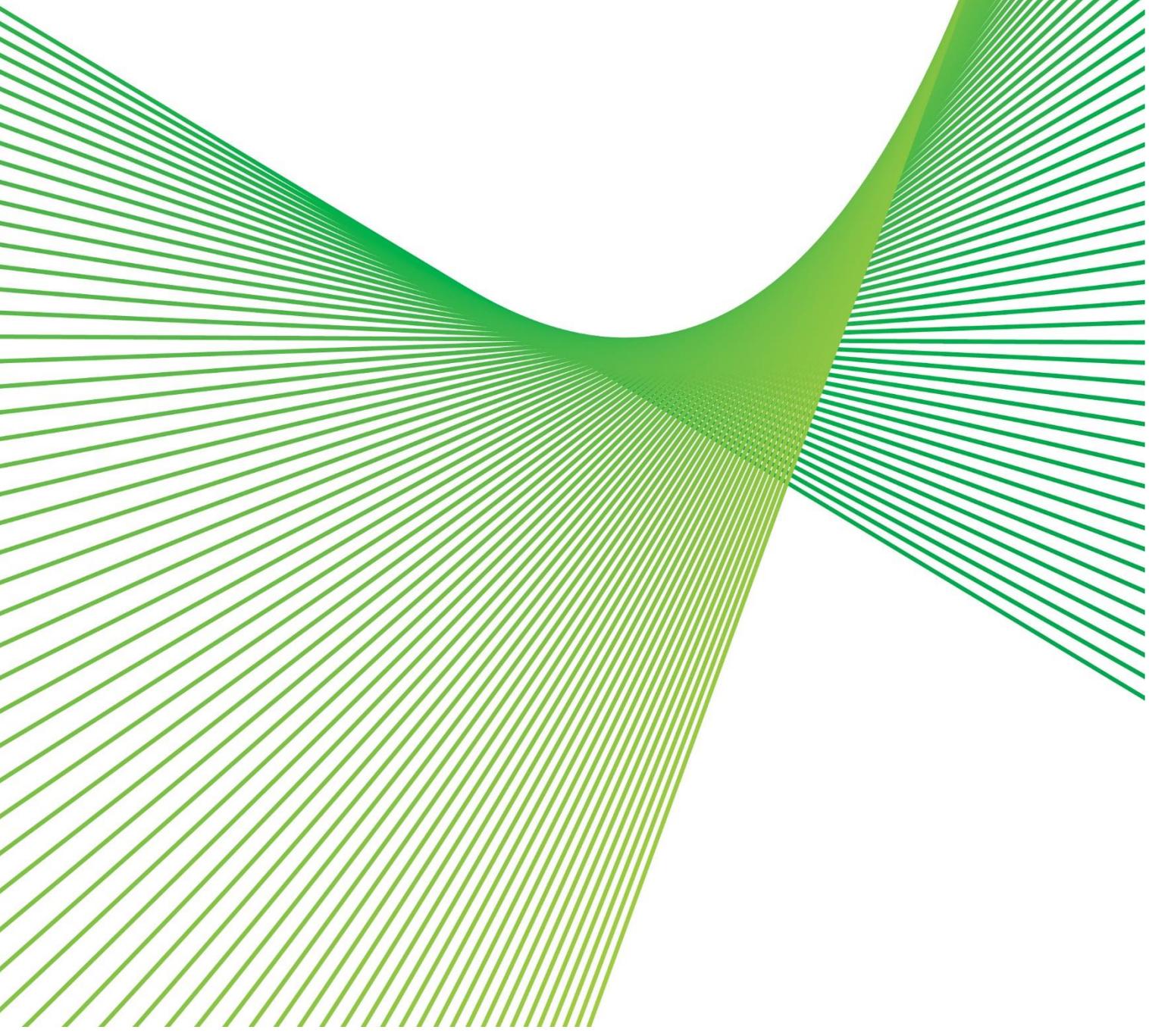


Summary: Managing safety and environmental risks on Line 18 (Kangaroo Valley – Dapto)

RIT-T Project Assessment Conclusions Report

Region: Southern

Date of issue: 21 December 2021



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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 18. Publication of this Project Assessment Conclusions Report (PACR) represents the final step in the RIT-T process.

