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Managing risk on Line 94M (Beryl-Crudine Ridge)

RIT-T Project Assessment Conclusions Report

Issue date: 13 November 2025

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Executive summary

We are applying the Regulatory Investment Test for Transmission (RIT-T) to options for mitigating safety, environmental (bushfire) and financial (high reactive maintenance) risks caused by the deteriorating condition of certain components of the 132 kV line running between Beryl substation and Crudine Ridge Wind Farm on the NSW network ('Line 94M').

Line 94M is a 132 kV transmission line between Beryl substation and Crudine Ridge Wind Farm. The line is part of the original line built between Mount Piper and Beryl substations in 1976, which was broken up when Crudine Ridge Wind Farm was connected to the grid in 2020. The line has a route length of 84km but only 70km is subject to refurbishment, 29 structures to be replaced and 40 structures to remediated out of 264 structures.

Detailed analysis of asset condition information indicates that the line has several condition issues which require refurbishment to address its health and maintain appropriate risk levels across the network. The most significant element of concern is the condition of the wood pole structures on the line. Line 94M was first placed into service in 1976, and the wood poles are approaching 50 years of age and toward the end of their nominal lives. The defect rate on the line has increased from 2017 onwards, which is in line with the expected condition of the asset based on its original design parameters.

Identified need: managing risks on Line 94M

If action is not taken, the condition of Line 94M is expected to expose us and our customers to increasing levels of risk going forward, as the likelihood of failure increases. There are safety and 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'). The proposed investment will enable us to manage safety, environmental, and financial risks on Line 94M.

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 the lines will continue to deteriorate.

We manage and mitigate safety and bushfire risk to ensure they are below risk tolerance levels or 'As Low As Reasonably Practicable' ('ALARP'), in accordance with our obligations under the *New South Wales Electricity Supply (Safety and Network Management) Regulation 2014* and our Electricity Network Safety Management System (ENSMS).[1]

The proposed investment will enable us to continue to manage and operate this part of the network to a safety and risk mitigation level consistent with 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.

We note that the risk cost estimating methodology adopted for this RIT-T aligns with that used in our Revised Revenue Proposal for the 2023-28 period. It reflects feedback from the Australian Energy Regulator (AER) on the methodology initially proposed in our original revenue proposal.

1 Our ENSMS follows the International Organization for Standardization's ISO31000:2018 Risk Management framework which requires following a hierarchy of hazard mitigation approach.

One submission received in response to the PSCR

We published a Project Specification Consultation Report (PSCR) on 26 May 2025 and invited written submissions on the material presented within the document. One submission was received in response to the PSCR. With permission from the submitter, Xatech International Pty Ltd, the submission is available on our website.

The submission proposed a variation to Option 3; specifically, an alternative conductor to the ASCR/Lemon considered in the PSCR. In developing Option 3, we focused on managing condition issues through 'like-for-like' replacement. We proposed ACSR/GZ Lemon as a modern equivalent to Panther because it is the most prudent and efficient alternative that will enable us to address the condition issues that are driving the identified need. Selection of the proposed alternative conductor, Lisbon/Hawk, could assist us to meet the identified need, however it would also mean we would be uprating the line which is outside the scope of this RIT-T.

Notwithstanding, we considered whether this proposed alternative conductor could be progressed for this RIT-T as part of a credible option; effectively as a variation of Option 3 with the Lisbon/Hawk conductor being used rather than ACSR/GZ Lemon considered in the PSCR. Lisbon/Hawk is not typically used on our network; and as such, the timeframe required for testing to ensure design standards are met extends beyond the time available to conduct testing for this project. Therefore, even if the scope of this RIT-T were to include uprating of the line, we will not be able to progress this as a credible option as it cannot be implemented in sufficient time to meet the identified need.[2]

No material developments since publication of the PSCR

No additional credible options were identified during the consultation period following publication of the PSCR. In addition, no material changes have occurred since the PSCR that have made an impact on the preferred option. The costs for all credible options were presented in 2024/25 dollars in the PSCR and have been escalated to 2025/26 dollars using CPI inflation for this PACR.

Since the PSCR we have updated the capital expenditure estimate for Option 1. The capital expenditure has decreased by 2.7% due to the construction duration being reduced by 2 months.

Credible options considered

In this PACR, we have considered three credible options that would meet the identified need from a technical, commercial, and project delivery perspective.[3] These options are summarised in the table below.

Table E-1 Summary of credible options

Option	Description	Capital costs ($m +/- 25%, Real $2025/26)
Option 1	Replace the 29 wood pole structures known to be exhibiting deterioration with steel or concrete pole structures including associated insulators and fittings and remediate identified condition issues for line components that have priority condition issues and/or have reached end of serviceable life.	9.34 (+/-25%)

2 As per clause 5.15.2(a)(3)
3 As per clause 5.15.2(a) of the NER.

Option 2	Rebuild the entire line, replacing wood poles with concrete or steel pole structures including associated insulators and fittings.	47.47 (+/-25%)
Option 3	Rebuild the entire circa 1976 line, replacing wood poles with concrete or steel pole structures including associated insulators and fittings. The existing Panther conductor is to be replaced with Lemon ACSR/GZ.	61.28 (+/-25%)

The preferred option is Option 1, as it has the highest weighted NPV result of the technically and commercially feasible options which have been considered at this stage of the RIT-T process.

Non-network options are not able to assist for this RIT-T

We do 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 (bushfire) risk posed as a result of deteriorating wood pole condition. Additionally, we did not receive any submissions in response to the PSCR related to non-network options.

The options have been assessed against three reasonable scenarios

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 PACR assessment, which differ in terms of the key drivers of the estimated net market benefits (ie, the estimated risk costs avoided).

Given that wholesale market benefits are not relevant for this RIT-T, the three scenarios implicitly assume the most likely scenario from the AEMO's 2025 IASR (i.e., the 'Step Change' scenario). The scenarios differ by the assumed level of risk costs, given that these are key parameters that may affect the ranking of the credible options. Risk cost assumptions do not form part of AEMO's IASR, and have been based on Transgrid's analysis, as discussed in section 2.

We developed the Central Scenario around a static model of demand scenarios, described further in Section A.3 of our Network Asset Criticality Framework. We consider that this approach is appropriate since it materially reduces the computational effort required, and since differences in demand forecasts will not materially affect the ranking of the credible options.

How the NPV results are affected by changes to other variables (including the discount rate and capital costs) has been investigated in the sensitivity analysis. We consider this is consistent with the latest AER guidance for RIT-Ts of this type (ie, where wholesale market benefits are not expected to be material).[4],[5],[6]

Table E-2 Summary of scenarios

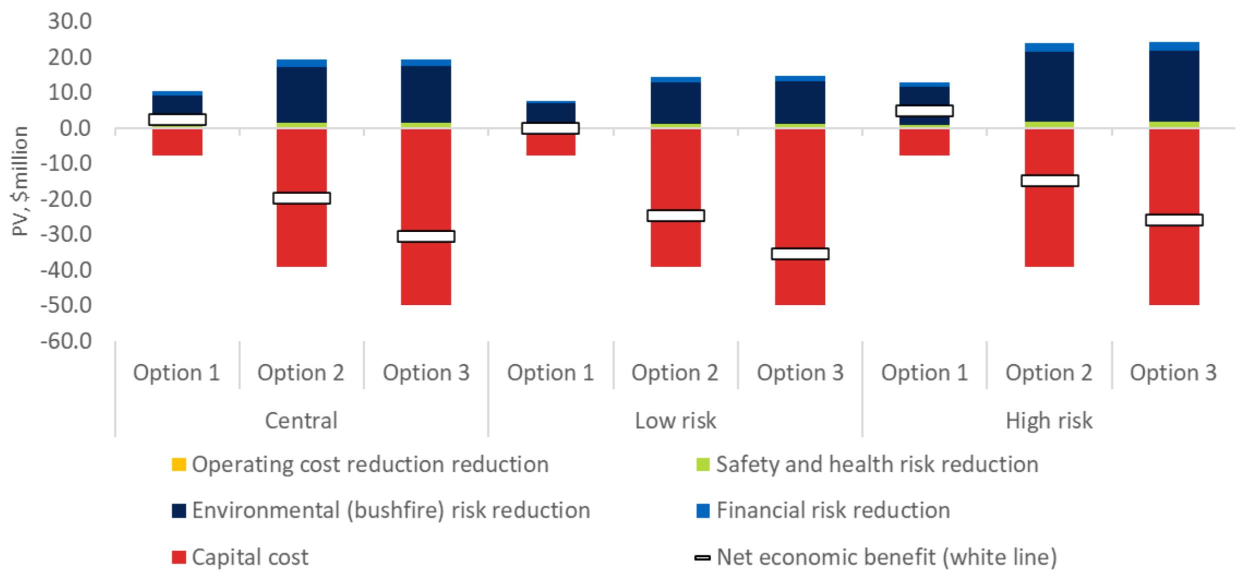
Variable / Scenario	Central	Low risk cost scenario	High risk cost scenario risk
Scenario weighting	1/3	1/3	1/3
Discount rate	7%	7%	7%
Network capital costs	Base estimate	Base estimate	Base estimate
Operating and maintenance costs	Base estimate	Base estimate	Base estimate
Safety, environmental and financial risk benefit	Base estimate	Base estimate – 25%	Base estimate +25%

The sensitivity analysis has investigated how the NPV results are affected by changes to other variables, including the discount rate and capital costs.

Option 1 delivers the greatest net economic benefits

Under all scenarios, the costs of mitigating the risks under Option 1 are found to be significantly outweighed by the expected benefit of avoiding the risks. The net economic benefits delivered by Option 1 are estimated at $1.93 million.

Figure E-1 Net economic benefits ($m, PV)



[4] AER, Application Guidelines Regulatory Investment Test for Transmission, November 2024, pp.43-44.

