or commercially sensitive information included in their proposals that they do not wish to be disclosed publicly.

9.3. EOI contact

Transgrid's representative can be contacted during the tender period for enquiries.

Jesse Steinfeld
Energy Transition Manager
Jesse.Steinfeld@transgrid.com.au

9.4. EOI submission

Transgrid invites you to propose solution(s) that can meet, or help to meet, Transgrid's system strength requirements for the NSW power system.

EOI proposals and the Returnable Schedule are to be emailed to systemstrength@transgrid.com.au **no later than 6pm, 30 March 2023.**

Attachment A – legal terms

The following high-level outline is provided to illustrate an example of the terms that may be included in a non-network support agreement. The legal terms and conditions of any non-network support agreement remain subject to the particular eligible non-network option proposed by the proponent.

Conditions precedent	Any conditions to the agreement being effective (e.g. obtaining necessary approvals and obtaining funding.) This may include target and end dates. A failure to achieve such dates may have consequences including delay damages or termination.
Conditions for supply of services	Any conditions to be satisfied before services can be supplied (e.g. equipment installation/build, commissioning, testing, services validation). This may include target and end dates. A failure to achieve such dates may have consequences including delay damages or termination.
Services Term	Period for which services will be provided. Transgrid may include options for term extension.
Services	Description of services to be provided, including: <ul style="list-style-type: none"> • Service periods • Service limitations • Technical characteristics • Metering points • Performance standards
Availability regime	A guaranteed availability regime for the service and remedy requirements and fee abatement or failure to achieve availability targets. How availability is measured will depend on the nature of the plant providing the service. Availability targets will generally be set exclusive of maintenance (i.e. planned and unplanned maintenance will be accounted for in setting the targets, e.g. with the default 95% target, the 5% allowance is inclusive of maintenance). Proponent will receive relief from force majeure events.
OSM	If a market scheduled resource, a requirement to be accredited in the OSM by AEMO and to bid into the OSM at the contracted prices and in accordance with the service requirements. Requirements to comply with OSM obligations under the NER and to cooperate with AEMO and Transgrid on OSM participation.
Charging structure	See section 6.5 (Expected system strength contract price).
Payments and invoicing	Invoicing requirements – monthly Payment terms – Transgrid requires 30 day payment terms Treatment of revenue received in the NEM for the provision of the service Acknowledgement that where AEMO is liable to pay enablement charges under the OSM, then Transgrid will not be liable for such payments GST provisions Payment dispute

Credit support	Transgrid may require credit support in certain circumstances, e.g. for delay damages or where Transgrid pays one off establishment fees.
Operations and maintenance	<p>O&M requirements, including submission of O&M plant</p> <p>Maintenance scheduling</p> <p>Performance reporting and auditing</p> <p>Performance testing and validation requirements</p> <p>Defect rectification</p> <p>Plant modifications</p> <p>Inspection rights</p> <p>Any specific obligations relating to land tenure, connection, safety, cyber security, SCADA systems</p>
Liability	<p>Limitations of liability and indemnity provisions including specific exclusions of liability from caps, standard carve-outs for ‘consequential loss’ and project phase specific liabilities.</p> <p>Transgrid has obligations under the NER, its Transmission Licence and connection agreements to ensure supply reliability and power system security is maintained to its customers. Proponents of non-network options must also be willing to accept any liability that may arise from its contribution to a failure to provide system strength services, including a consequential reliability of supply failure.</p>
Change in law	Principles for dealing with change in law
Insurance	Types and value of project specific insurances that the proponent must procure and maintain throughout the term of the agreement
Default and termination	<p>The consequences for a default under the agreement, including the right to cure any such default, suspension of obligations and treatment of accrued rights.</p> <p>The events of default will depend on the non-network option proposed, however, the agreement will include a standard set of events of default for this type of project, e.g. payment default, breach of material obligations, insolvency, prolonged force majeure and may include “bright line” termination rights for sustained failure of availability targets.</p>
“Boilerplate” provisions	Notices, knowledge sharing, dispute resolution, confidentiality, waiver, standard representations and warranties, amendments etc.
Project	Means the non-network solutions to meet or contribute to meeting system strength requirements in NSW.