

Summary: Maintaining compliance with performance standards applicable to Ingleburn substation secondary systems

RIT-T Project Specification Consultation Report

Region: Greater Sydney

Date of issue: 15 November 2021



Disclaimer

This suite of documents comprises Transgrid's application of the Regulatory Investment Test for Transmission (RIT-T) which has been prepared and made available solely for information purposes. It is made available on the understanding that Transgrid and/or its employees, agents and consultants are not engaged in rendering professional advice. Nothing in these documents is a recommendation in respect of any possible investment.

The information in these documents reflect the forecasts, proposals and opinions adopted by Transgrid at the time of publication, other than where otherwise specifically stated. Those forecasts, proposals and opinions may change at any time without warning. Anyone considering information provided in these documents, at any date, should independently seek the latest forecasts, proposals and opinions.

These documents include information obtained from the Australian Energy Market Operator (AEMO) and other sources. That information has been adopted in good faith without further enquiry or verification. The information in these documents should be read in the context of the Electricity Statement of Opportunities, the Integrated System Plan published by AEMO and other relevant regulatory consultation documents. It does not purport to contain all of the information that AEMO, a prospective investor, Registered Participant or potential participant in the National Electricity Market (NEM), or any other person may require for making decisions. In preparing these documents it is not possible, nor is it intended, for Transgrid to have regard to the investment objectives, financial situation and particular needs of each person or organisation which reads or uses this document. In all cases, anyone proposing to rely on or use the information in this document should:

1. Independently verify and check the currency, accuracy, completeness, reliability and suitability of that information
2. Independently verify and check the currency, accuracy, completeness, reliability and suitability of reports relied on by Transgrid in preparing these documents
3. Obtain independent and specific advice from appropriate experts or other sources.

Accordingly, Transgrid makes no representations or warranty as to the currency, accuracy, reliability, completeness or suitability for particular purposes of the information in this suite of documents.

Persons reading or utilising this suite of RIT-T-related documents acknowledge and accept that Transgrid and/or its employees, agents and consultants have no liability for any direct, indirect, special, incidental or consequential damage (including liability to any person by reason of negligence or negligent misstatement) for any damage resulting from, arising out of or in connection with, reliance upon statements, opinions, information or matter (expressed or implied) arising out of, contained in or derived from, or for any omissions from the information in this document, except insofar as liability under any New South Wales and Commonwealth statute cannot be excluded.

Privacy notice

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.

Under the National Electricity Law, there are circumstances where Transgrid may be compelled to provide information to the Australian Energy Regulator (AER). Transgrid will advise you should this occur.

Transgrid's Privacy Policy sets out the approach to managing your personal information. In particular, it explains how you may seek to access or correct the personal information held about you, how to make a complaint about a breach of our obligations under the Privacy Act, and how Transgrid will deal with complaints. You can access the Privacy Policy here (<https://www.transgrid.com.au/Pages/Privacy.aspx>).

Summary

Transgrid is applying the Regulatory Investment Test for Transmission (RIT-T) to options for maintaining reliable secondary systems at Ingleburn substation. Publication of this Project Specification Consultation Report (PSCR) represents the first step in the RIT-T process.

Ingleburn substation will 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. It forms part of the Greater Sydney network which supports the flow of energy between generation in the Central West of NSW and the southern suburbs of Sydney. Ingleburn substation is a customer connection point supplying the Endeavour Energy 66 kV network in the area inclusive of Macquarie Fields and Minto, supply major infrastructure and a growing residential population in the area.

Transgrid has identified that the secondary systems at Ingleburn substation have reached a condition that reflects the end of serviceable life. As it is superseded by new technology at the manufacturer level and the existing technology becomes obsolete, spare parts become scarce and the ability of any primary asset connected to the substation to reliably operate will be at risk.

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

Secondary systems are used to control, monitor, protect and secure communication to facilitate safe and reliable network operation.¹ They are necessary to operate the transmission network and prevent damage to primary assets when adverse events occur.

Provision of redundant protection schemes to ensure the transmission system is adequately protected is a Network Performance Requirement under Schedule 5.1 of the National Electricity Rules (NER), therefore the condition issues affecting the secondary systems at Ingleburn substation must be addressed.

The Network Performance Requirements, set out in Schedule 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. Schedule 5.1.9(c) of the NER requires a TNSP to provide sufficient primary and back-up protection systems, including any communications facilities and 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.² 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.³

¹ As per Schedule 5.1 of the NER.

² As per S5.1.2.1(d) of the NER.