[5] We consider the approach to scenarios and sensitivities to be consistent with the AER guidance provided in November 2022 in the context of the disputes of the North West Slopes and Bathurst, Orange and Parkes RIT-Ts. See: AER, *Decision: North West Slopes and Bathurst, Orange and Parkes Determination on dispute - Application of the regulatory investment test for transmission*, November 2022, pp. 18-20 & 31-32, as well as with the AER's RIT-T Guidelines.

[6] AEMO '2023 Inputs, Assumptions and Scenarios Report', July 2023, pp.123-124

Conclusion

Option 1 (replacing 29 wood pole structures with steel or concrete poles) is the preferred option to meet the identified need at this stage of the RIT-T. 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 our obligations under the *New South Wales Electricity Supply (Safety and Network Management) Regulation 2014* and our Electricity Network Safety Management System (ENSMS) are met.

The estimated capital expenditure associated with this option is $9.34 million. Routine operating and maintenance costs relating to planned checks by our field crew are $99,744 per year. Option 1 is found to have positive net benefits under all scenarios investigated and, on a weighted basis, will deliver $2.34 million in net economic benefits.

The works would be undertaken from 2023/24 to 2026/27 (including completion of the RIT-T). All works would be completed in accordance with the relevant standards with minimal modification to the wider transmission assets. Necessary outages of affected line(s) in service would be planned appropriately in order to complete the works with minimal impact on the network.

Next steps

This PACR represents the final step of the consultation process in relation to the application of the RIT-T process undertaken by Transgrid.

The second step of the RIT-T process, production of a Project Assessment Draft Report (PADR), was not required as the investment meets the criteria for exemption under NER clause 5.16.4(z1-z2), ie:

- the estimated capital cost of the preferred option is less than $54 million;
- the PSCR included statements on:
  - the proposed preferred option, together with the reasons for the proposed preferred option;
  - that Transgrid expects to be exempt from producing a PADR; and
  - that the proposed preferred option and any other credible options will not have a material market benefit for the classes of market benefit specified in clause 5.15A.2(b)(4), with the exception of market benefits arising from changes in voluntary and involuntary load shedding;
- no PSCR submissions identified additional credible options that could deliver a material market benefit; and
- the PACR addresses any issues raised in relation to the proposed preferred option during the PSCR consultation (noting that no issues have been raised).

Parties wishing to raise a dispute notice with the AER may do so prior to 13 December 2025 (30 days after publication of this PACR). Any dispute notices raised during this period will be addressed by the AER within 40 to 100 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 regulatory.consultation@transgrid.com.au. In the subject field, please reference 'Line 94M PACR'.

Contents

1. Introduction

We are applying the Regulatory Investment Test for Transmission (RIT-T) to options for mitigating safety, environmental (bushfire) and financial (high reactive maintenance) risks caused by the deteriorating condition of certain components of the 132 kV line running between Beryl substation and Crudine Ridge Wind Farm on the NSW network ('Line 94M'). Publication of this Project Assessment Conclusions Report (PACR) represents the final step in the RIT-T process.

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

This RIT-T therefore examines options for addressing the asset condition issues so that network safety continues to meet a risk mitigation level of ALARP. Consequently, it is considered a reliability corrective action under the RIT-T.

1.1. Purpose of this report

The purpose of this PACR[7] is to:

- describe the identified need;
- summarise the submissions received to the Project Specification Consultation Report (PSCR);
- describe and assess credible options to meet the identified need;
- describe the assessment approach used; and
- provide details of the proposed preferred option to meet the identified need.

Overall, this report provides transparency into the planning considerations for investment options to ensure continuing reliable supply to our customers. A key purpose of this PACR is to provide interested stakeholders the opportunity to review the analysis and assumptions and have certainty and confidence that the preferred option has been robustly identified as optimal.

1.2. One submission was received in response to the PSCR

We published a Project Specification Consultation Report (PSCR) on 26 May 2025 and invited written submissions on the material presented within the document. One submission was received in response to the PSCR. With permission from the submitter, Xatech International Pty Ltd, the submission is available on our website.

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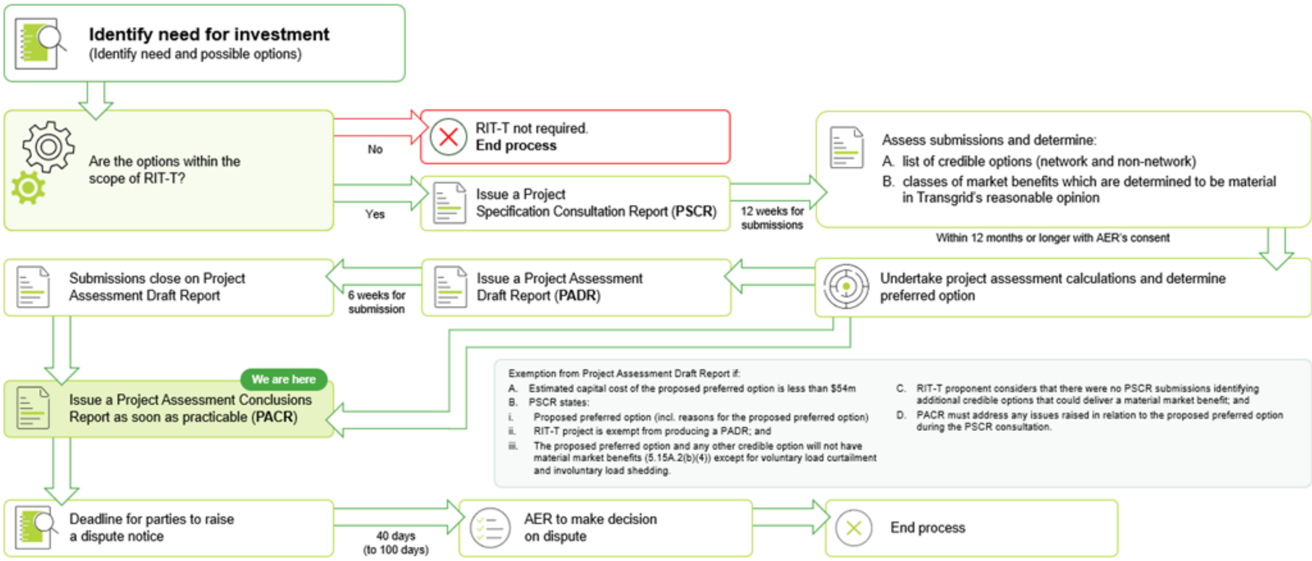
[7] See Appendix A for the National Electricity Rules requirements.

Notwithstanding, we considered whether this proposed alternative conductor could be progressed for this RIT-T as part of a credible option; effectively as a variation of Option 3 with the Lisbon/Hawk conductor being used rather than ACSR/GZ Lemon considered in the PSCR. Lisbon/Hawk is not typically used on our network; and as such, the timeframe required for testing to ensure design standards are met extends beyond the time available to conduct testing for this project. Therefore, even if the scope of this RIT-T were to include uprating of the line, we will not be able to progress this as a credible option as it cannot be implemented in sufficient time to meet the identified need.[8]

1.3. Next steps

This PACR represents the final step of the consultation process in relation to the application of the RIT-T process undertaken by Transgrid.

Figure 1-1 This PACR is the final stage of the RIT-T process[9]



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Further details on the RIT-T can be obtained from Transgrid's Regulation team via regulatory.consultation@transgrid.com.au . In the subject field, please reference 'Line 94M PACR'.

[8] As per clause 5.15.2(a)(3)

[9] Australian Energy Market Commission. "*Replacement expenditure planning arrangements, Rule determination*". Sydney: AEMC, 18 July 2017.

2. The identified need

This section outlines the identified need for this RIT-T, as well as the assumptions and data underpinning it. It first sets out background information relating to Line 94M.

2.1. Background to the identified need

Line 94M is a 132 kV line between Beryl substation and Crudine Ridge Wind Farm. The line consists of one part originally built in 1976 as a Mount Piper 132 kV to Beryl substation. It was cut-in to Crudine Ridge Wind Farm in 2020 with 46 double circuit structures over a route length of 13.7km. The double circuit section is a negotiated asset and is outside the scope of this PACR. The section to Mount Piper was given the new line number ‘9ML’. The remaining 94M Beryl substation to the cut-in location has a route length of 70km strung over 264 structures. Figure 2-1 depicts the location of Line 94M on our Central West NSW network.

