

Summary: Managing safety and environmental risks on Line 81 (Newcastle – Liddell)

RIT-T Project Assessment Conclusions Report

Region: Newcastle & Central Coast

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

Constructed in 1964, Line 81 is a 330 kV transmission line which spans approximately 100km between Newcastle substation and Liddell 330 kV switching station. The transmission line is comprised of 288 steel tower structures and forms part of the network that provides a key link between approximately 4,400 MW of existing generation in the Hunter Valley and Newcastle.

Line 81 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.

As coal mines in the area expanded, portions of Line 81 were realigned with approximately 24 per cent of the structures being constructed after 1986. Consequently, those post-1986 structures are not affected by corrosion to the same degree as the earlier towers.

A significant proportion of the pre-1986 steel transmission structures of Line 81 are impacted by various levels of deterioration and corrosion. The affected components include tower steelwork, foundations and earthing, insulators, conductor fittings, earthwire and associated fittings. This greatly increases the likelihood of transmission structure failures, conductor drop, and subsequent bushfire and safety risks.

Table 1 Condition issues along Line 81 and their consequences

| Issue | Impact |
|---|---|
| Ground line corrosion of steel at footing | Steel corrosion of critical member, can lead to structural failure of tower |
| Buried concrete foundations | Accelerated corrosion of critical member |
| Corrosion of earth strap | Earthing safety hazard |
| Rusting of tower steel members | Structural failure |
| Corroded fasteners | Structural failure |
| Corroded and damaged disc insulators | Conductor drop |
| Faulty composite insulators | Flashover (line outage) or Conductor drop |
| Corroded earthwire and fittings | Conductor drop |
| Conductor dampers | Accelerated fatigue of conductor due to vibration |
| Earthwire dampers | Accelerated fatigue of conductor 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 81

The proposed investment will enable TransGrid to manage safety and environmental risks on Line 81. A considerable number of the steel tower structures and associated line components on Line 81 have reached a condition that reflects they are nearing the end of serviceable life. The assets affected by corrosion-related issues pose risk 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 increases these risks.

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

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 is estimated to be approximately \$350,000 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.

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 material developments since publication of the PSCR

No additional credible options were identified during the consultation period following publication of the PSCR. TransGrid has updated the estimate for capital expenditure that was published in the PSCR to reflect a reduction in the construction component which has been reduced by \$15,000. Option 1, refurbishing Line 81 remains the preferred option at this stage of the RIT-T process.

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 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 81 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 81 including replacement of line components, tower steel member replacement, remediation of tower 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 81, mainly caused by corrosion. One other option to address the need was considered but was not progressed further as it was 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 | 7.8 (± 25%) | 65,000 | Most economical and preferred option |
| Option 2 | Line decommissioning and dismantling | 27.3 (± 25%) | 0 | 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 81 is optimal

The optimal commercially and technically feasible option presented in the PSCR – Option 1 (refurbishment of Line 81) – 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 \$7.8 million ± 25 per cent. Routine operating and maintenance costs are approximately \$65,000 per year, similar to the cost under the base case. TransGrid calculates that the avoided risk costs by undertaking Option 1 is approximately \$197k 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 notes that

the low net economic scenario which delivers a negative benefit is comprised of an extreme combination of low safety and environmental risks estimates and high capital costs.

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 81.

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 and dampers
- > earthwire replacement
- > replacement of tower members, ladders and nuts & bolts
- > tower member painting
- > tower earthing
- > tower danger signage and climbing deterrents
- > remediation of tower foundations

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:

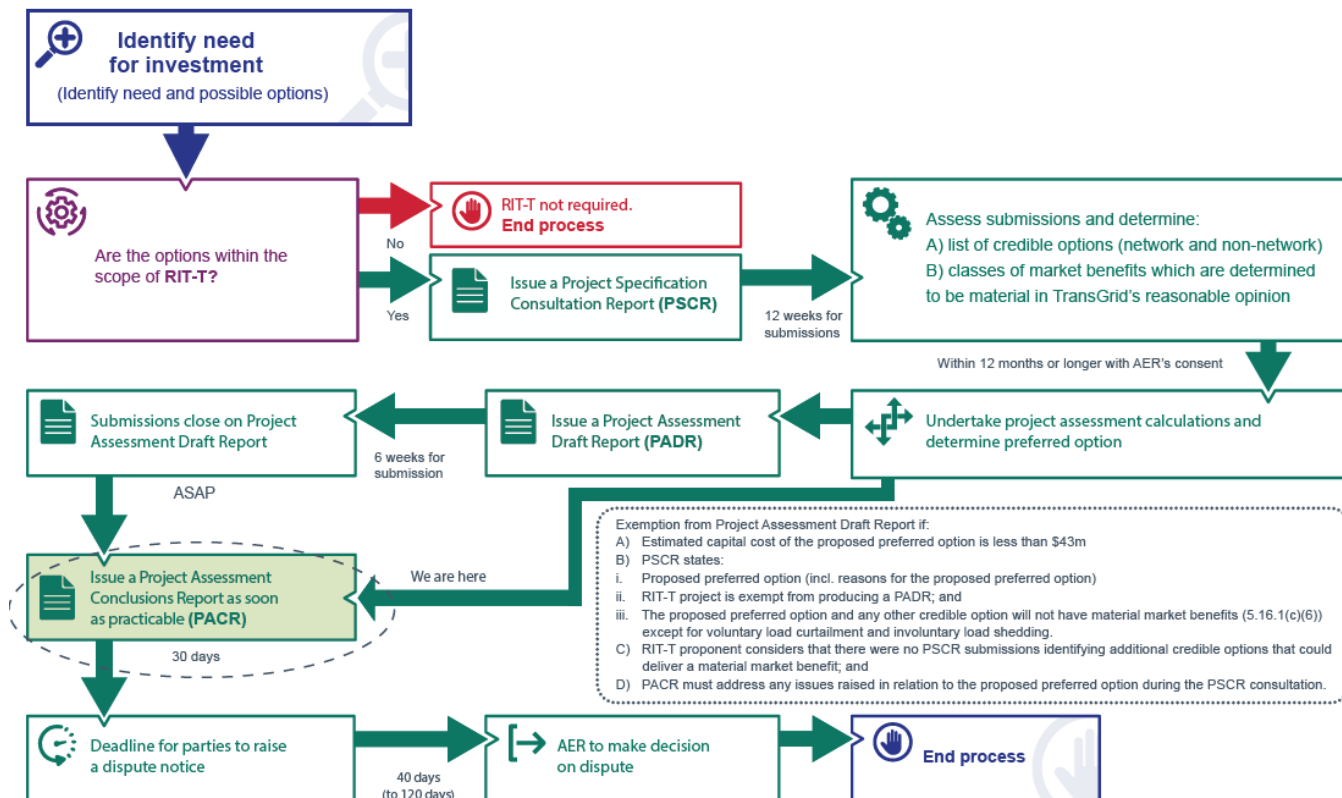
- > the estimated capital cost of the preferred option being less than \$43 million;
- > the TNSP identifies in its PSCR its proposed preferred option, together with its reasons for the preferred option and notes that the proposed investment has the benefit of the clause 5.16.4(z1) exemption; and
- > 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 5.16.1(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.

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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.

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 81 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>