

Summary: Managing safety and environmental risks on Line 3W (Kangaroo Valley – Capital Wind Farm)

RIT-T Project Assessment Conclusions Report

Region: Southern

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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 3W. Publication of this Project Assessment Conclusions Report (PACR) represents the final step in the RIT-T process.

Constructed in 1972, the 130 km single circuit 330 kV transmission line is comprised of 296 steel tower structures between Capital Wind Farm and Kangaroo Valley 330 kV switching stations. Line 3W forms a key link between Canberra and Wollongong and enables the transmission of electricity from generators in the area including Capital Wind Farm, Woodlawn Wind Farm, Kangaroo Valley Pumping and Power Station, and Bundeela Pumping and Power Station to the NEM.

The line 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.

The majority of Line 3W passes through isolated timber country, with a large portion of the line running through Morton National Park.

Condition-related 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 3W and their consequences

Issue	Consequences if not remediated
Corrosion of tower leg steel members	Steel corrosion, particularly of critical leg members near the ground line, can affect structural integrity and lead to failure of tower
Damaged tower concrete footings	Foundation failure
Corrosion of earth straps	Earthing safety hazard
Corroded fasteners	Structural failure
Corroded insulators and conductor attachment fittings	Conductor drop
Corrosion of earth wire attachment fittings	Conductor drop
Conductor dampers	Accelerated conductor fatigue due to vibration

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 3W

The proposed investment will enable TransGrid to manage safety and environmental risks on Line 3W. A considerable number of steel tower structures and associated line components on Line 3W have reached a condition that reflects they are nearing the end of serviceable life. The assets affected by corrosion-related issues pose risks to supply, environment, and safety as a consequence of potential structural failure, conductor drop, and earthing safety hazards. Further deterioration of the condition of these assets as a result of corrosion increases these risks.

TransGrid manages and mitigates bushfire and safety risks to ensure they are below 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 \$725,000 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 positive.

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 29 October 2019 and invited written submissions on the material presented within the document. No submissions were received in response to the PSCR.

No developments since publication of the PSCR

No additional credible options were identified during the consultation period following publication of the PSCR. Option 1, refurbishing Line 3W, remains the preferred option at this stage of the RIT-T process.

¹ TransGrid 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 practises 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.

Refurbishing Line 3W remains the most prudent and economically efficient option to manage safety and environmental risks to ALARP

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 3W including replacement of line components and remediation of steelwork and foundations. 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 3W 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 PACR are in 2019/20 dollars.

Table 2 Options considered

Option	Description	Capital costs (\$m)	Operating costs (\$ per year)	Remarks
Option 1	Line refurbishment	14.5 (± 25%)	35,000	Most economical and preferred option
Option 2	Line decommissioning and dismantling	37.4 (± 25%)	0	Not progressed due to significant costs
Option 3	New transmission line from Kangaroo Valley Switching Station to Capital Wind Farm Switching Station	> 100	Not considered	Not progressed due to significant costs

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.

Conclusion: refurbishment of Line 3W is optimal

The optimal commercially and technically feasible option presented in the PSCR – Option 1 (refurbishment of Line 3W) – 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.

The estimated capital expenditure associated with this option is \$14.5 million \pm 25 per cent. Routine operating and maintenance costs are approximately \$35,000 per year, similar to the cost under the base case. TransGrid calculates that the avoided risk costs by undertaking Option 1 is approximately \$650k per year.

This preferred option, Option 1, whilst having negative net benefits under most scenarios investigated, still falls within the risk benefit threshold once the ALARP disproportionality factors are considered. 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, the costs of mitigating the bushfire risks is less than the disproportionate risk benefit⁵ expected from refurbishing Line 3W.

Moving forward with this option is the most prudent and economically efficient solution to manage and mitigate bushfire and safety risk to the As Low As Reasonably Practical (ALARP) level. Option 1 consists of works on:

- > insulators
- > conductor fittings and vibration dampers
- > earthwire fittings
- > replacement of tower members and nuts & bolts
- > tower leg member remediation
- > tower earthing
- > footing remediation

The works will be undertaken between 2019/20 and 2020/21. Planning and procurement (including completion of the RIT-T) will occur in 2019/20, while project delivery and construction will occur in 2020/21. All works will be completed in accordance with the relevant standards by 2020/21 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.

The analysis undertaken and the identification of Option 1 as the preferred option satisfies the RIT-T.