Figure 2-1 Location of Line 94M

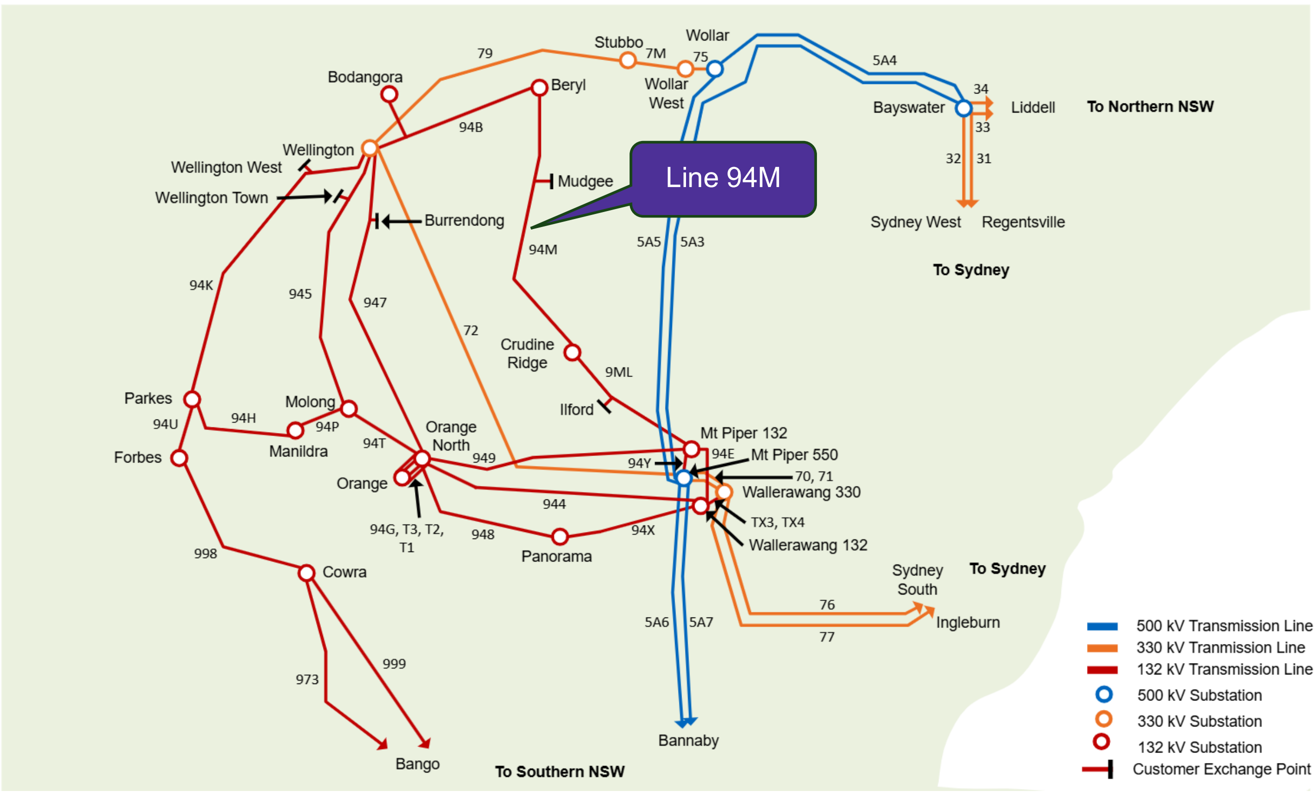


Figure 2-2 Wood pole structures on Line 94M.

The line has widespread condition issues on various line components, all of which increase the probability of asset failure. These issues present a bushfire and safety risk which Transgrid is obligated to manage.

The most significant element of concern is the condition of the wood pole structures on the line. Line 94M was first placed into service in 1976, and the wood poles are approaching 50 years of age and toward the end of their nominal lives. The defect rate on the line has increased from 2017 onwards, which is in line with the expected condition of the asset based on its original design parameters. It is noted that the neighbouring Line 94B between Beryl and Wellington had amongst the highest defect rates of Transgrid's wood pole lines, prior to its replacement with concrete pole structures between 2012 and 2015.

Detailed analysis of asset condition information records has identified that 11 structures, or 4% of the line are currently having deteriorating condition issues. A further 18 structures will have decayed to the point of requiring replacement by 2028, based on the average defect rates of structures assessed to require additional monitoring due to their condition (also known as "conditionally serviceable") over the past 10 years on this line.

The total number of structures expected to require replacement by FY26/27 is 29.

Given the age of the asset, it is also noted that other line components are in a deteriorating condition that is reflective of them approaching the end of their serviceable lives. These other condition issues impact 225 of the 246 wood pole structures on Line 94M, and cover multiple line components, including:

- Deterioration of conductor & earthwire dampers due to corrosion – failure of these components can lead to a conductor drop.

- Angle structure eye bolts – Wherein insulators are connected to the pole, as opposed to a crossarm. These bolts can "pull through" defected timber causing a conductor drop. Due to the design of these structures it is not possible to sound the poles in this area without an outage. The preferred connection is a pole band.
- Deterioration of earthwire bonding due to corrosion – this can lead to possible transfer potential, earth current and voltage gradient issues
- A large number of structures (222) still have porcelain insulators installed that are of pre-1974 vintage. These insulators are approaching the end of their serviceable lives. A sample 11 of 1960 manufacture porcelain disc insulator found five of them exhibit porosity (die penetrate testing). This is typical long-term deterioration. The insulators, despite being in good condition visually, are at risk of puncture through the porcelain.
- Condition issues with Panther ACSR/GZ conductor have also been identified, attributed to deterioration and inadequate welding practices during manufacturing of the conductor inner steel cores.

There is a need to remediate condition issues in order to:

- Manage network safety risk levels "As Low As Reasonably Practicable in accordance with the regulation obligations and Transgrid's business risk appetite. Under the Electricity Supply (Safety and Network Management) Regulation 2014 Section 5 'A network operator must take all reasonable steps to ensure that the design, construction, commissioning, operation and decommissioning of its network (or any part of its network) is safe.'
- Provide economic benefit to the consumers through safety and bushfire risks reductions. The direct impact of asset failure can result in a conductor drop event with potential fire ignition and/or safety hazard consequences to the general public, as evaluated in the associated modelling.

If the condition issues on the line are not addressed in sufficient time, then the asset will operate with increasing risk of failure as it continues to deteriorate. The level of reactive corrective maintenance needed to keep the line operating within required standards may also increase, particularly when asset failures ultimately occur.

Consequently, the proposed project has an economic benefits need, and addressing this need will provide avoidable cost savings from unserved energy penalties, reduced bushfire and safety risk, and maintenance costs that would otherwise occur without refurbishment.

Figure 2-3, Figure 2-4, and Figure 2-5 below provide illustrative examples of the condition of various components.

Figure 2-3 Typical broken batten

Figure 2-4 Typical wood pole deterioration

Figure 2-5 Measured hollow section at pole

2.2. Description of identified need

If action is not taken, the condition of Line 94M is expected to expose us and our customers to increasing levels of risk going forward, as the likelihood of failure increases. There are safety and 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’). The proposed investment will enable us to manage safety, environmental, reliability and financial risks on Line 94M.

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 the lines will continue to deteriorate.

We manage and mitigates bushfire and safety risk to ensure they are below risk tolerance levels or ‘As Low As Reasonably Practicable’ (‘ALARP’), in accordance with our obligations under the *New South Wales Electricity Supply (Safety and Network Management) Regulation 2014* and our Electricity Network Safety Management System (ENSMS).[10]

The proposed investment will enable us 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.

2.3. Assumptions underpinning the identified need

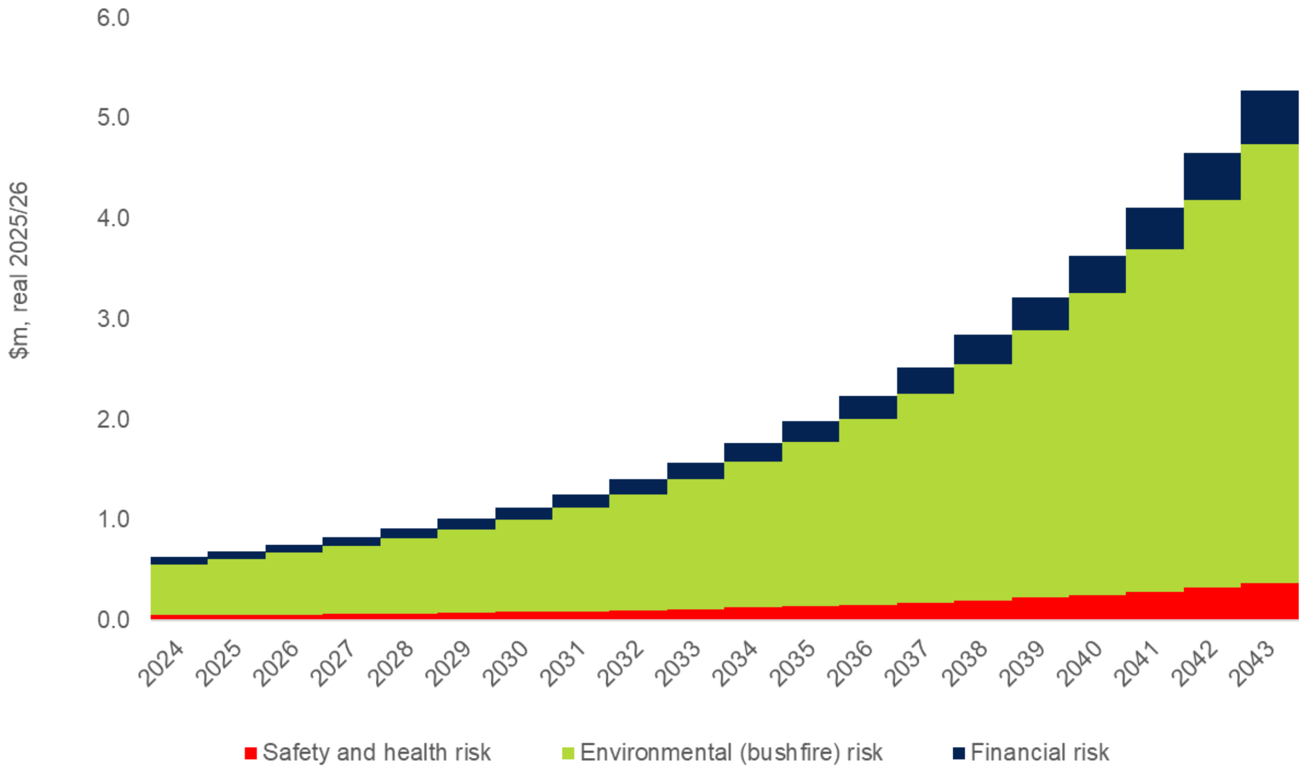
We adopt a risk cost framework to quantify and evaluate the risks and consequences of increased failure rates. Appendix B provides an overview of our Risk Assessment Methodology.

We note that the risk cost estimating methodology aligns with that used in our submitted Revised Revenue Proposal for the 2023-28 period. It reflects feedback from the Australian Energy Regulator (AER) on the methodology initially proposed in our initial Revenue Proposal.