³ Australian Energy Market Operator. "Power System Security Guidelines, 7 April 2021." Melbourne: Australian Energy Market Operator, 2021.35. Accessed 22 June 2021. https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/power_system_ops/procedures/so_op_3715-power-system-security-guidelines.pdf?la=en

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 taking 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 2022/23), the likelihood of not recovering from secondary systems faults and not maintaining compliance with NER performance requirements will increase.

The proposed investment will enable Transgrid 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.

Credible options considered

In this PSCR, Transgrid has put forward for consideration credible options that would meet the identified need from a technical, commercial, and project delivery perspective.⁴

These are summarised in the following table.

Table 1 Summary of the credible options

Option	Description	Capital cost (\$m 2021/22)	Operating costs (\$ per year)	Remarks
Option 1	Complete in-situ replacement	~ 7.4 (+/- 25%)	~ 3,000	Preferred option, would maintain regulatory obligations and provide highest net economic benefits.
Option 2	IEC-61850 replacement ⁵	~ 12.7 (+/- 25%)	~ 10,000	Would maintain regulatory obligations but

⁴ As per clause 5.15.2(a) of the NER.

⁵ International Electrotechnical Commission (IEC), “IEC 61850 standard for Power Utility Automation,” accessed 14 May 2020. <http://www.iec.ch/smartgrid/standards/>

Option	Description	Capital cost (\$m 2021/22)	Operating costs (\$ per year)	Remarks
Option 3	Strategic asset replacement	~ 2.4 (+/- 25%) by 2022/23 and ~5.4 (+/- 25%) spread between 2023/24 and 2034/35	~ 3,000	provide less benefits.

Non-network options are not able to assist in this RIT-T

Transgrid does 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 secondary systems and ensure that the transmission system is adequately protected.

Implementing Option 1 will meet relevant regulatory obligations

Implementation of Option 1 will enable Transgrid to meet regulatory obligations set out in Schedule 5.1 and clauses 4.11.1, 4.6.1(b)⁶ of the NER to provide redundant secondary systems and ensure that the transmission system is adequately protected. Consequently, it will also ensure the performance standards applicable to Ingleburn substation secondary systems are met.

Option 1 delivers highest net economic benefits

In considering all scenarios, the highest weighted net economic benefits result from implementing Option 1. Option 1 is the most efficient option to ensure reliability of the secondary systems at Ingleburn substation and mitigate its risks of prolonged failure. Sensitivity testing finds that Option 1 delivers the most net economic benefits under all sensitivities undertaken by Transgrid. Option 1 will also mitigate the risk posed by flooding at the site.

Draft conclusion

The implementation of Option 1, complete in-situ replacement of the secondary systems at Ingleburn substation, is the most efficient technically and commercially feasible option at this draft stage of the RIT-T process. Option 1 can be implemented in sufficient time to meet the identified need by 2022/23, and is therefore the preferred option presented in this PSCR.

The estimated capital cost of this option is approximately \$7.4 million. Routine operating and maintenance costs are approximately \$3,000 per year.

The works will be undertaken between 2021/22 and 2022/23. Planning (including commencement of the RIT-T) commenced in 2020/21 and is due to conclude in 2021/22. The detailed design will commence in

⁶ As per clause 4.6.1(b) of the NER, AEMO must ensure that there are processes in place that will allow the determination of fault levels for normal operation of the power system and in anticipation of all credible contingency events and protected events that AEMO considers may affect the configuration of the power system, so that AEMO can identify any busbar which could potentially be exposed to a fault level which exceeds the fault current ratings of the circuit breakers associated with that busbar.

2021/22 with procurement and delivery of the identified assets planned to occur during 2021/22. All works will be completed by 2022/23.

Necessary outages of relevant existing assets will be planned appropriately in order to complete the works with minimal impact on the network.

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 Transgrid considers 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 \$43 million⁷;
- the PSCR states:
 - the proposed preferred option (including reasons for the proposed preferred option)
 - the RIT-T is exempt from producing a PADR
 - the proposed preferred option and any other credible option will not have material market benefits⁸ 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
- the PACR must address any issues raised in relation to the proposed preferred option during the PSCR consultation.

Submissions and next steps

The purpose of this PSCR is to set out the reasons Transgrid proposes that action be taken, present the options that address the identified need, outline the technical characteristics that non-network options will need to provide, and allow interested parties to make submissions and provide input to the RIT-T assessment.

Transgrid welcomes written submissions on materials contained in this PSCR. Submissions are particularly sought on the credible options presented and from potential proponents of non-network options that could meet the technical requirements set out in this PSCR. Submissions are due on 14 February 2022.

Submissions should be emailed to Transgrid's Regulation team via RIT-TConsultations@transgrid.com.au.⁹ In the subject field, please reference 'Ingleburn secondary systems PSCR.'