Next steps

This PACR represents the third step in a formal Regulatory Investment Test for Transmission (RIT-T) process undertaken by TransGrid. It follows a Project Specification Consultation Report (PSCR) released in October 2019. 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 required⁶ due to:

- > the estimated capital cost of the preferred option being less than \$43 million;
- > the TNSP identifies in its PSCR its proposed preferred option, together with its reasons for the preferred option and notes that the proposed investment has the benefit of the clause 5.16.4(z1) exemption; and
- > if the TNSP considers that the proposed preferred option and any other credible options in respect of the identified need will not have a material market benefit for the classes of market benefit specified in clause

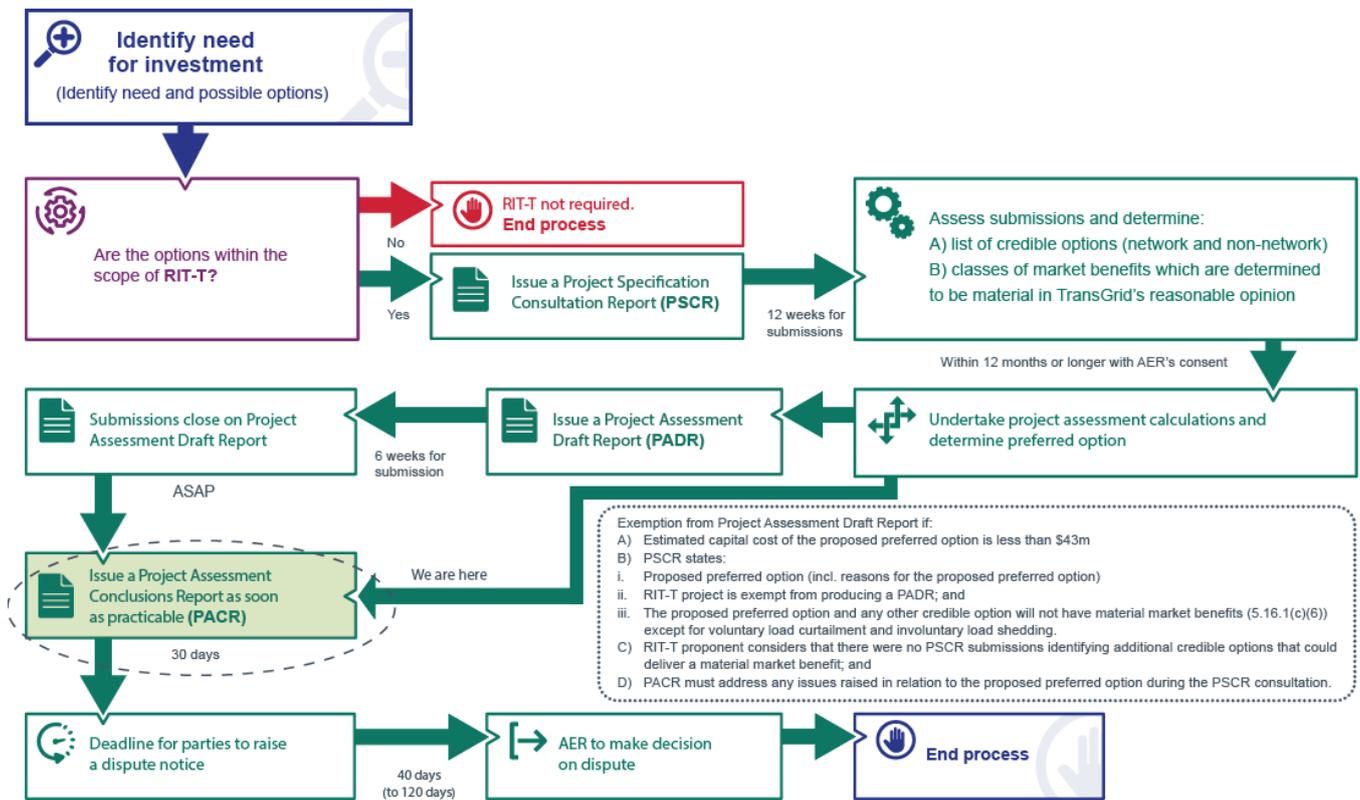
⁵ Risk benefit including gross disproportionate factor

⁶ 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.

5.16.1(c)(4), with the exception of market benefits arising from changes in voluntary and involuntary load shedding.

This PACR represents the third and final stage of the consultation process in relation to the application of the RIT-T.

Figure 1 This PACR is the third stage of the RIT-T process⁷



Parties wishing to raise a dispute notice with the AER may do so prior to 26 February 2020 (30 days after publication of this PACR). 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 project can be obtained from TransGrid's Regulation team via RIT-TConsultations@transgrid.com.au. In the subject field, please reference 'Line 3W PACR'.

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

⁷ 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>