Figure 2.6 Estimated risk costs summarises the increasing risk costs over the assessment period under the base case.

[10] Our ENSMS follows the International Organization for Standardization’s ISO31000:2018 Risk Management framework which requires following a hierarchy of hazard mitigation approach.

Figure 2.6 Estimated risk costs



This section describes the assumptions underpinning our assessment of the risk costs, ie, the value of the risk that may be avoided by undertaking a credible option that addresses the identified need. The regular maintenance regime will not be able to mitigate the risk of asset failure that will expose us and end-customers to approximately $0.83 million per year in safety, environmental, and financial risk costs by 2026/27. This is expected to increase going forward if action is not taken and the line is left to deteriorate further (reaching approximately $5.27 million/year by 2043, by the end of the 20-year assessment period).

2.3.1. Asset health and the probability of failure

Our asset health modelling aligns with Chapter 5.2 of the AER's Asset Replacement Planning guideline.[11] Condition information for each asset is assessed to generate an Asset Health Index and assets in relatively poor condition, as identified through the Asset Health Index, are candidates for a replacement or refurbishment intervention.

The asset health issues identified on Line 94M are summarised in Table 2-1.

[11] AER, *Industry practice application note – Asset replacement planning*, January 2019.

Table 2-1 Asset health issues along Line 94M and their consequences

Issue	Consequences if not remediated
Wood pole deterioration	Bushfire resulting in potential loss of property and/or life Safety incident resulting in potential injury or death Line outage with potential network reliability impacts.
Flying angle eye bolt pull-through	Bushfire resulting in potential loss of property and/or life Safety incident resulting in potential injury or death Line outage with potential network reliability impacts.
Vibration damper deterioration	Bushfire resulting in potential loss of property and/or life Safety incident resulting in potential injury or death Line outage with potential network reliability impacts.
Earthwire downlead deterioration	Line outage with potential network reliability impacts.
Wood pole batten cover deterioration	Safety incident resulting in potential injury or death
Possible conductor type issues (Panther Conductor)	Bushfire resulting in potential loss of property and/or life Safety incident resulting in potential injury or death Line outage with potential network reliability impacts.

Asset Health is used to estimate the remaining life of an asset and forecast the associated probability of failure (PoF) of the asset now and into the future. The future health of an asset (health forecasting) is a function of its current health and any factors causing accelerated (or decelerated) degradation or 'age shifting' of one or more of its components. Such moderating factors can represent the cumulative effects arising from continual or discrete exposure to unusual events, external stresses, overloads and faults.

Asset condition information is the primary source of information on the current health of the transmission line and its components. Condition information obtained through routine inspections of transmission line, such as condition rating of each component, and asset information, such as natural age, location and ideal life expectancy, form the basis for deriving current health.

The PoF is the likelihood that an asset will fail during a given period resulting in a particular adverse event. The probability of each failure mode is calculated using reliability engineering techniques that take into account conditional age (chronological age moderated by asset health), failure and defect history, and industry benchmarking studies. We screen out failures that are not related to end-of-life when quantifying risk for replacement projects because such risks are not addressed by these works.

2.3.2. Bushfire risk

This risk refers to the consequence to the community of an asset failure that results in a bushfire starting. We recently undertook assessment with the University of Melbourne[12] to improve our quantification of bushfire risks across our network, including the moderation of risk costs, using an electricity industry-developed approach.

[12] Refer to Network Asset Criticality Framework

The bushfire risk model:

- models the potential spread from a fire started at each asset in the network using recognised fire modelling software;
- calculates the consequence based on the number of houses, agricultural and forestry land use (and other infrastructure in the predicted burn area);
- moderates the consequence using a statistical distribution of fire conditions across the year to come up with a most likely consequence to be used in the investment decision;
- moderates this likely consequence by the likelihood of network assets igniting a fire in the event a catastrophic asset failure occurs (i.e., not all asset failures will ignite a fire); and
- further moderates this likely consequence taking in to account the expected emergency services response to a fire based on the proximity to population (i.e., locations close to population centres have the highest moderation of likely consequence as the emergency services response is expected to be relatively expeditious).

Consistent with our ALARP obligations, we apply a disproportionality factor of 'six' to the bushfire risk.[13].

Bushfire risk makes up approximately 82.6 per cent of the total estimated risk cost in present value terms under the base case for this RIT-T.

2.3.3. Financial risk

This risk refers to the direct financial consequence arising from the failure of an asset including the cost of replacement or repair of the asset (reactive maintenance) which may need to be under emergency conditions.

Financial risk makes up approximately 10 per cent of the total estimated risk cost in present value terms under the base case for this RIT-T.

2.3.4. Safety risk

This risk refers to the safety consequence to members of the public of an asset failure whose failure modes can create harm. The estimated value takes into account the cost associated with a fatality or injury including compensation, loss of productivity, litigation fees, fines and any other related costs.

Our safety model has recently been updated and developed in conjunction with asset management specialist consultancy AMCL[14]. The main changes to the model relate to consequence and likelihood quantifications with our safety risk now considering a range of consequences, from minor injury to fatality, and the likelihood of each based on historical events, human movement data and land use.

Consistent with our ALARP obligations, we apply a disproportionality factor of 'six' to the public safety component and 'three' to the worker safety component of safety risk.

Safety risk makes up 7 per cent of the total estimated risk cost in present value terms under the base case for this RIT-T.

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[13] Refer to section 6.2.5 of the Network Risk Assessment Methodology
[14] Refer to Network Asset Criticality Framework

3. Potential credible options

This section describes the options we have investigated to address the need, including the scope of each option and the associated costs.

We consider that there are three feasible options from a technical, commercial, and project delivery perspective that can be implemented in sufficient time to meet the identified need. Three other options were considered but not progressed for the reasons that are outlined in Table 3-1.

All costs and benefits presented in this PACR are in 2025/26 dollars, unless otherwise stated.

3.1. Base case

The costs and benefits of each option in this PACR are compared against those of a base case. Under this base case, no proactive capital investment is made to remediate the deterioration of Line 94M and the line will continue to operate and be maintained under the current regime.

While the base case is not a situation we plan to encounter, and this RIT-T has been initiated specifically to avoid it, the assessment is required under RIT-T to use this base case as a common point of reference when estimating the net benefits of each credible option.

The regular maintenance regime will not be able to mitigate the risk of asset failure that will expose us and end-customers to approximately $0.83 million per year in safety, environmental, and financial risk costs by 2026/27, rising to $5.27 million per year by the end of the assessment period.[15] The environmental and safety risk costs are mainly due to consequences of a bushfire event resulting from conductor drop or structure failure and risks associated with compromised earthing. Under the base case, all of these risks will continue to increase.

Routine operating and maintenance costs are estimated at approximately $101,373 per year. This decreases for each option that reduces the number of wooden poles on the line. This is because wooden poles require an ongoing maintenance program. Reactive maintenance costs also differ and are captured under financial risks.

3.2. Option 1 – Remediate known condition issues on the line

Option 1 involves the following:

- Replacement of the wood pole structures known to be exhibiting deterioration with steel or concrete pole structures. The number of structures to be replaced for this option is 29.
- Remediation work which includes replacement of insulators, earthwire bonding, conductor and earthwire dampers and batten covers. The number of structures to remediate for this option is 40.

The works are expected to be undertaken between 2023/24 and 2026/27. Planning, design, development and procurement (including completion of the RIT-T) will occur between 2023/24 and 2025/26, while project delivery and construction will occur from 2026/27. This project is expected to take approximately 39 months to complete.

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[15] This determination of yearly risk costs is based on our Network Asset Risk Assessment Methodology and incorporates variables such as likelihood of failure/exposure, various types of consequence costs and corresponding likelihood of occurrence.

All works would be completed in accordance with the relevant standards with minimal modification to the wider transmission assets. Necessary outages of affected line(s) in service would be planned appropriately in order to complete the works with minimal impact on the network.

The estimated capital expenditure associated with this option is $9.34 million, which is comprised of:

- $2.74 million in labour costs;
- $0.99 million in materials costs; and
- $5.61 million in expenses.

Routine operating and maintenance costs relating to planned checks by our field crew are approximately $99,744 per year.

3.3. Option 2 – Rebuild the entire line, replacing wood poles with concrete or steel pole structures.

Option 2 involves:

- replacement of all wood pole structures with steel or concrete pole structures (264 in total)

Given the age of the asset, it is also noted that other line components are in a deteriorating condition that is reflective of them approaching the end of their serviceable lives. This option addresses other condition issues which impact 225 of the 246 structures on Line 94M, and cover multiple line components, including:

- Deterioration of conductor & earthwire dampers due to corrosion.
- Angle structure eye bolts – Wherein insulators are connected to the pole, as opposed to a crossarm. These bolts can “pull through” defected timber causing a conductor drop. Due to the design of these structures it is not possible to sound the poles in this area without an outage. The preferred connection is a pole band.
- Deterioration of earthwire bonding due to corrosion.
- A large number of structures (222) still have porcelain insulators installed that are of pre-1974 vintage.

While these issues are widespread, it is not considered economically efficient to conduct a refurbishment program to remediate them. Due to the advanced age and condition of the wood pole structures on the line, it is likely that full replacement of the structures will be required within the short to medium term. Were these components to be replaced under any refurbishment programme, they would need to be replaced again at the time of the structure replacement and will accordingly only be in service for a fraction of their nominal expected lives.

Hence, replacement of all remaining wood pole structures is proposed including the wood pole structures stated in option 1. The number of structures to be replaced for this option is 264.

The works are expected to be undertaken between 2023/24 and 2026/27. Planning, design, development and procurement (including completion of the RIT-T) will occur between 2023/24 and 2025/26, while project delivery and construction will occur from 2026/27. The works are estimated to take 39 months to complete. Project completion is assumed in 2026/27.

