

Summary: Managing safety and environmental risks on Line 25 & Line 26 (Vineyard – Munmorah)

RIT-T – Project Assessment Draft Report

Region: Greater Sydney

Date of issue: 22 January 2020

Summary

TransGrid is applying the Regulatory Investment Test for Transmission (RIT-T) to options for mitigating safety and environmental risks caused by the deteriorating condition of Line 25 and Line 26. Publication of this Project Assessment Draft Report (PADR) represents the second step in the RIT-T process.

Lines 25 and Line 26 are two key 330 kV transmission lines from the Central Coast to Sydney. Spanning a route of 109 km, Line 25 connects Eraring substation on the Central Coast and Vineyard substation on the Greater Sydney network. Line 26 spans 123 km and runs between Munmorah substation on the Central Coast and Sydney West substation on the Greater Sydney network.

This RIT-T relates to single circuit section of Line 26, as well as the double circuit section of Line 25 and Line 26 between transmission Structure 11 and the Vineyard substation.

The route of the single circuit section of Line 26 runs between Munmorah and Vales Point, with the 7 km route constructed in 1962 and consists of 24 structures. This part of Line 26 traverses land that is in close proximity to the ocean, lakes and power stations. The double circuit section between transmission Structure 11 and Vineyard substation was constructed in 1965, with the 93km route encompassing 262 structures. This portion of Line 25 and Line 26 traverses National Parks, heavily timbered ridgetops, rural areas and suburban areas as it enters the Sydney basin. There are also several major road and rail crossings, as well as numerous local road crossings, along the length of the route.

The transmission lines are part of the network that connects more than 4,000 MW of existing generators north of Sydney (Central Coast, Upper Hunter and northern NSW) and the major load centre of Sydney. They will continue to play a central role in supporting the flow of energy between regions to take advantage of naturally-diverse weather patterns, and in the safe and reliable operation of the power system throughout and after the transition to a low-carbon electricity future.

Corrosion-related issues that will impact the safe and reliable operation of the network have been found on Line 25 and Line 26. The condition issues raise a number of risks associated with asset failure, including safety and environmental (bushfire) risks.

Table 1 Condition issues along Line 25 & Line 26 and their consequences – single circuit and double circuit sections

Issue	Consequences if not remediated
Corrosion of tower steel members	Steel corrosion, particularly of critical members, can lead to structural failure of tower
Buried concrete foundations	Accelerated corrosion of critical member
Corrosion of earth straps	Earthing safety hazard
Corroded fasteners	Structural failure
Corroded insulators	Conductor drop
Corroded conductor attachment fittings	Conductor drop
Corrosion of earth wire attachment fittings	Conductor drop
Conductor dampers	Accelerated conductor fatigue due to vibration
Corroded ladder and step bolts	Field crew injury or fatality

As the asset condition deteriorates over time, the likelihood of failure and subsequent risks may increase should these issues not be addressed.

Identified Need: managing safety and environmental risks from corrosion on Line 25 and Line 26

The proposed investment will enable TransGrid to manage safety and environmental risks on Line 25 and Line 26. Options considered under this RIT-T have been assessed relative to a base case. Under the base case, no proactive capital investment is made and the condition of Line 25 and Line 26 will continue to deteriorate.

TransGrid calculates that the safety and environmental risk costs associated with the condition deterioration and corrosion of Line 25 and Line 26 are approximately \$7.5m per year. Further condition deterioration of the affected assets due to corrosion would mean an increase in bushfire and safety risks along Line 25 and Line 26 as the likelihood of failure increases. If left untreated, corrosion of some of the vital components of the steel towers could result in incidents such as conductor drop and tower collapse. Such incidents could have serious safety consequences for nearby residents and members of the public, as well as TransGrid field crew members who may be working on or near the assets. The lines traverse farmlands and national parks, increasing the risk of bushfire from a conductor drop. The consequence of the bushfire is further magnified by its proximity to the urban areas on the outskirts of Sydney and the Central Coast.

