

# **Summary: Maintaining compliance with performance standards applicable to Sydney East substation secondary systems**

RIT-T Project Specification Consultation Report

Region: Greater Sydney

Date of issue: 31 October 2023



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## Summary

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We are applying the Regulatory Investment Test for Transmission (RIT-T) to options for maintaining the safe and reliable operation of Sydney East Substation. Publication of this Project Specification Consultation Report (PSCR) represents the first step in the RIT-T process.

Sydney East substation was commissioned in 1976 and forms part of our network that serves the Greater Sydney area. It is a customer connection point supplying Ausgrid's 132 kV network in the area.

The area supplied by Sydney East includes the North Sydney Central Business District (CBD) and provides a base for a number of major infrastructure and transport networks including road tunnels, train networks, hospitals and data centres. These infrastructure assets require a high level of electricity reliability and security to maintain services required for Sydney to operate as a major international city. Additionally, there are large infrastructure developments or expansion plans, with many projects under construction or scheduled for the near term<sup>1</sup>.

Sydney East substation is expected to continue to play a central role in the safe and reliable operation of the power system throughout and after the transition to a low-carbon electricity future. While residential, industrial and commercial load growth in Inner Sydney has remained steady over the last few years, a significant increase is projected in the uptake of electrical vehicles, with a variety of charging modes. The other potential network impact will be due to rooftop PV panels, with generation across NSW and ACT expected to increase significantly to 8,733 GWh by 2025.<sup>2</sup>

Secondary systems assets at Sydney East substation are facing technological obsolescence, increasing the time to reactively rectify faults and increasing the risk that primary assets at the substation may not be able to reliably operate.

The purpose of this PSCR is to examine and consult on options to address the risk of secondary systems failure as a result of technological obsolescence at Sydney East substation.

### **Identified need: meet the service level required under National Electricity Rules for protection schemes**

Secondary systems are used to control, monitor, protect and secure communication to facilitate safe and reliable network operation.<sup>3</sup> They are necessary to ensure the secure operation of the transmission network and prevent damage to primary assets when adverse events occur.

The secondary system assets are subject to technological obsolescence. This means that the technology is no longer being manufactured or supported. Reactive replacement of failed secondary systems components is not sustainable and impacts our ability to meet the requirements of the National Electricity Rules (NER).

Redundant protection schemes are required to ensure the transmission system is adequately protected as outlined in the Network Performance Requirement under Schedule 5.1 of the National Electricity Rules (NER), therefore the condition issues affecting the identified protection relays on the ACT and NSW transmission network must be addressed. The Network Performance Requirements, set out in Schedule

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<sup>1</sup> Transgrid, NSW Transmission Annual Planning Report 2022, p.42

<sup>2</sup> Transgrid, NSW Transmission Annual Planning Report 2023, p.51

<sup>3</sup> As per Schedule 5.1 of the NER.

5.1 of the NER, place an obligation on Transmission Network Service Providers (TNSPs) to provide redundant protection schemes to ensure the transmission system is adequately protected. Clause 5.1.9(c) of the NER requires a TNSP to provide sufficient primary and back-up protection systems (including breaker fail protection systems), to ensure that a fault of any type anywhere on its transmission system is automatically disconnected.

Additionally, TNSPs are required to disconnect the unprotected primary systems where secondary systems fault lasts for more than eight hours (for planned maintenance) or 24 hours (for unplanned outages). TNSPs must also ensure that all protection systems for lines at a voltage above 66 kV are well-maintained so as to be available at all times other than for short periods (less than eight hours), while the maintenance of protection systems is being carried out.<sup>4</sup>In the event of an unplanned outage, AEMO's Power System Security Guidelines require that the primary network assets must be taken out of service within 24 hours<sup>5</sup>.

Furthermore, as per clause 4.11.1 of the NER, remote monitoring and control systems are required to be maintained in accordance with the standards and protocols determined and advised by AEMO.