All works would be completed in accordance with the relevant standards with minimal modification to the wider transmission assets. Necessary outages of affected line(s) in service would be planned appropriately in order to complete the works with minimal impact on the network.

The estimated capital expenditure associated with this option is $47.47

million, which is comprised of:

- $7.48 million in labour costs;
- $2.37 million in materials costs; and
- $37.63 million in expenses.

Routine operating and maintenance costs relating to planned checks by our field crew are approximately $87,550 per year.

3.4. Option 3 – Rebuild entire line and replace existing conductor

Option 3 involves:

- Rebuilding the entire line, replacing wood poles with concrete or steel pole structures. The existing Panther conductor is to be replaced with Lemon ACSR/GZ.

Condition issues with Panther ACSR/GZ conductor have also been identified, attributed to deterioration and inadequate welding practices during manufacturing of the conductor inner steel cores.

This option will address the condition issues in Option 1, 2 and also the Panther conductor by rebuilding the entire line. This will provide efficiency in the delivery. No uprating is needed for this line, and Lemon is chosen as like-for-like replacement based on condition assessment.

The number of structures to be replaced for the option is 264. 70km of conductor and overhead earthwire are also to be replaced under this option.

The works are expected to be undertaken between 2023/24 and 2026/27. Planning, design, development and procurement (including completion of the RIT-T) will occur between 2023/24 and 2025/26, while project delivery and construction will occur from 2026/27. The works are estimated to take 39 months to complete. Project completion is assumed in 2026/27.

All works would be completed in accordance with the relevant standards with minimal modification to the wider transmission assets. Necessary outages of affected line(s) in service would be planned appropriately in order to complete the works with minimal impact on the network.

The estimated capital expenditure associated with this option is $61.28 million, which is comprised of:

- $9.64 million in labour costs;
- $2.92 million in materials costs; and
- $48.73 million in expenses.

Routine operating and maintenance costs relating to planned checks by our field crew are approximately $87,550 per year.

3.5. Options considered but not progressed

We considered several additional options to meet the identified need in this RIT-T. Table 3-1 summarises the reasons the following credible options were not progressed further.

Table 3-1 Options considered but not progressed

Description	Reason(s) for not progressing
Increased inspections	The condition issues have already been identified and cannot be rectified through increased inspections, and therefore is not technically feasible.
Elimination of all associated risk	This can only be achieved through retirement and decommissioning of the associated assets which is not technically feasible. Line 94M is required to maintain the security of supply to the Central West region of the network, and connect Crudine Ridge Wind Farm to the National Electricity Market.
Non-network solutions	Transgrid does not consider non-network options to be commercially and technically feasible to assist with meeting the identified need, as non-network options will not mitigate the environment (bushfire) and safety risk posed as a result of wood pole deterioration. No submissions were received in response to the PSCR in relation to non-network options.
Using an alternative conductor (ie Lisbon/Hawk as an alternative to ACSR/Lemon) as a variation to Option 3	We proposed ACSR/GZ Lemon as a modern equivalent to Panther because it is the most prudent and efficient alternative that will enable us to address the condition issues outlined in the PSCR. Using a conductor a higher rating would not result in any increase in circuit due to the sections of 94M out of scope of this RIT-T being strung with Lemon conductor. While we consider using an alternative conductor not typically used on our network to be technically feasible, the testing required to ensure it meets design standards extends beyond the time available to conduct testing for this project. Therefore, even if the scope of this RIT-T were to include uprating of the line, we will not be able to progress this as a credible option as it cannot be implemented in sufficient time to meet the identified need.

3.6. No material inter-network impact is expected

We have considered whether the credible options described above is expected to have material inter-regional impact.[16] A 'material inter-network impact' is defined in the NER as:

> *"A material impact on another Transmission Network Service Provider's network, which impact may include (without limitation): (a) the imposition of power transfer constraints within another Transmission Network Service Provider's network; or (b) an adverse impact on the quality of supply in another Transmission Network Service Provider's network."*

[16] As per clause 5.16.4(b)(6)(ii) of the NER.

AEMO's suggested screening test to indicate that a transmission augmentation has no material inter-regional impact is that it satisfies the following:[17]

- a decrease in power transfer capability between transmission networks or in another TNSP's network of no more than the minimum of 3% of the maximum transfer capability and 50 MW;
- an increase in power transfer capability between transmission networks or in another TNSP's network of no more than the minimum of 3% of the maximum transfer capability and 50 MW;
- an increase in fault level by less than 10 MVA at any substation in another TNSP's network; and
- the investment does not involve either a series capacitor or modification in the vicinity of an existing series capacitor.

We note that the credible option satisfies these conditions as it does not modify any aspect of electrical or transmission assets. By reference to AEMO's screening criteria, there is no material inter-network impacts associated with the credible option.

3.7. Community engagement

Social license costs can be reduced through early and continued engagement with communities and stakeholders who are reasonably expected to be affected by the project.

Transgrid recognises that the preferred option being considered in this RIT-T (Option 1 - replacing wooden poles with concrete in select locations) may impact surrounding communities. A detailed plan, known as a Community Action Plan, would be drafted and communicated to inform contractors and staff of landowner access and bio-security requirements. Engagement would occur prior to construction to discuss issues and work to reduce impacts, for example, timing of works to minimise harvesting or stock movements. The landowner would be provided with contacts for staff members should issues arise so they can be addressed in a timely manner.

[17] Inter-Regional Planning Committee. *Final Determination: Criteria for Assessing Material Inter-Network Impact of Transmission Augmentations*. Melbourne: Australian Energy Market Operator, 2004. Appendix 2 and 3.

4. Materiality of market benefits

This section outlines the categories of market benefits prescribed in the National Electricity Rules (NER) and whether they are considered material for this RIT-T.[18]

The AER has recognised that if the credible options considered will not have an impact on the wholesale electricity market, then a number of classes of market benefits will not be material in the RIT-T assessment and so do not need to be estimated.[19]

The credible options considered in this RIT-T will not address network constraints between competing generating centres and are therefore not expected to result in any change in dispatch outcomes and wholesale market prices. We therefore consider that the following classes of market benefits are not material for this RIT-T assessment:

- changes in fuel consumption arising through different patterns of generation dispatch;
- changes in voluntary load curtailment (since there is minor impact on pool price);
- changes in costs for parties other than the RIT-T proponent;
- changes in ancillary services costs;
- changes in network losses;
- competition benefits; and
- changes in greenhouse gas emissions.

4.1. Wholesale electricity market benefits are not material

The AER has recognised that if the credible options considered will not have an impact on the wholesale electricity market, then a number of classes of market benefits will not be material in the RIT-T assessment, and so do not need to be estimated.[20]

The credible options considered in this RIT-T will not address network constraints between competing generating centres and are therefore not expected to result in any change in dispatch outcomes and wholesale market prices. We therefore consider that the following classes of market benefits are not material for this RIT-T assessment:

- changes in fuel consumption arising through different patterns of generation dispatch;
- changes in voluntary load curtailment (since there is minor impact on pool price);
- changes in costs for parties other than the RIT-T proponent;
- changes in ancillary services costs;

[18] The NER requires that all classes of market benefits identified in relation to the RIT-T are included in the RIT-T assessment, unless the TNSP can demonstrate that a specific class (or classes) is unlikely to be material in relation to the RIT-T assessment for a specific option – NER clause 5.15A.2(5). See Appendix A for requirements applicable to this document.

[19] AER, *Application Guidelines Regulatory Investment Test for Transmission*, November 2024, pp.56-57.

[20] AER, *Application Guidelines Regulatory Investment Test for Transmission*, November 2024, pp. 56-57.

- changes in network losses; and
- competition benefits.

4.2. No other classes of market benefits are material

In addition to the classes of market benefits listed above, NER clause 5.15A.2(4) requires that we consider the following classes of market benefits, listed in Table 5-1 arising from each credible option. We consider that none of the classes of market benefits listed are material for this RIT-T assessment for the reasons outlined below.

Table 4-1 Reasons non-wholesale electricity market benefits are considered immaterial

Market benefits	Reason
Changes in involuntary load curtailment	Since Line 94M forms part of a meshed network (with an N-1 level of redundancy) required to supply the Central West NSW region, a failure of one line due to condition issues results in a negligible chance of unserved energy.
Differences in the timing of expenditure	Options considered will provide an alternative to meeting reliability requirements but are unlikely to affect decisions to undertake unrelated expenditure in the network. Consequently, material market benefits will neither be gained nor lost due to changes in the timing of other network expenditure from any of the options considered.
Option value	We note the AER's view that option value is likely to arise where there is uncertainty regarding future outcomes, the information that is available is likely to change in the future, and the credible options considered by the TNSP are sufficiently flexible to respond to that change.[21] We also note the AER's view that appropriate identification of credible options and reasonable scenarios captures any option value, thereby meeting the NER requirement to consider option value as a class of market benefit under the RIT-T. We note that no credible option is sufficiently flexible to respond to change or uncertainty for this RIT-T. Specifically, each option is focused on proactively replacing deteriorating assets ahead of when they fail.
Changes in Australian greenhouse gas emissions	None of the options are expected to induce a material change in Australia's greenhouse gas emissions.

4.3. Approach to estimating option costs

We have estimated the capital costs of the options based on the scope of works necessary together with costing experience from previous projects of a similar nature.

The cost estimates are developed using our 'MTWO' cost estimating system. This system utilises historical average costs, updated by the costs of the most recently implemented project with similar scope. All

[21] AER, *Regulatory Investment Test for Transmission Application Guidelines*, November 2024, pp.57-58.

estimates in MTWO are developed to deliver a ‘P50’ portfolio value for a total program of works (i.e., there is an equal likelihood of over- or under-spending the estimate total).[22]

We estimate the majority of structures will be refurbished in normal soil. As work is to replace structures on an existing line, minor access track upgrade works have been allowed for.