TransGrid manages and mitigates bushfire and safety risk to ensure they are below risk tolerance levels or 'As Low As Reasonably Practicable' ('ALARP'), in accordance with TransGrid's obligations under the New South Wales Electricity Supply (Safety and Network Management) Regulation 2014 and TransGrid's Electricity Network Safety Management System (ENSMS).¹

The proposed investment will enable TransGrid to continue to manage and operate this part of the network to a safety and risk mitigation level of ALARP. 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 16 October 2018 and invited written submissions on the material presented within the document. In the PSCR TransGrid presented a range of potential network options to address the identified need. The options included: a program of work to refurbish Line 25 and Line 26; staging the delivery of the remediation work over multiple years; replacing Line 25 and Line 26; and decommissioning the lines. The program of work to refurbish Lines 25 and Line 26 (Option 1) is comprised of replacement of asset components, remediation of steelwork and foundations.² Of the options considered, this is the only option that was found to be commercially and technically feasible.

The refurbishment of Line 25 and Line 26 is the preferred option presented in this PADR. The other options put forward for consideration in the PSCR were estimated to cost significantly more than the preferred option without any additional benefit. Therefore, at the time of the PSCR assessment, they were found to be inferior.

TransGrid also considered and outlined alternate timings for delivery in the PSCR, however it was concluded that the optimal works delivery date is as soon as practicable, proposed for 2021/22.

¹ TransGrid's ENSMS follows the International Organization for Standardization's ISO31000 risk management framework which requires following hierarchy of hazard mitigation approach

² This RIT-T does not include removal of asbestos paint using solvents. This work will be undertaken outside of this RIT-T.

Developments since publication of the PSCR

At the time the PSCR was published, TransGrid's cost estimate for refurbishing Line 25 and Line 26 was primarily based on a desktop assessment of the activity required to refurbish the line. TransGrid has since undertaken detailed inspections of the asset involving extensive climbing of every structure to further develop the scope. The inspections determined the quantum and extent of the condition issues has increased from TransGrid initial outline noted in the PSCR in October 2018.

Due to the issues described above, the cost estimate of refurbishing Line 25 and Line 26 in the PSCR (\$6.7 million +/- 25 per cent) is not adequate to cover the scope of Option 1 and has been revised accordingly.

As a result of the condition of the asset being further deteriorated than expected, the associated estimates proposed to remediate those issues has been revised to factor in:

- > increase in identified condition issues and associated increase in the required scope of works
- > revision of pricing rates to reflect the latest market conditions.

The revised capital expenditure estimate is now \$23 million +/- 25 per cent. The risk cost estimate has also been updated from \$1.3 million per year to \$7.5 million per year to reflect the current extent of the condition issues and expected continued deterioration of the structures.

No additional credible options were identified during the consultation period following publication of the PSCR. TransGrid has recalculated the NPV analysis for this PADR using the updated estimate for capital expenditure and risk cost benefits for Option 1.

Option 1, refurbishing Line 25 and Line 26, remains the preferred option at this stage of the RIT-T process.

TransGrid considers refurbishing Line 25 and 26 is the only credible network option

In the PSCR TransGrid put forward for consideration one technically and commercially feasible option: refurbishing the existing line by remediating or replacing the identified components. This option (Option 1) involves the refurbishment of Line 25 and Line 26 including replacement of asset components, earthwire, remediation of steelwork and foundations.³ No submissions were received in response to this PSCR and no additional credible options have been identified.

The primary driver for the identified need is to mitigate bushfire and safety risks associated with condition issues on Line 25 and Line 26 caused by corrosion. Three other options to address the need were considered but were not progressed further as they were not commercially viable when assessed against the preferred option.

This RIT-T may include assets in areas which are currently experiencing ongoing bushfire events. The impact of these bushfires may affect some of the costs associated with the works outlined in this document. TransGrid will not be able to determine the extent of the impact or the effect on those costs until further inspection work is undertaken.

The options are summarised in the table below.