A failure of the secondary systems would involve replacement of the failed component or removing the affected primary assets, such as lines and transformers, out of service. Though replacement of failed secondary systems component is a possible interim measure, the approach is not sustainable as the stock of spare components will deplete due to the technology no longer being manufactured or supported. Once all spares are used, replacement will cease to be a viable option to meet performance standards stipulated in clause 4.6.1 of the NER.

If the failure to provide functional secondary systems due to technology obsolescence is not addressed by a technically and commercially feasible credible option in sufficient time (by 2027/28), the likelihood of not recovering from secondary systems faults and not maintaining compliance with NER performance requirements will increase.

The proposed investment will enable us to continue to meet the standards for secondary systems availability set out in the NER, and to avoid the impacts of taking primary assets out of service. Consequently, it is considered a reliability corrective action under the RIT-T.

A reliability corrective action differs from a 'market benefits'-driven RIT-T in that the preferred option is permitted to have negative net economic benefits on account of it being required to meet an externally imposed obligation on the network business.

## **Two credible network options have been identified**

We have identified two credible network option that meet the identified need from a technical, commercial, and project delivery perspective.<sup>6</sup> These options are summarised in Table E-1 below.

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<sup>4</sup> As per S5.1.2.1(d) of the NER.

<sup>5</sup> AEMO. "Power System Security Guidelines, 9 March 2023." Melbourne: AEMO, 2023.23. Accessed 6 September 2023.

<sup>6</sup> As per clause 5.15.2(a) of the NER.

Table E-1: Summary of the credible options

Option	Description	Capital costs (\$M, 2021-22)	Operating costs (\$/yr, 2021-22)
Option 1	Replacement of individual assets	17.55	10,548
Option 2	Complete in-situ replacement	26.53	10,548

Assets with deteriorating condition to be replaced include protection relays, control systems and metering systems. See Appendix B for a full list of assets to be replaced under Option 1.

### Non-network options are not expected to be able to assist with this RIT-T

We do not consider non-network options to be commercially and technically feasible to assist with meeting the identified need for this RIT-T. Non-network options are not able to meet NER obligations to provide redundant protection schemes (secondary systems) and ensure that the transmission system is adequately protected.

### The options have been assessed against three reasonable scenarios

The credible options have been assessed under three scenarios as part of this Project Specification Consultation Report (PSCR) assessment, which differ in terms of the key drivers of the estimated net market benefits (ie, the estimated risk costs avoided).

Given that wholesale market benefits are not relevant for this RIT-T, the three scenarios assume the most likely scenario from AEMO's Integrated System Plan (ISP) (ie, the 'Step Change' scenario). The scenarios differ by the assumed level of risk costs, given that these are key parameters that may affect the ranking of the credible options. Risk cost assumptions do not form part of AEMO's ISP assumptions and have been based on Transgrid's analysis.

Table E-2 Summary of scenarios

Variable / Scenario	Central	Low risk cost scenario	High risk cost scenario risk
Scenario weighting	1/3	1/3	1/3
Discount rate	7%	7%	7%
VCR (\$2022-23)	\$49,216/MWh	\$49,216/MWh	\$49,216/MWh
Network capital costs	Base estimate	Base estimate	Base estimate
Operating and maintenance costs	Base estimate	Base estimate	Base estimate
Environmental, safety and financial risk benefit	Base estimate	Base estimate – 25%	Base estimate + 25%
Avoided unserved energy	Base estimate	Base estimate – 25%	Base estimate + 25%

The sensitivity analysis presented in this PSCR demonstrates how the NPV results are affected by changes to other variables, including the discount rate and capital costs.

## **Option 2 delivers the highest net economic benefit and will meet NER requirements**

We have assessed that Option 2 is net beneficial under all three reasonable scenarios considered in this PSCR. On a weighted basis, where each scenario is weighted equally, Option 2 is expected to deliver net benefits of approximately \$0.35 million. Option 2 will also enable us to meet a range of obligations under the NER and jurisdictional instruments (which is not expected to be the case under the base case), including obligations set out in Schedule 5.1 of the NER to provide redundant secondary systems and ensure that the transmission system is adequately protected.