We estimate that actual costs will be within +/- 25 per cent of the central capital cost estimate. An accuracy of +/-25 per cent for cost estimates is consistent with industry best practice and aligns with the accuracy range of a ‘Class 4’ estimate, as defined in the Association for the Cost Engineering classification system.

All cost estimates are prepared in real, 2024/25 dollars based on the information and pricing history available at the time that they were estimated. The cost estimates do not include or forecast any real cost escalation for materials.

Routine operating and maintenance costs are based on works of similar nature.

On 21 November 2024, the requirements set out in the Australian Energy Regulator’s Regulatory Investment Test for Transmission (RIT-T) Application Guidelines were amended. The amended guidelines now expect a RIT-T proponent to explicitly consider community engagement and social licence during the RIT-T process.

The amended guidelines mean that Transgrid must consider social licence principles in the identification of credible options. This may affect how we determine the most likely cost and delivery timeline for an option.

Transgrid believes building relationships and trust is how we can gain and grow social licence. Through engagement with affected communities, we identify prudent and efficient investment opportunities that can build and gain community acceptance for our options. Costs associated with social licence include those associated with engagements, community benefits, minor route adjustments and legislated additional landholder payments, as applicable.

We acknowledge this important change to the RIT-T guidelines. However, due to the nature of these works being a replacement to infrastructure within an existing line, and therefore low impact on community, we do not anticipate the need to provide additional cost to address social license considerations (as outlined in 3.7)

4.4. The options have been assessed against three reasonable scenarios

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.

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[22] For further detail on our cost estimating approach refer to section 7 of our Augmentation Expenditure Overview Paper submitted with our 2023-28 Revenue Proposal.

The credible options have been assessed under three scenarios as part of this PACR assessment, which differ in terms of the key drivers of the estimated net market benefits (i.e., the estimated risk costs avoided).

Given that wholesale market benefits are not relevant for this RIT-T, the three scenarios implicitly assume the most likely scenario from the 2025 IASR (i.e., the 'Step Change' scenario). The scenarios differ by the assumed level of risk costs, given that these are key parameters that may affect the ranking of the credible options. Risk cost assumptions do not form part of AEMO's IASR assumptions, and have been based on Transgrid's analysis, as discussed in section 2.

We developed the Central Scenario around a static model of demand scenarios, described further in Section A.3 of our Network Asset Criticality Framework. We consider that this approach is appropriate since it materially reduces the computational effort required, and since differences in demand forecasts will not materially affect the ranking of the credible options.

How the NPV results are affected by changes to other variables (including the discount rate and capital costs) has been investigated in the sensitivity analysis. We consider this is consistent with the latest AER guidance for RIT-Ts of this type (i.e., where wholesale market benefits are not expected to be material).[23],[24],[25]

Table 4-2 Summary of scenarios

Variable / Scenario	Central	Low risk cost scenario	High risk cost scenario
Scenario weighting	1/3	1/3	1/3
Discount rate	7%	7%	7%
Network capital costs	Base estimate	Base estimate	Base estimate
Operating and maintenance costs	Base estimate	Base estimate	Base estimate
Safety, environmental and financial risk benefit	Base estimate	Base estimate – 25%	Base estimate +25%

We have weighted the three scenarios equally given there is nothing to suggest an alternate weighting would be more appropriate.

4.5. Sensitivity analysis

In addition to the scenario analysis, we have also considered the robustness of the outcome of the cost benefit analysis through undertaking various sensitivity testing.

23 AER, Application Guidelines Regulatory Investment Test for Transmission, November 2024, pp. 42-44.

24 We consider the approach to scenarios and sensitivities to be consistent with the AER guidance provided in November 2022 in the context of the disputes of the North West Slopes and Bathurst, Orange and Parkes RIT-Ts. See: AER, *Decision: North West Slopes and Bathurst, Orange and Parkes Determination on dispute - Application of the regulatory investment test for transmission*, November 2022, pp. 18-20 & 31-32, as well as with the AER's RIT-T Guidelines.

25 AEMO '2025 Inputs, Assumptions and Scenarios Report', July 2025, p 159

The range of factors tested as part of the sensitivity analysis in this PACR are:

- lower and higher assumed capital costs;
- lower and higher estimated safety, environmental and financial risk benefits; and
- alternate commercial discount rate assumptions.

The above list of sensitivities focuses on the key variables that could impact the identified preferred option. The results of the sensitivity tests are set out in Section 6.4

In addition, we have also sought to identify the ‘boundary value’ for key variables beyond which the outcome of the analysis would change, including the amount by which capital costs would need to increase for the preferred option to no longer be preferred.

5. Overview of the assessment approach

This section outlines the approach that we have applied in assessing the net benefits associated with each of the credible options against the base case.

5.1. Description of the base case

The costs and benefits of each option are compared against the base case. Under this base case, no investment is undertaken, we incur regular and reactive maintenance costs, and the line will continue to operate with an increasing level of risk.

We note that this course of action is not expected in practice. However, this approach has been adopted since it is consistent with AER guidance on the base case for RIT-T applications.[26]

5.2. Assessment period and discount rate

A 20-year assessment period from 2023/24 to 2042/43 has been adopted for this RIT-T analysis. This period takes into account the size, complexity and expected asset life of the options.

Where the capital components of the credible options have asset lives extending beyond the end of the assessment period, the NPV modelling includes a terminal value to capture the remaining asset life. This ensures that the capital cost of long-lived options over the assessment period is appropriately captured, and that all options have their costs and benefits assessed over a consistent period, irrespective of option type, technology or asset life. The terminal values are calculated as the undepreciated value of capital costs at the end of the analysis period.

A real, pre-tax discount rate of 7 per cent has been adopted as the central assumption for the NPV analysis presented in this PACR, consistent with the AEMO's 2025 Inputs, Assumptions and Scenarios Report (IASR).[27] The RIT-T requires that sensitivity testing be conducted on the discount rate. We have therefore tested the sensitivity of the results to a lower bound and upper bound discount rate of 3.00 per cent and 10.0 per cent, respectively which are consistent with AEMO's 2025 IASR.

5.3. Approach to estimating option costs

We have estimated the capital costs of the options based on the scope of works necessary together with costing experience from previous projects of a similar nature.

The cost estimates are developed using our 'MTWO' cost estimating system. This system utilises historical average costs, updated by the costs of the most recently implemented project with similar scope. All estimates in MTWO are developed to deliver a base cost' portfolio value for a total program of works (i.e., there is an equal likelihood of over- or under-spending the estimate total).[28]

We estimate the majority of structures will be refurbished in normal soil with some presence of rock along the line. As the work is to refurbish and replace structures on an existing line, minor access track upgrade

[26] AER, "*Application guidelines Regulatory Investment for Transmission, November* 2024, pp.21-23.
[27] AEMO, *2025 Inputs, Assumptions and Scenarios Report*, August 2025, pp.159.
[28] For further detail on our cost estimating approach refer to section 7 of our Augmentation Expenditure Overview Paper submitted with our 2023-28 Revenue Proposal.

work, water crossing upgrades, groundwork in the form of grade and filling, and vegetation clearing have been allowed for.

We estimate that actual costs will be within +/- 10 per cent of the central capital cost estimate. An accuracy of +/-10 per cent for cost estimates is consistent with industry best practice and aligns with the accuracy range of a 'Class 2' estimate, as defined in the Association for the Cost Engineering classification system.

All cost estimates are prepared in real 2024/25 dollars based on the information and pricing history available at the time that they were estimated. The cost estimates do not include or forecast any real cost escalation for materials.[29]

Routine operating and maintenance costs are based on works of similar nature.

On 21 November 2024, the requirements set out in the Australian Energy Regulator's Regulatory Investment Test for Transmission (RIT-T) Application Guidelines were amended. The amended guidelines now expect a RIT-T proponent to explicitly consider community engagement and social licence during the RIT-T process.

The amended guidelines mean that Transgrid must consider social licence principles in the identification of credible options. This may affect how we determine the most likely cost and delivery timeline for an option.

Transgrid believes building relationships and trust is how we can gain and grow social licence. Through engagement with affected communities, we identify prudent and efficient investment opportunities that can build and gain community acceptance for our options. Costs associated with social licence include those associated with engagements, community benefits, minor route adjustments and legislated additional landholder payments, as applicable.

We acknowledge this important change to the RIT-T guidelines and will continue to engage with the community to identify opportunities to address social impacts and reduce the need for compensation due to project impact. We will take into account any additional social licence considerations (including those identified through ongoing community engagement, as outlined in section 3.6) identified and accordingly update the cost and timing of the credible options in the PACR, where appropriate.

5.4. The options have been assessed against three reasonable scenarios

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 PACR assessment, which differ in terms of the key drivers of the estimated net market benefits (i.e., the estimated risk costs avoided).

[29] Costs have been inflated using CPI to the real dollar 2025/26 for assessment purposes

Given that wholesale market benefits are not relevant for this RIT-T, the three scenarios implicitly assume the most likely scenario from the 2025 IASR (i.e., the 'Step Change' scenario). The scenarios differ by the assumed level of risk costs, given that these are key parameters that may affect the ranking of the credible options. Risk cost assumptions do not form part of AEMO's IASR assumptions, and have been based on Transgrid's analysis, as discussed in section 2.

We developed the Central Scenario around a static model of demand scenarios, described further in Section A.3 of our Network Asset Criticality Framework. We consider that this approach is appropriate since it materially reduces the computational effort required, and since differences in demand forecasts will not materially affect the ranking of the credible options.