⁷ Varied from \$35m to \$43m based on the AER Final Determination: Cost threshold review November 2018.14. Accessed 20 May 2020 <https://www.aer.gov.au/netw orks-pipelines/guidelines-schemes-models-reviews/cost-thresholds-review-for-the-regulatory-investment-tests-2018>

⁸ As per clause 5.16.1(c)(6)

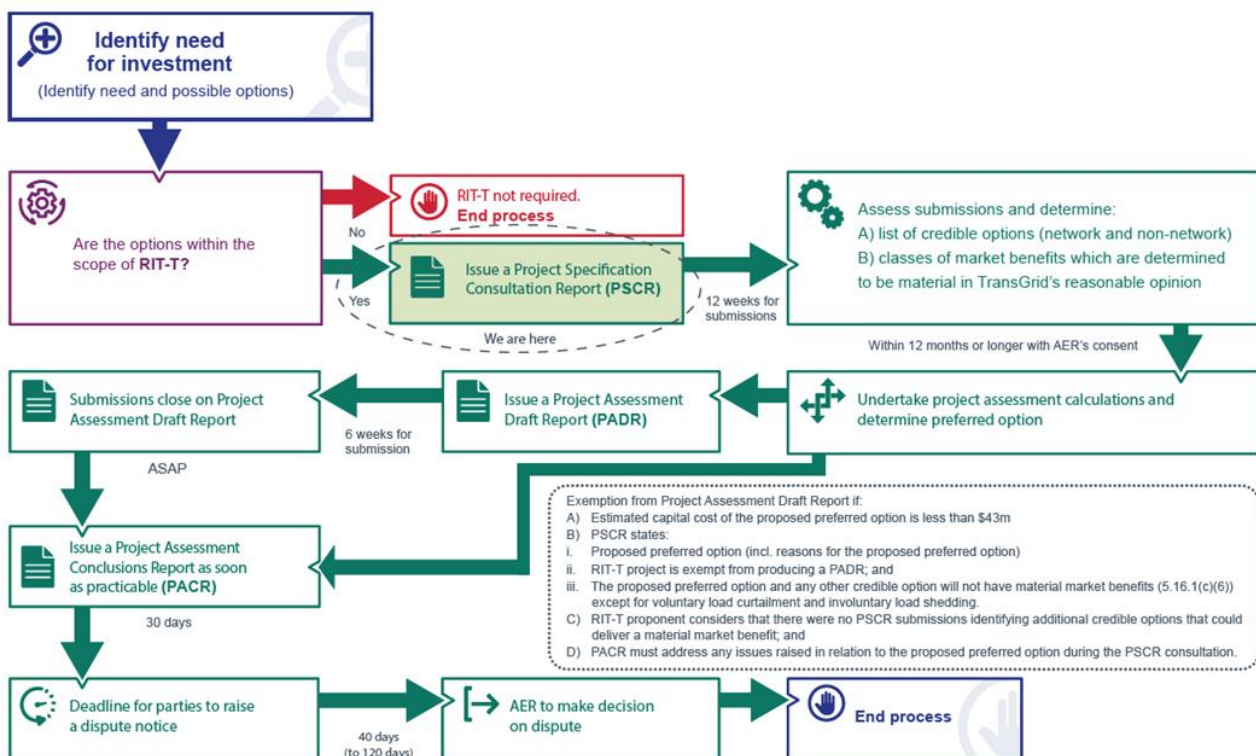
⁹ Transgrid is bound by the Privacy Act 1988 (Cth). In making submissions in response to this consultation process, Transgrid will collect and hold your personal information such as your name, email address, employer and phone number for the purpose of receiving and following up on your submissions. 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.

At the conclusion of the consultation process, all submissions received will be published on Transgrid’s website. If you do not wish for your submission to be made public, please clearly specify this at the time of lodgement.

Should Transgrid consider that no additional credible options were identified during the consultation period, Transgrid intends to produce a Project Assessment Conclusions Report (PACR) that addresses all submissions received including any issues in relation to the proposed preferred option raised during the consultation period.¹⁰ Subject to additional credible options being identified, Transgrid anticipates publication of a PACR in March 2022.

To read the full Project Specification Consultation Report visit [Transgrid’s website](#).

Figure 1 ThisPSCR is the first stage of the RIT-T process¹¹



¹⁰ In accordance with NER clause 5.16.4(z2).

¹¹ Australian Energy Market Commission. “Replacement expenditure planning arrangements, Rule determination”. Sydney: AEMC, 18 July 2017.65. Accessed 14 May 2020. <https://www.aemc.gov.au/sites/default/files/content/89fbf559-2275-4672-b6ef-c2574eb7ce05/Final-rule-determination.pdf>