



TransGrid

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

RIT-T Project Assessment Conclusions Report

Region: Greater Sydney

Date of issue: 3 June 2020

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 National Transmission Network Development 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 this document
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 Haymarket substation. Publication of this Project Assessment Conclusions Report (PACR) represents the final step in the RIT-T process.

Along with other key substations including Rookwood Road and Beaconsfield, Haymarket substation forms part of TransGrid's network that serves the Sydney Central Business District (CBD). It will continue to play a central role in supporting the growing need¹ of Australia's largest commercial district.

TransGrid has identified that the secondary systems at Haymarket 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.² 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 Haymarket 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.³ 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.⁴

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.

¹ TransGrid. "Transmission Annual Planning Report 2019." Sydney: TransGrid, 2019. 81. Accessed 18 February, 2020. <https://www.transgrid.com.au/what-we-do/Business-Planning/transmission-annual-planning/Documents/2019%20Transmission%20Annual%20Planning%20Report.pdf>

² As per Schedule 5.1 of the NER.

³ As per S5.1.2.1(d) of the NER.

⁴ Australian Energy Market Operator. "Power System Security Guidelines, 20 September 2019." Melbourne: Australian Energy Market Operator, 2019.39 Accessed 15 May 2020. https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3715---Power-System-Security-Guidelines.pdf

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.

No submissions received in response to Project Specification Consultation Report

TransGrid published a Project Specification Consultation Report (PSCR) on 27 May 2019 and invited written submissions on the material presented within the document. No submissions were received in response to the PSCR.

No material developments since publication of the PSCR

No additional credible options were identified during the consultation period following publication of the PSCR.

The following changes have occurred since the PSCR which have not made an impact on the preferred option:

- > updated the discount rates used
- > inflation escalation update (including capex)
- > included benefits associated with reductions in risk costs in the NPV analysis

Option 1 remains the preferred option at this stage of the RIT-T process.

Combined on-site replacement of protection and control systems remains the most prudent and economically efficient option to meet regulatory obligations

In the PSCR TransGrid put forward for consideration two technically and commercially feasible options:

- > **Option 1** – combined on-site replacement of protection and control systems; and
- > **Option 2** – independent on-site replacement of protection and control systems

Option 1 remains the most prudent and economically efficient option to address the identified need. Implementation of Option 1 will enable TransGrid to continue meeting its regulatory obligations set out in clauses 4.11.1, 4.6.1(b),⁵ and Schedule 5.1 of the NER. Consequently, it will ensure the performance standards

⁵ As per clause 4.6.1(b) of the NER, AEMO must ensure that there are processes in place, which 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.

applicable to Haymarket substation secondary systems are met and is therefore the preferred option for this RIT-T.

TransGrid expects coronavirus (COVID-19) to impact its suppliers and disrupt their supply chains. TransGrid has preliminary advice that this is already occurring, although at this time the extent of the current or future impact is unknown. Consequently, some of the costs associated with the works outlined in this document may be affected.

All costs presented in this PACR are in 2019/20 dollars. The options are summarised in the table below.

Table 1 Options considered

| Option | Description | Capital costs (\$m 2019/20) | Operating costs (\$ per year) | Remarks |
|----------|---|-----------------------------|-------------------------------|---|
| Option 1 | Combined on-site replacement of protection and control systems | ~12.1 (+/-25%) | ~7,000 | Preferred option, would maintain regulatory obligations and provide highest net economic benefits |
| Option 2 | Independent on-site replacement of protection and control systems | ~12.7 (+/-25%) | ~7,000 | Would maintain regulatory obligations but provide less benefits |

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

In the PSCR, TransGrid noted that non-network options are not considered to be commercially and technically feasible to assist with meeting the identified need for this RIT-T. This is because non-network options will not enable TransGrid to continue meeting its NER obligation to provide redundant secondary systems and ensure that the transmission system is adequately protected.

Conclusion: combined on-site replacement of protection and control systems is optimal

The optimal commercially and technically feasible option presented in the PSCR – Option 1 (combined on-site replacement of protection and control systems) – remains the preferred option to meet the identified need. 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 PACR.

Moving forward with this option is the most prudent and economically efficient solution to enable TransGrid to continue meeting its regulatory obligations set out in clauses 4.11.1, 4.6.1(b),⁶ and Schedule 5.1 of the NER. Consequently, it will ensure the performance standards applicable to Haymarket substation secondary systems are met.

⁶ As per clause 4.6.1(b) of the NER, AEMO must ensure that there are processes in place, which 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.

Option 1 involves an on-site upgrade and renewal (replacement) of the protection and control systems at Haymarket substation to combined systems which eliminates the need for standalone remote monitoring and control units. Efficiencies will be leveraged by reusing the existing building, tunnel boards, and the cabling where practicable.

The estimated capital cost of this option is approximately \$12.1 million. Routine and operating maintenance costs are approximately \$7,000 per year.

The works will be undertaken between 2019/20 and 2022/23. Planning and procurement (including completion of the RIT-T) commenced in 2019/20 and is due to conclude in 2020/21. The procurement and delivery of the identified assets is planned to occur in 2021/22 all works will be completed by 2022/23.