How the NPV results are affected by changes to other variables (including the discount rate and capital costs) has been investigated in the sensitivity analysis. We consider this is consistent with the latest AER guidance for RIT-Ts of this type (i.e., where wholesale market benefits are not expected to be material).[30],[31],[32]

Table 5-1 Summary of scenarios

Variable / Scenario	Central	Low risk cost scenario	High risk cost scenario
Scenario weighting	1/3	1/3	1/3
Discount rate	7%	7%	7%
Network capital costs	Base estimate	Base estimate	Base estimate
Operating and maintenance costs	Base estimate	Base estimate	Base estimate
Safety, environmental and financial risk benefit	Base estimate	Base estimate – 25%	Base estimate +25%

We have weighted the three scenarios equally given there is nothing to suggest an alternate weighting would be more appropriate.

5.5. Sensitivity analysis

In addition to the scenario analysis, we have also considered the robustness of the outcome of the cost benefit analysis through undertaking various sensitivity testing.

The range of factors tested as part of the sensitivity analysis in this PACR are:

30 AER, Application Guidelines Regulatory Investment Test for Transmission, November 2024, pp. 42-44.

31 We consider the approach to scenarios and sensitivities to be consistent with the AER guidance provided in November 2022 in the context of the disputes of the North West Slopes and Bathurst, Orange and Parkes RIT-Ts. See: AER, *Decision: North West Slopes and Bathurst, Orange and Parkes Determination on dispute - Application of the regulatory investment test for transmission*, November 2022, pp. 18-20 & 31-32, as well as with the AER's RIT-T Guidelines.

32 AEMO '2025 Inputs, Assumptions and Scenarios Report', July 2025, pp. 159

- lower and higher assumed capital costs;
- lower and higher estimated safety, environmental and financial risk benefits; and
- alternate commercial discount rate assumptions.

The above list of sensitivities focuses on the key variables that could impact the identified preferred option. The results of the sensitivity tests are set out in Section 6.4

In addition, we have also sought to identify the 'boundary value' for key variables beyond which the outcome of the analysis would change, including the amount by which capital costs would need to increase for the preferred option to no longer be preferred.

6. Assessment of credible options

This section outlines the assessment we have undertaken of the credible network options. The assessment compares the costs and benefits of the credible option to the base case. The benefits of the credible option are represented by a reduction in costs or risks compared to the base case.

All costs and benefits presented in this PACR are in 2025/26 dollars.

6.1. Estimated gross benefits

Table 6-1 below summarises the present value of the gross benefits of the options under the three scenarios. These include both the avoided risk cost estimates for each credible option relative to the base case.

Table 6-1 Estimated gross benefits from credible options relative to the base case ($million, PV)

Option/scenario	Central	Low risk cost scenario	High risk cost scenario	Weighted
Scenario weighting	*1/3*	*1/3*	*1/3*	
Option 1	10.22	7.67	12.78	10.22
Option 2	19.14	14.35	23.92	19.14
Option 3	19.22	14.42	24.03	19.22

6.2. Estimated costs

Table 6-2 below summarises the costs of the option, relative to the base case, in present value terms. The cost includes the direct capital and routine operating costs of each option, relative to the base case, and is the same in all scenarios across both Options given nothing that affects the direct costs is varied between scenarios.

Table 6-2 Costs of credible options relative to the base case ($million, PV)

Option	Cost
Option 1	7.88
Option 2	38.90
Option 3	49.84

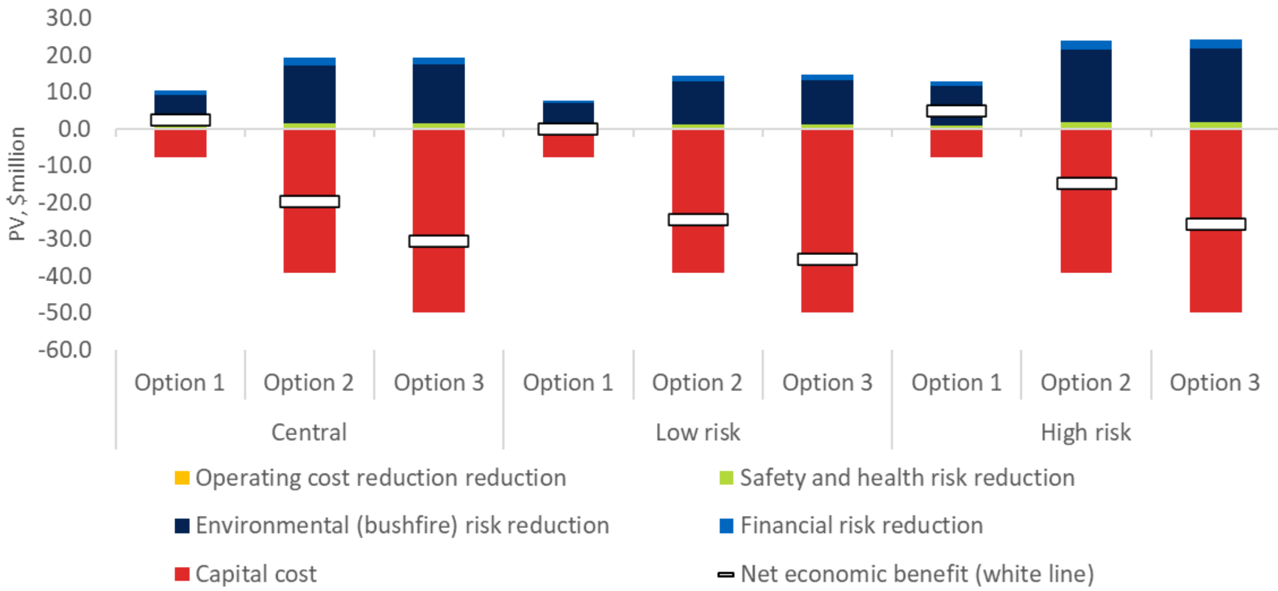
6.3. Estimated net economic benefits

The net economic benefits are the differences between the estimated gross benefits less the estimated costs.

Table 6-3 NPV of net economic benefits relative to the base case ($m/PV)

Option	Central scenario	Low risk costs scenario	High risk costs scenario	Weighted scenario
Scenario weighting	*1/3*	*1/3*	*1/3*	
Option 1	2.34	-0.21	4.90	2.34
Option 2	-19.76	-24.55	-14.98	-19.76
Option 3	-30.61	-35.42	-25.81	-30.61

Figure 6-1 Net economic benefits ($million, PV)



6.4. Sensitivity testing

We have undertaken sensitivity testing to understand the robustness of the RIT-T assessment to underlying assumptions about key variables. In particular, we have undertaken two sets of sensitivity tests:

- Step 1 – testing the sensitivity of the optimal timing of the project ('trigger year') to different assumptions in relation to key variables; and
- Step 2 – once a trigger year has been determined, testing the sensitivity of the total NPV benefit associated with the investment proceeding in that year, in the event that actual circumstances turn out to be different.

Having assumed to have committed to the project by this date, we have also looked at the consequences of 'getting it wrong' under step 2 of the sensitivity testing. That is, if expected safety and environmental risks are not as high as expected, for example, the impact on the net economic benefit associated with the project continuing to go ahead on that date.

The application of the two steps to test the sensitivity of the key findings is outlined below.

6.4.1. Step 1 – Sensitivity testing of the optimal timing

This section outlines the sensitivity of the identification of the commissioning year of Option 1 to changes in the underlying assumptions. In particular, the optimal timing of Option 1 is found to be variant to the assumptions of:

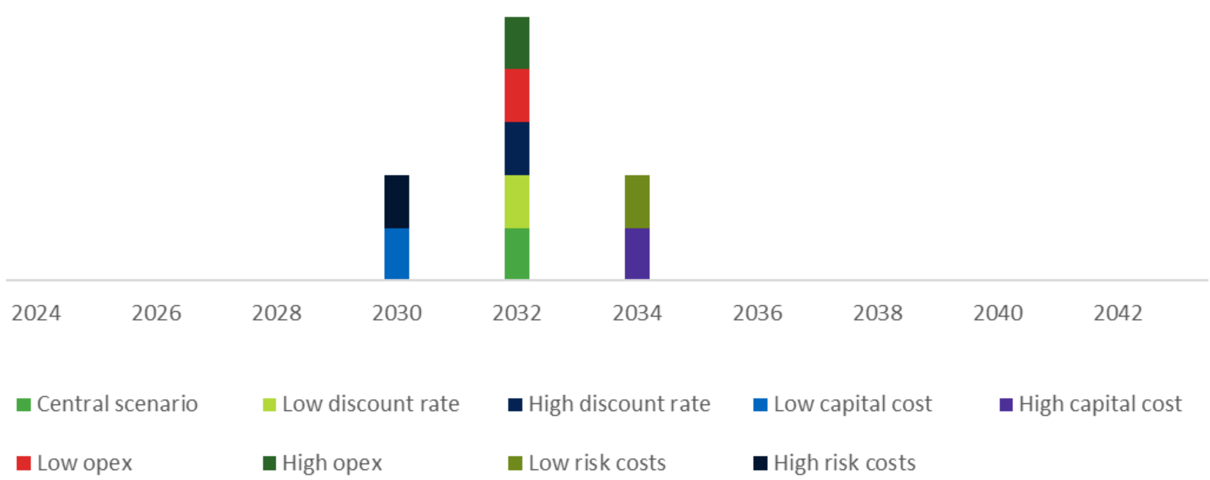
- a 25 per cent increase/decrease in the assumed capital and operating expenses;
- lower discount rate of 3.0 per cent as well as a higher rate of 10.0 per cent; and
- higher assumed safety, environmental and financial risks.

Each timing sensitivity has been undertaken on the central scenario.

Figure 6-2 outlines the impact on the optimal commissioning year, under a range of alternative assumptions. It illustrates that for Option 1, the optimal commissioning date is found to be in 2031/32 for all of the sensitivities investigated.