Commissioned in 1974, the 43 km single circuit 330 kV transmission line is comprised of 107 steel tower structures between Kangaroo Valley switching station and Dapto 330 kV substation. The section from Kangaroo Valley to Robertson was built in 1974 whilst the remaining section to Dapto substation was built in 1962, previously part of a Yass-Dapto connection. Line 18 forms a key link between the Shoalhaven and Wollongong regions and supports the transmission of electricity from existing generators in southern NSW to the major load centres of Sydney, Newcastle and Wollongong.

The line will continue to play a central role in supporting the flow of energy 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.

The transmission line mainly traverses farmland and Morton National Park – after leaving Dapto, it climbs from the coastal plain up the Illawarra Escarpment.

Condition issues that will impact the safe and reliable operation of the network have been found on the line. These raise a number of risks associated with asset failure, including safety and environmental (bushfire) risks.

Table 1 Condition issues along Line 18 and their consequences

Issue	Consequences if not remediated
Corrosion of tower steel members	Steel corrosion, particularly of critical members, can lead to structural failure of tower
Foundation condition buried legs and ground level steel corrosion	Foundation failure
Corroded fasteners	Structural failure
Corroded insulators and conductor attachment fittings	Conductor drop
Corrosion of earth wire and earth wire attachment fittings	Public safety risk increase in case of fault
Condition of conductor and earth wire vibration dampers	Accelerated conductor fatigue due to vibration
Condition of conductor spacers	Damaged spacers can lead to conductor clashing
Asbestos paint	Safety risks
Condition of Climbing deterrents	Public safety

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

Identified need: managing safety and environmental risks from corrosion on Line 18

The proposed investment will enable Transgrid to manage safety and environmental risks on Line 18. 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 18 will continue to deteriorate.

Transgrid calculates that the safety and environmental risk costs associated with the condition deterioration and corrosion of Line 18 are approximately \$0.7 million per year and the financial risks are approximately \$0.03 million. Condition deterioration of the affected assets due to corrosion would mean an increase in bushfire and safety risks along Line 18 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.

Transgrid manages and mitigates bushfire and safety risks 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

Using Transgrid's Risk Assessment Methodology², the risks on safety and environment are sufficient such that their mitigation is warranted. The safety and environmental risk costs from corrosion of steel components of the structures, or 'members', insulators and fittings are estimated to be approximately \$0.7 million per year.³

Under the ALARP test with the application of a gross disproportionate factor⁴, the weighted benefits are expected to exceed the cost. Transgrid's analysis concludes that the costs are less than the weighted benefits from mitigating bushfire and safety risks. 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.

Applying the ALARP principle to manage and mitigate bushfire and safety risks, Transgrid determines that its obligations under the New South Wales *Electricity Supply (Safety and Network Management) Regulation 2014* and Transgrid's ENSMS will be met by implementing Option 1 by 2022/23. Under this principle, risks are mitigated unless it is possible to demonstrate that the costs involved in further reducing the risk would be grossly disproportionate to the benefits gained. Using the ALARP principle, all scenarios under Option 1 are NPV positive.

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.

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

² Appendix B provides an overview of the risk assessment methodology adopted by Transgrid.

³ This determination of yearly risk costs is based on Transgrid's Network Asset Risk Assessment Methodology and incorporates variables such as likelihood of failure/exposure, various types of consequence costs and corresponding likelihood of occurrence.