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

The analysis undertaken and the identification of Option 1 as the preferred option satisfies the RIT-T. Option 1 is the preferred option in accordance with NER clause 5.16.1(b) because it is the credible option that maximises the net present value of the net economic benefit to all those who produce, consume and transport electricity in the market. This preferred option, Option 1, was found to have the highest net economic benefit or least cost while also maintaining compliance with regulatory and safety obligations. TransGrid also conducted sensitivity analysis on the net economic benefit to investigate the robustness of the conclusion to key assumptions. TransGrid finds that under all sensitivities, Option 1 delivers the most benefit.

Next steps

This PACR represents the third and final step of the consultation process in relation to the application of the Regulatory Investment Test for Transmission (RIT-T) process undertaken by TransGrid. It follows a Project Specification Consultation Report (PSCR) released in May 2019. No submissions were received in response to the PSCR.

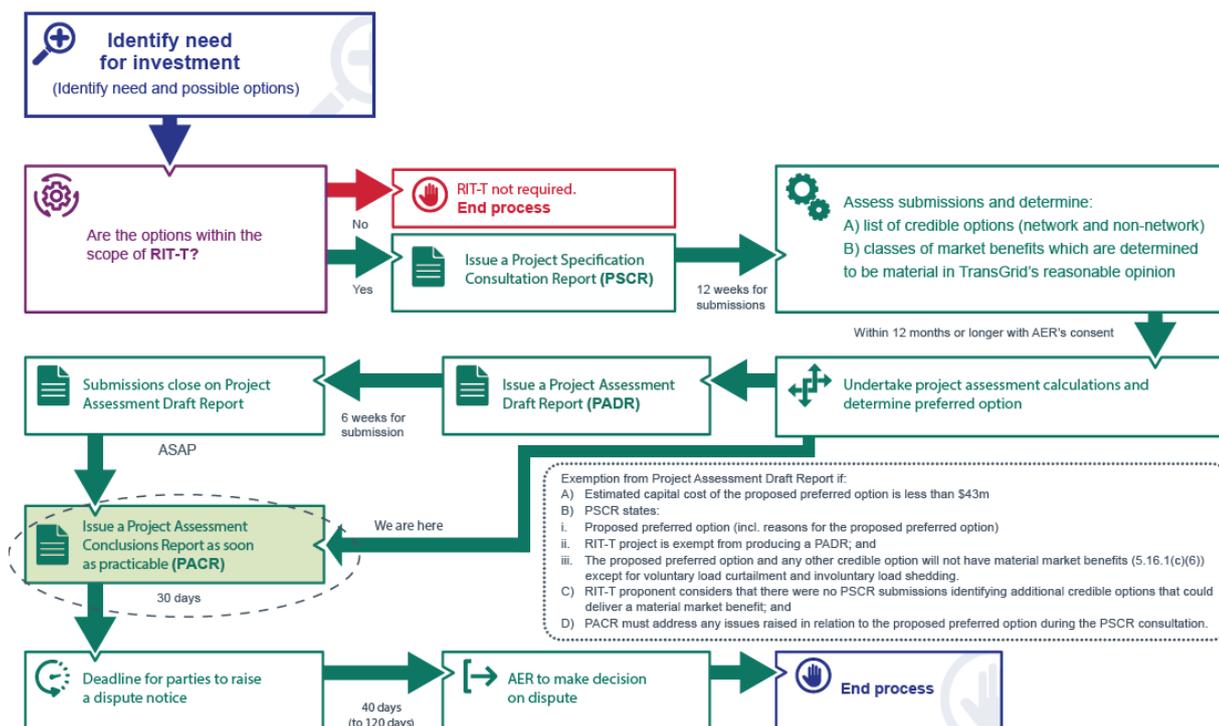
The second step, production of a Project Assessment Draft Report (PADR), was not required as the investment in relation to the preferred option is exempt from this part of the RIT-T process under NER clause 5.16.4(z1). Production of a PADR is not required⁷ due to:

- > the estimated capital cost of the proposed preferred option being less than \$43 million;
- > the PSCR stated:
 - the proposed preferred option (including reasons for the proposed preferred option)
 - 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
- > RIT-T proponent considers that there were no PSCR submissions identifying additional credible options that could deliver a material market benefit; and
- > PACR must address any issues raised in relation to the proposed preferred option during the PSCR consultation.

⁷ In accordance with NER clause 5.16.4(z1)(4), the exemption from producing a PADR will no longer apply if TransGrid considers that an additional credible option that could deliver a material market benefit is identified during the consultation period. No additional credible options were identified.

⁸ As per clause 5.16.1(c)(6)

Figure 1 This PACR is the third stage of the RIT-T process⁹



Parties wishing to raise a dispute notice with the AER may do so prior to 3 July 2020 (30 days after publication of this PACR). Any dispute notices raised during this period¹⁰ will be addressed by the AER within 40 to 120 days, after which the formal RIT-T process will conclude.

Further details on the RIT-T can be obtained from TransGrid's Regulation team via RIT-TConsultations@transgrid.com.au. In the subject field, please reference 'Haymarket Secondary Systems PACR'.

To read the full Project Assessment Conclusions Report visit the [Regulatory Investments Test page](#) on TransGrid's website.

⁹ Australian Energy Market Commission. "Replacement expenditure planning arrangements, Rule determination". Sydney: AEMC, 18 July 2017.65. Accessed 19 November 2019. <https://www.aemc.gov.au/sites/default/files/content/89fbf559-2275-4672-b6ef-c2574eb7ce05/Final-rule-determination.pdf>

¹⁰ Additional days have been included to cover public holidays.