Managing risk on Line 86 (Tamworth - Armidale)

RIT-T - Project Assessment Draft Report

Region: Northern New South Wales

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Summary

Line 86 is a 330 kV single-circuit transmission line, running between Tamworth and Armidale (111 km), and was constructed in 1982 using mostly composite wood pole[1] structures.[2] Line 86 is the only 330 kV line in our network that was not constructed using steel towers.

The unique construction of this transmission line means that wood rot beneath the composite pole joint sleeve is prevalent throughout the composite wood poles that are utilised along the line. We have replaced, or remediated, 40 poles since 2000, which represents 10 per cent of the original wood poles on Line 86.

Given the expected increasing rate of defect issues, including required pole replacements, and past experience with composite wood pole structures,[3] we consider it is likely that all the remaining wood structures on Line 86 are exhibiting various forms of decay, which is only expected to worsen over time. The deteriorating condition of the wood poles gives rise to bushfire risk and also results in higher expected costs associated with reactive maintenance (which may need to be done under emergency conditions).

This Regulatory Investment Test for Transmission (RIT-T) process was initiated to progress and consult on the assessment of investment options to address the asset condition issues identified on Line 86. This includes assessing whether the benefit expected from proactively avoiding the risks associated with the deteriorating condition of the wood poles (i.e., ahead of when they fail) is expected to exceed the replacement costs, while providing the greatest overall net benefit to the National Electricity Market (NEM) over the long-term. Publication of this Project Assessment Draft Report (PADR) is the second formal document in the RIT-T process and follows the Project Specification Consultation Report (PSCR) and accompanying non-network expression of interest (EOI) released in December 2021.

Overview

The PADR finds that a focused replacement of the highest risk Line 86 wood poles, like for like and in-situ with concrete or steel poles ('Option 1C') is the preferred option for meeting the identified need across all scenarios and sensitivities assessed. Option 1C is expected to deliver approximately $20 million in net benefits over the 27-year assessment period (on a weighted-basis), and approximately $17 million under the most likely scenario (the central scenario).

Option 1C satisfactorily reduces the bushfire risk posed by the deteriorating poles on Line 86, and avoids significant expected costs associated with reactive maintenance (which may need to be done under emergency conditions).

The PADR assessment shows that the additional costs of replacing Line 86 with either a higher capacity line or in combination with a VTL (i.e., Option 3 and Option 1B, respectively) are not outweighed by the additional wholesale market benefits expected.

Option 1C involves replacing the 31 highest risk poles of Line 86 between 2025-26 and 2027-28 (making up approximately 8 per cent of the remaining poles to be replaced/remediated). While we have also included a second tranche of poles being replaced towards the end of the assessment period in Option 1C (between 2042-43 and 2044-45) based on our current condition reports/data and risk modelling, we consider this only indicative at this stage given how far into the future it is expected to be required. The

[1] A composite wood pole consists of a two-piece pole arrangement that is held together by a metal cylinder/sleeve.
[2] A short section (3.72km) of the line outside Tamworth is constructed on steel towers.
[3] Composite wood poles structures are known to trap moisture within the joint sleeve creating an environment for wood rot to develop. Due to this issue, Transgrid has replaced almost all other composite wood poles which existed across our network.

replacement of the poles included in this second tranche, and all other poles, would be subject to a separate RIT-T in the future to determine whether this work is justified (and in what form).

The estimated capital cost of the first tranche of replacements under Option 1C is approximately $10.65 million.

Benefits from addressing the condition of the Line 86 wood poles

If action is not taken, the condition of the wood poles is expected to expose Transgrid and its customers to unacceptable levels of risk going forward. Specifically, there are significant bushfire risks under the 'do nothing' base case, as well as higher expected costs associated with reactive maintenance that may be required under emergency conditions ('financial risks'). There are also expected to be reputational, safety and reliability risks if the condition of the poles is not addressed but these are small relative to the bushfire and financial risks estimated.

While all of the credible options assessed in this PADR mitigate the risks associated with the condition of the wood poles, they also have the potential to impact the wider wholesale market in various ways, through increasing the network transfer capacity between Tamworth and Armidale. These expected wider wholesale market interactions are primarily due to the interaction with:

- the nearby Queensland to New South Wales Interconnector (QNI), which is currently being upgraded; and
- the New England Renewable Energy Zone (REZ) around Armidale, which is being progressed under the NSW Government's Electricity Infrastructure Roadmap.

Each of the options are expected to affect the wholesale market relative to the base case by reducing the time that Line 86 is out of service due to poles failing.

The larger capacity option (Option 3) and the VTL option (Option 1B) also increase the overall network transfer capacity. These options therefore also have a further impact on the wholesale market, which has been reflected in the analysis in this PADR. However , the assessment finds that either this wider impact results in a negative market benefit (Option 3), or that any additional positive market benefit is outweighed by the additional cost of the option (Option 1B).

Three submissions were received to the PSCR

Three submissions were received in response to the PSCR. Due to requested confidentiality, they have not been summarised in detail as part of this PADR.