All costs presented in this PADR are in 2019/20 dollars.

³ This RIT-T does not include removal of asbestos paint using solvents. This work will be undertaken outside of this RIT-T.

Table 2 Options considered

Option	Description	Capital costs (\$m)	Operating costs (\$ per year)	Remarks
Option 1	Refurbishment of Line 25 and Line 26	23 (± 25%)	\$280,000	Most economical and preferred option
Option 2	Staged delivery of Option 1 over multiple years	Not costed	Not considered	There are cost efficiencies associated with replacing all identified components in one year, as opposed to spreading this out across multiple years. In addition, delaying the replacement of any components comes with a greater expected risk value. The combination of greater costs and less expected benefits (in terms of avoided risk costs) makes this option less commercially feasible relative to Option 1. This option was not progressed.
Option 3	Replacement of Line 25 and Line 26	~ 150 million	Not considered	The capital cost of replacing the entire line is estimated to be significantly higher than Option 1, about \$150 million, but will not provide any additional benefits. In addition, not all components that make up Line 25 and 26 require replacement in coming years. This option was not progressed.
Option 4	Decommissioning and dismantling of Line 25 and Line 26	~ Between 19 and 38 (depending on access and clearing costs)	Not considered	To manage the risks to workers' safety, public safety, properties, and environment, Line 25 and Line 26, if decommissioned, must be dismantled. This requires: <ul style="list-style-type: none"> > physical disconnection of the line from the 330 kV switchbays at Vales Point and Sydney West substations > dismantling of line structures, fittings, and conductors > rehabilitation of the easement. IPART Reliability standard requires redundancy category 2 ("N-1") for Vineyard Bulk Supply Point (BSP). If

				<p>both Line 25 and Line 26 are decommissioned, the redundancy level at Vineyard BSP will be reduced to “N”.</p> <p>This option was considered not technically feasible and was not progressed.</p>
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Non-network options are not able to assist in this RIT-T

The PSCR 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 mitigate the safety and environmental risk posed as a result of corrosion-related asset deterioration.

Draft Assessment: refurbishment of Line 25 and Line 26 is optimal

The optimal commercially and technically feasible option presented in the PSCR – the refurbishment of Line 25 and Line 26 replacement of asset components, and remediation of steelwork and foundations – remains the preferred option to meet the identified need.

The estimated capital expenditure associated with this option is \$23 million +/- 25 per cent. Routine operating and maintenance costs relating to planned checks by TransGrid field crew are approximately \$280,000 per year – similar to the cost under the base case. TransGrid calculates that the avoided risk costs by undertaking Option 1 is approximately \$7.1 million per year.

This preferred option, Option 1, is found to have positive net benefits under all scenarios investigated and on a weighted basis will deliver approximately \$58 million in net economic benefits. 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, positive net benefits are expected from refurbishing Line 25 and Line 26.

Moving forward with this option is the most prudent and economically efficient solution to manage and mitigate safety and environmental risk to ALARP.

The works will be undertaken between 2018/19 and 2020/21. Planning and procurement (including completion of the RIT-T) will occur between 2018/19 and 2019/20, while project delivery and construction will occur in 2020/21 and 2021/2022. All works will be completed in accordance with the relevant standards by 2021/22 with minimal modification to the wider transmission assets. Necessary outages of affected line(s) in service will be planned appropriately in order to complete the works with minimal impact on the network.

Submissions and next steps

TransGrid welcomes written submissions on material contained in this PADR. Submissions are due on or before 10 March 2020.