### **Draft Conclusion**

This PSCR finds that Option 2 is the preferred option to address the identified need. Option 2 involves replacement of all secondary systems at the site. This option will adopt an automation philosophy consistent with current design standards and practices. This option also includes replacement of Direct Current (DC) supplies to account for an increase in secondary systems power requirements and remediation of the 415 V Alternating Current (AC) distribution in the building and switchyard.

The condition of various categories of automation assets such as protection relays, control systems, AC distribution, DC supply systems, and market meters creates a need for modernisation. This will deliver benefits such as reduced preventative maintenance requirements, improved operational efficiencies, better utilisation of our high-speed communications network, improved visibility of assets using modern technologies and reduced reliance on routine maintenance and testing. There are also additional operational benefits available to improved remote monitoring, control and interrogation, efficiency gains in responding to faults, and phasing out of obsolete and legacy systems and protocols.

The capital cost of this option is approximately \$26.53 million (in \$2021-22). The work will be undertaken in stages over a five-year period with all works expected to be completed by 2027/28. Routine operating and maintenance costs are estimated to be approximately \$10,548 per annum (in \$2021-22).

### **Exemption from preparing a Project Assessment Draft Report**

Subject to additional credible options being identified during the consultation period, publication of a Project Assessment Draft Report (PADR) is not required for this RIT-T as we consider its investment in relation to the preferred option to be exempt from that part of the process under NER clause 5.16.4(z1). Production of a PADR is not required due to:

- the estimated capital cost of the proposed preferred option being less than \$46 million<sup>7</sup>;
- the PSCR states:
  - the proposed preferred option, together with the reasons for the proposed preferred option;
  - the RIT-T is exempt from producing a PADR; and
  - the proposed preferred option and any other credible option will not have a material market benefit for the classes of market benefit specified in clause 5.15A.2(b)(4), with the exception of market benefits arising from changes in voluntary and involuntary load shedding except for voluntary load curtailment and involuntary load shedding;
- the RIT-T proponent considers that there were no PSCR submissions identifying additional credible options that could deliver a material market benefit; and

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<sup>7</sup> Varied from \$43m to \$46m based on the [AER Final Determination: Cost threshold review](#) November 2021.

- the PACR must address any issues raised in relation to the proposed preferred option during the PSCR consultation.

We consider the investment in relation to Option 1 and Option 2 meets these criteria and therefore that we are exempt from producing a PADR under NER clause 5.16.4(z1).

In accordance with NER clause 5.16.4(z1)(4), the exemption from producing a PADR will no longer apply if we consider that an additional credible option that could deliver a material market benefit is identified during the consultation period.

Accordingly, if we consider that any additional credible options are identified, we will produce a PADR which includes an NPV assessment of the net market benefit of each additional credible option.

Should we consider that no additional credible options were identified during the consultation period, we intend to produce a PACR that addresses all submissions received, including any issues in relation to the proposed preferred option raised during the consultation period, and presents our conclusion on the preferred option for this RIT-T.

## **Submissions and next steps**

We welcome written submissions on materials contained in this PSCR.

Submissions are due on 31 January 2024<sup>8</sup> and should be emailed to our Regulation team via [regulatory.consultation@Transgrid.com.au](mailto:regulatory.consultation@Transgrid.com.au).<sup>9</sup> In the subject field, please reference 'Sydney East Secondary Systems PSCR.' At the conclusion of the consultation process, all submissions received will be published on our website. If you do not wish for your submission to be made public, please clearly specify this at the time of lodgement.

Should we consider that no additional credible options were identified during the consultation period, we intend to produce a PACR that addresses all submissions received including any issues in relation to the proposed preferred option raised during the consultation period. Subject to additional credible options being identified, we anticipate publication of a PACR in February 2024.

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<sup>8</sup> Consultation period is for 12 weeks, additional days have been added to cover public holidays

<sup>9</sup> Transgrid is bound by the Privacy Act 1988 (Cth). In making submissions in response to this consultation process, Transgrid will collect and hold your personal information such as your name, email address, employer and phone number for the purpose of receiving and following up on your submissions. If you do not wish for your submission to be made public, please clearly specify this at the time of lodgement. See Privacy Notice within the Disclaimer for more details.