One submission proposed the use of batteries to form a virtual transmission line (VTL), which has been assessed alongside the other credible options as part of this PADR (Option 1B).

Another party proposed the use of an alternate conductor technology for options involving construction of a new line. This proposal has been assessed but not progressed as part of this PADR since these two network options are found to either not be commercially feasible (Option 2), or have costs that far outweigh the benefits (Option 3), and any cost reductions due to the alternate conductor technology are not expected to change these findings.

The PADR assessment covers four different credible options

The PADR assesses four different credible options that cover:

- replacing all poles on Line 86 in one-go, versus in a targeted manner;
- replacing the poles in-situ and leaving the line capacity the same, versus rebuilding the line at a higher capacity; and
- providing greater capacity to this area of the network through either building a new line, or through coupling the existing line with a VTL.

The table below summarises the credible options assessed in this PADR.

Table E-1: Summary of the credible options

Option	Description	Estimated capital cost ($2021-22)*	Expected completion date**	Expected transfer improvement (reduced service outages)***	Expected transfer improvement (higher rating)
Replace Line 86 like for like in-situ utilising concrete or steel poles, keeping the existing twin lime conductor and single circuit configuration, while maintaining the overall design temperature at 100°C					
1A	Replace all (367) poles in one-go	95.7	2027-28	280 MW	-
1B	Replace all (367) poles in one-go and couple with a VTL (2 x 200 MW batteries)	95.7 (for the line) Confidential for the VTL	2027-28 (for the line) 2023-24 (for the VTL)	280 MW	200 MW (from the VTL)
1C	Replace the highest risk structures (31) over 2025-26 to 2027-28 Replace a second tranche of structures (112) between 2042-43 and 2044-45, with the remaining structures (224) replaced beyond the assessment period	10.65 (2025-26 to 2027-28) 34.47 (2042-43 to 2044-45)	2028-29 (initial tranche) 2045-46 (indicative second tranche)	280 MW	-
Rebuild Line 86 as a double circuit with twin olive conductors and a 120°C design temperature along a new easement parallel to the original Line 86 (which is then removed)					
3	Rebuild Line 86 as a double circuit line	315.4	2027-28	280 MW	350 MW

** While the capital costs are shown at an aggregate level in this table, they have been broken out by key cost category for each option (as relevant and subject to requested confidentiality) in the body of this PADR. ** The 'expected completion date' denotes the year after the replacement, or rebuild, work is undertaken and is akin to a 'commissioning year' for new lines. *** The expected transfer improvement due to reduced service outages reflects the transfer capacity loss under the base case if Line 86 fails (it has been coupled with the probability of failure, which increases each year going forward as the poles are left to deteriorate further, in the market modelling).*

Option 1A and Option 3 remain the same as presented in the PSCR,[4] while Option 1B has been included in response to a submission to the PSCR and Option 1C has been included following additional asset condition assessment undertaken by Transgrid since the PSCR was released. Option 2 from the PSCR is no longer considered commercially feasible and so has been removed from the PADR assessment.

[4] Option 1A was referred to as 'Option 1' in the PSCR.

Three scenarios have been assessed

The RIT-T is focused on identifying the top ranked credible option in terms of expected net benefits. However, uncertainty exists in terms of estimating future inputs and variables (termed future 'states of the world').

To deal with this uncertainty, the NER requires that costs and market benefits for each credible option are estimated under reasonable scenarios and then weighted based on the likelihood of each scenario to determine a weighted ('expected') net benefit. It is this 'expected' net benefit that is used to rank credible options and identify the preferred option.

The credible options have been assessed under three scenarios as part of this PADR assessment, which differ in terms of the key drivers of the estimated net market benefits.

Table E-2: Summary of scenarios assessed in this PADR

Variable	Central	Low net economic benefits	High net economic benefits
Network capital costs	Base estimate	Base estimate + 25%	Base estimate - 25%
Non-network costs	Base estimate	Base estimate + 25%	Base estimate - 25%
Estimated risk costs	Base estimate	Base estimate - 25%	Base estimate + 25%
Wholesale market benefits estimated	EY estimated based on the step-change 2022 ISP scenario	EY estimated based on the progressive change 2022 ISP scenario	EY estimated based on the hydrogen superpower 2022 ISP scenario
Discount rate	5.50%	7.50%	1.96%