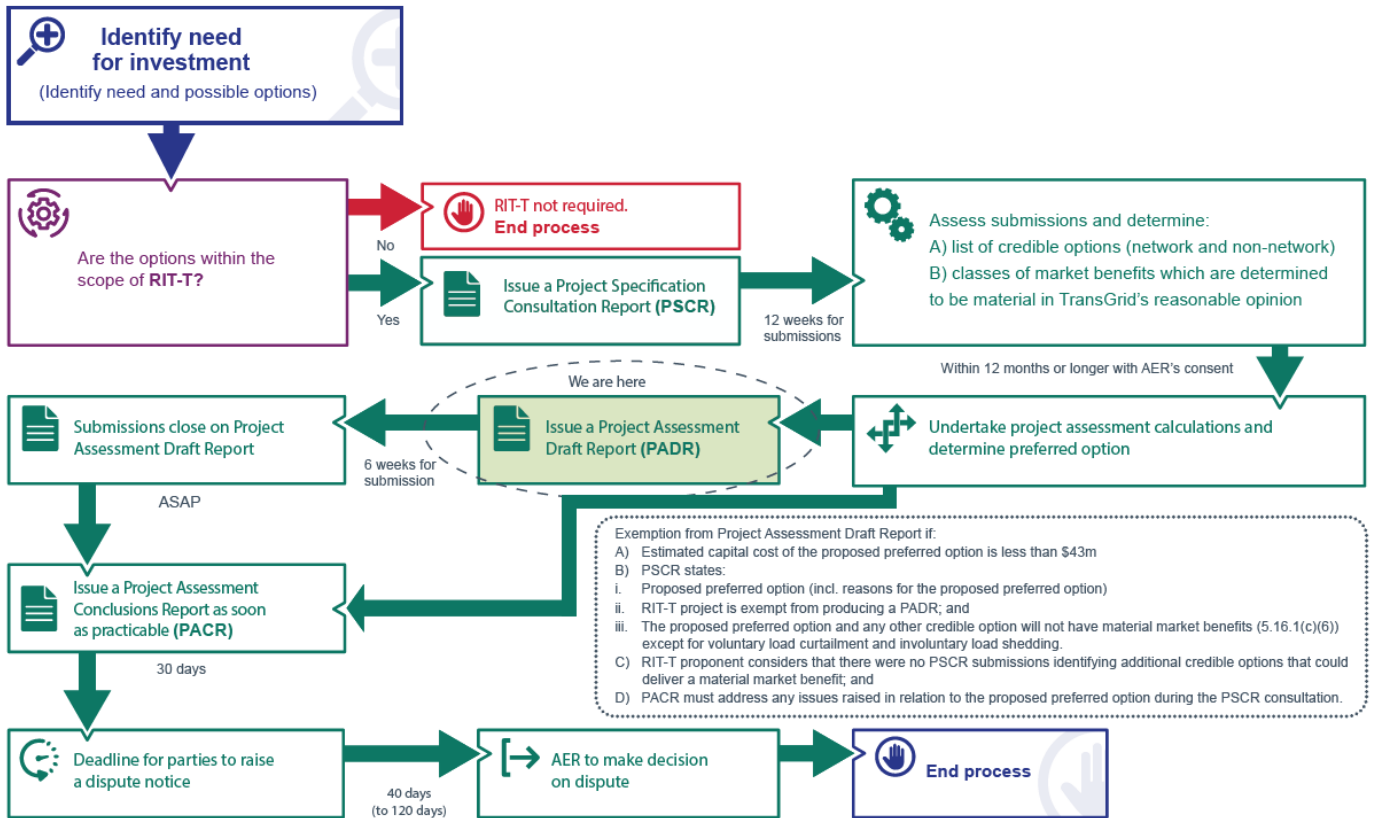
Submissions should be emailed to TransGrid’s Regulation team via RIT-TConsultations@transgrid.com.au⁴. In the subject field, please reference ‘Line 25 and Line 26 PADR’.

⁴ 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 the Disclaimer section of this PADR for more details.

Submissions will be published on the TransGrid website. If you do not want your submission to be made publicly available, please clearly specify this at the time of lodging your submission.

The next step in this RIT-T, following consideration of submissions received via the six-week consultation period and any further analysis required, will be publication of a Project Assessment Conclusion Report (PACR). TransGrid anticipates publication of a PACR by September 2020.

Figure 1 This PADR is the second stage of the RIT-T process⁵



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

⁵ 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>