⁴ In accordance with the framework for applying the ALARP principle, a disproportionality factor of 6 has been applied to risk cost figures. The values of the disproportionality factors were determined through a review of practices and legal interpretations across multiple industries, with particular reference to the works of the UK Health and Safety Executive. The methodology used to determine the disproportionality factors in this PSCR is in line with the principles and examples presented in the AER Replacement Planning Guidelines and is consistent with Transgrid's Revised Revenue Proposal 2018/19- 2022/23.

Submissions received in response to Project Specification Consultation Report

Transgrid published a Project Specification Consultation Report (PSCR) on 28 May 2021 and invited written submissions on the material presented within the document. One formal submission was received on the PSCR and with permission from the submitter it is available on Transgrid's website.

The submission covered consideration of the maintenance regime, assessment of the risk costs, and demonstrating the value for money of the investment.

Transgrid values the feedback raised in the submission and has taken it into account in preparing this report.

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 change has occurred since the PSCR which has not made an impact on the preferred option:

- the cost estimate factors for Option 1 have been adjusted to reflect the latest estimated resourcing requirements to implement the preferred option. This resulted in an increase to the total cost estimate from \$8.66m to \$8.83m.
- financial risk costs have been included in the analysis in response to the submission received.

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

Transgrid considers refurbishing Line 18 is the only credible option

Transgrid put forward for consideration one technically and commercially feasible option⁵: refurbishing the existing line by remediating or replacing the identified components. This option (Option 1) involves the refurbishment of Line 18 including replacement of asset components, earthwire, foundation repairs and remediation of steelwork.

The primary driver for the identified need is to mitigate bushfire and safety risks associated with condition issues on Line 18 caused by corrosion. Two other options to address the need were considered but were not progressed further as they were determined technically or commercially non-feasible when assessed against the preferred option. These are summarised in the following table.

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

All costs presented in this PACR are in 2020/21 dollars.

Table 2 Options considered

Option	Description	Capital costs (\$m 2020/21)	Operating costs (\$ per year)	Remarks
Option 1	Line refurbishment	8.83 (+/- 25%)	25,000	Most economical and preferred option

⁵ As per clause 5.15.2(a) of the NER.

Option 2	Line dismantling	~12.8	0	Not progressed due to technical infeasibility. Dismantling Line 18 will reduce the supply capability from the Southern network to Greater Sydney significantly, which may lead to reliability of supply issues.
Option 3	New transmission line from Kangaroo Valley switching station to Dapto substation	> 100	Not considered	Due to significant costs of this option, a new 330 kV transmission line from Kangaroo Valley switching station to Dapto substation is not commercially feasible.

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, as non-network options will not mitigate the safety and environment risk posed as a result of corrosion-related asset deterioration.

Conclusion: refurbishment of Line 18 is optimal

The optimal commercially and technically feasible option presented in this PACR – Option 1 (line refurbishment) – is the preferred option to meet the identified need.

Moving forward with this option is the most prudent and economically efficient solution to manage and mitigate safety and environmental risk to ALARP. Consequently, it will ensure 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) are met.

The estimated capital expenditure associated with this option is \$8.83 million +/- 25 per cent. Routine operating and maintenance costs relating to planned checks by Transgrid field crew are approximately \$25,000 per year – similar to the cost under the base case. Transgrid calculates that the avoided risk cost by undertaking Option 1 is approximately \$0.60 million⁶ per year.

This preferred option, Option 1, is found to have positive net benefits only for the high benefit scenario at \$5.1 million. Using the ALARP principle, where disproportionality factors have been applied on the bushfire and safety risks, the benefits from the risk reduction outweigh the costs under all scenarios for Option 1 and on a weighted basis will deliver \$29.7 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 18.

The works will be undertaken between 2020/21 and 2022/23. Planning and procurement (including completion of the RIT-T) commenced in 2020/21 and is due to conclude in 2021/22, while project delivery and construction will be completed in 2022/23.

All works will be completed in accordance with the relevant standards by 2023 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.