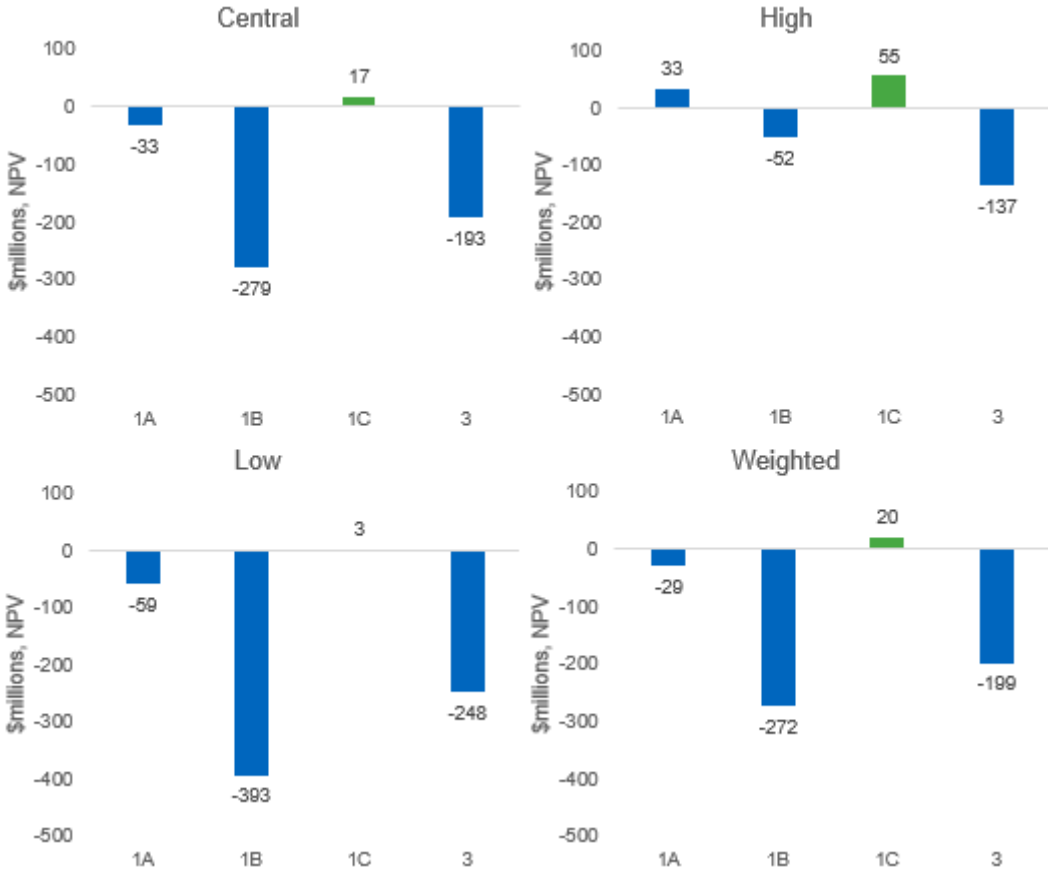
The wholesale market modelling in this PADR has been undertaken across the three key 2022 Integrated System Plan (ISP) scenarios. We have also weighted each of the scenarios for this RIT-T based on the draft 2022 ISP weightings for the underlying ISP scenarios, i.e.:

- 52 per cent to central scenario (based on the step-change scenario in the ISP);
- 30 per cent to the low benefits scenario (based on the progressive change scenario in the ISP); and
- 18 per cent to the high benefits scenario (based on the hydrogen superpower scenario in the ISP).

Option 1C is found to be the preferred option across all scenarios and sensitivities investigated

The PADR finds that a focused replacement of the highest risk Line 86 poles, like for like in-situ with concrete or steel poles ('Option 1C') is the preferred option for meeting the identified need across all scenarios and sensitivities assessed. Option 1C is expected to deliver approximately $20 million in net benefits over the 27-year assessment period (on a weighted-basis across the three scenarios), and approximately $17 million under the most likely scenario (the central scenario).

Figure E-1.1: Estimated net benefits for each scenario



The vast majority of the estimated market benefits for the options in each scenario comes from their ability to avoid the risk costs identified.

The assessment finds that the cost of increasing the capacity of Line 86 to provide wider benefits to the wholesale market, either via network investment (Option 3) or a VTL (Option 1B), is not outweighed by additional expected benefits. This is the case in all scenarios investigated.

We have also tested the robustness of the conclusion that Option 1C is the preferred option to a range of sensitivities as part of this PADR – namely:

- assumed level of risk costs;
- higher and lower network capital costs;
- higher and lower non-network capital costs; and
- alternate commercial discount rate assumptions.

Each sensitivity confirms Option 1C as the preferred option under this RIT-T.

We further find that there is no realistic increase in capital costs or commercial discount rate that would lead to Option 1C having a negative net benefit in the central scenario. Similarly, we find that there is no realistic decrease in the assumed level of risk costs that would result in Option 1C having negative net benefits in the central scenario.

Further information and next steps

We welcome written submissions on this PADR. Submissions are due on 15 July 2022.

Submissions should be emailed to our Regulation team via Regulatory.Consultation@transgrid.com.au.[5] In the subject field, please reference 'Line 86 PADR.'

At the conclusion of the consultation process, all submissions received will be published on our website. If you do not wish for your submission to be made public, please clearly specify this at the time of lodgement.

The next formal stage of this RIT-T is the publication of a PACR. The PACR is expected to be published in July 2022.

[5] 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.