⁶ \$3.4 million per year including the ALARP disproportionality factor.

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 lifecycle 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 net 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 2021.

The second step, production of a Project Assessment Draft Report (PADR), was not required as Transgrid considers its investment in relation to the preferred option to be exempt from that 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 stating:
 - 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 addressing any issues raised in relation to the proposed preferred option during the PSCR consultation.

Parties wishing to raise a dispute notice with the AER may do so prior to 24 January 2022 (30 days after publication of this PACR⁹). Any dispute notices raised during this period 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 'Line 18 PACR'.

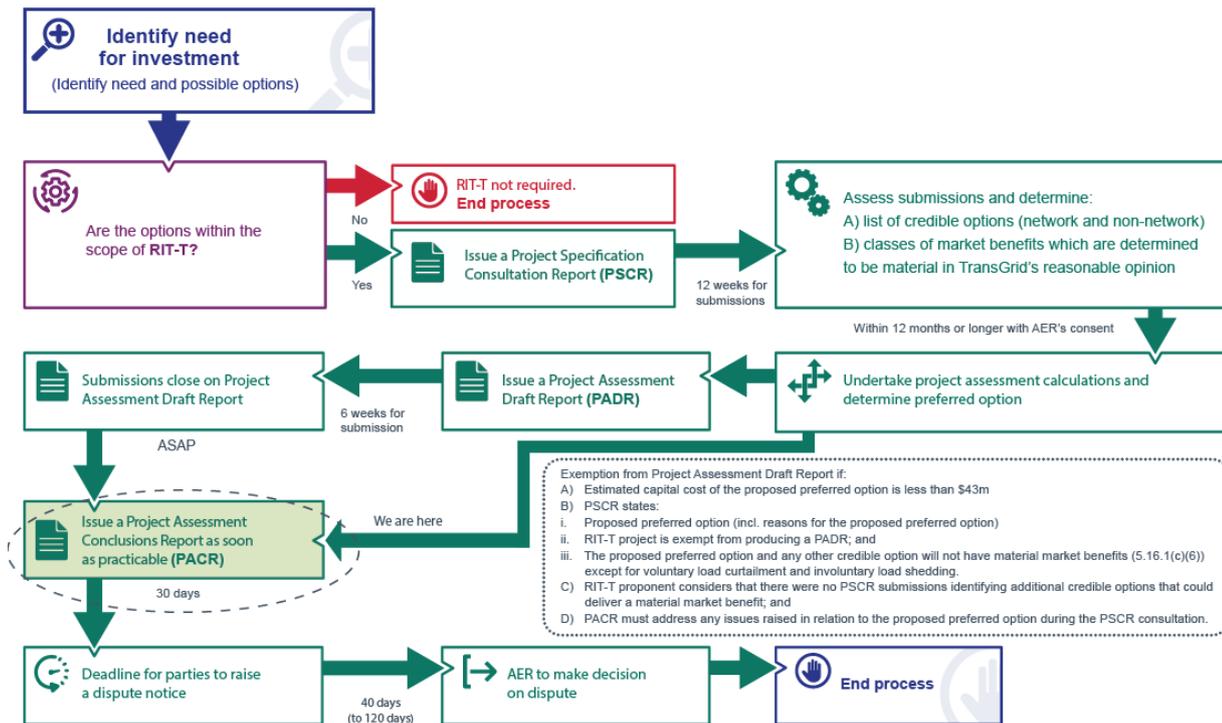
To read the full Project Assessment Conclusions Report visit [Transgrid's website](#).

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)

⁹ Additional days have been added to cover public holidays

Figure 1 This PACR is the third stage of the RIT-T process¹⁰



Parties wishing to raise a dispute notice with the AER may do so prior to 24 January 2022 (30 days after publication of this PACR¹¹). Any dispute notices raised during this period 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 'Line 18 PACR'.

¹⁰ 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>

¹¹ Additional days have been added to cover public holidays