The optimal timing for Option 1 is also invariant to all of the above assumptions.

Figure 6-2 Optimal timing of Option 1



6.4.2. Step 2 – Sensitivity of the overall net benefit

We have conducted sensitivity analysis on the present value of the net economic benefit, based on undertaking delivery of the project by 2031/32. Specifically, we have investigated the same sensitivities under this step as in the first step:

- a 25 per cent increase/decrease in the assumed network capital costs;
- lower (or higher) assumed safety, environmental and financial risks.
- lower discount rate of 3.0 per cent as well as a higher rate of 10.0 per cent.

All these sensitivities investigate the consequences of 'getting it wrong' having committed to a certain investment decision. However, Option 1 across all sensitivity tests is still preferred.

The figures below illustrate the estimated net economic benefits for each option if separate key assumptions in the central scenario are varied individually. Both options deliver positive benefits under all scenarios.

The sensitivity testing focuses on the central scenario given the ranking of the options is found to be the same across all three scenarios investigated and there are significant expected net market benefits under each scenario. That is, we do not expect the key findings to change for this RIT-T if the sensitivity testing was expanded to cover the low risk and high-risk scenarios.

Figure 6-3 Capital cost sensitivity

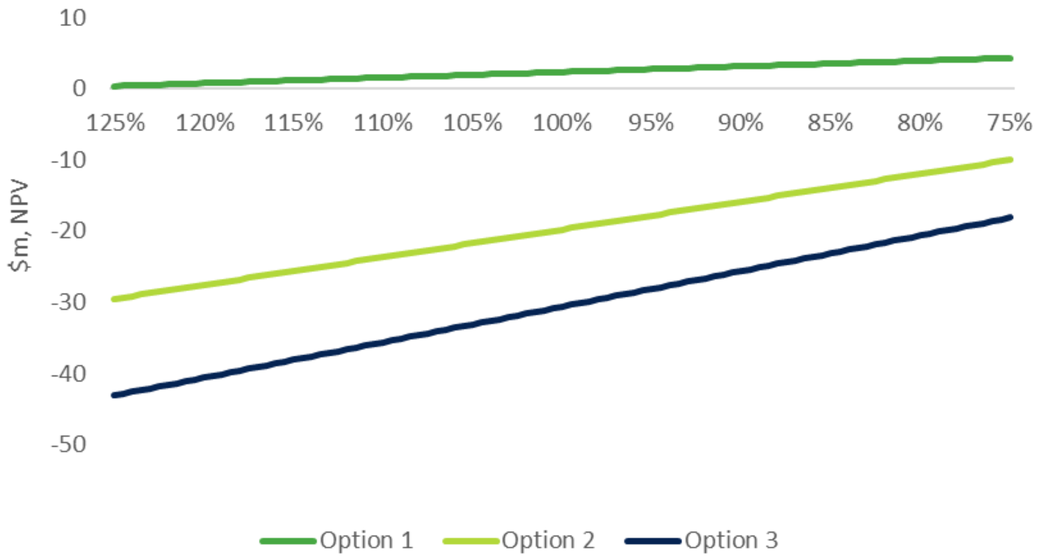


Figure 6-4 Risk costs sensitivity

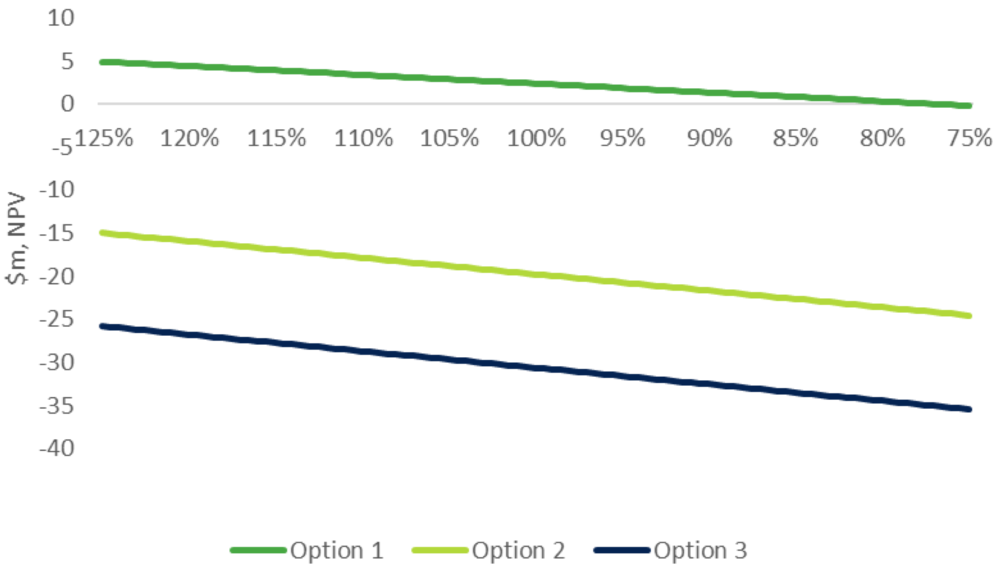
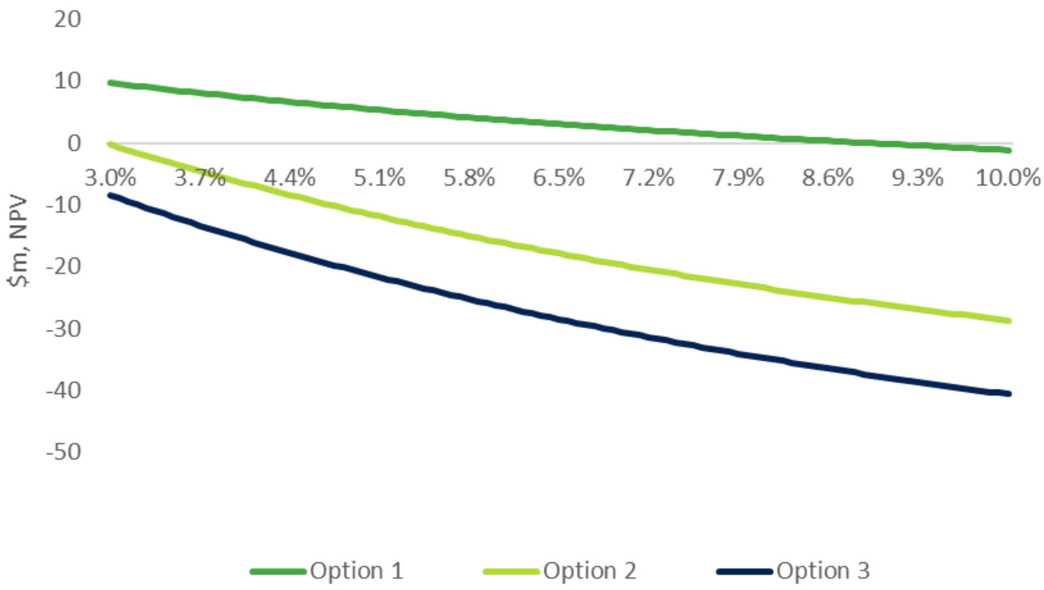


Figure 6-5 Commercial discount rate sensitivity



Our results suggests that there is no reasonable change in discount rate, assumed network capital costs, or estimated risk costs that would change the expected net benefit to negative, we therefore consider the expected positive net benefits provided by Option 1 to be robust to reasonable capital cost sensitivities.

In terms of boundary testing, we find that the following would need to occur for Option 1 to have net market benefits equal to that of Option 2:

- assumed network capital costs (for all options) would need to fall by 71 per cent;
- the estimated risk costs (in aggregate) would need to increase by 248 per cent; and
- no reasonable discount rate costs would result in Option 1 no longer being the preferred Option.

We therefore consider the finding that Option 1 is preferred over all options to be robust to the key underlying assumptions.

7. Final conclusion on the preferred option

This PACR has found that Option 1 is the preferred option for this RIT-T.

Option 1 involves:

- Replacement of the wood pole structures known to be exhibiting deterioration (29 in total) with steel or concrete pole structures.
- Remediation work which includes replacement of insulators, earthwire bonding, conductor and earthwire dampers and batten covers. The number of structures to remediate for this option is 40.

The estimated capital expenditure associated with this option is $9.34 million. Routine operating and maintenance costs relating to planned checks by our field crew are $99,744 per year. The works are estimated to take 30 months to complete. Project completion is assumed in 2026/27.

Option 1 is found to have positive net benefits under all scenarios investigated and, on a weighted basis, will deliver $2.34 million in net present value of economic benefits over the assessment period.

The required works for Option 1, including preparation works, would be undertaken between 2023/24 to 2026/27. All works would be completed in accordance with the relevant standards with minimal modification to the wider transmission assets. Necessary outages of affected line(s) in service would be planned appropriately in order to complete the works with minimal impact on the network.

Option 1 is the preferred option in accordance with NER clause 5.15A.2(b)(12) 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. The analysis undertaken and the identification of Option 1 as the preferred option satisfies the RIT-T.

Transgrid considers this conclusion to be robust to changes in capital cost inputs, estimated risk costs and underlying discount rates, noting that there would need to be unrealistic changes to these key assumptions to change the ranking of the options (as shown via the boundary testing at the end of Section 6. Transgrid will however continue to monitor these key assumptions and will notify the AER if such changes do occur (or appear likely), which would constitute a material change in circumstance.

Appendix A Compliance checklist

This appendix sets out a checklist which demonstrates the compliance of this PACR with the requirements of the National Electricity Rules 236 version.

Rules clause	Summary of requirements	Relevant section(s) in the PACR
5.16.4(v)	The project assessment conclusions report must set out:	
	(1) the matters detailed in the project assessment draft report as required under paragraph (k) See below.	See below
	(2) a summary of, and the RIT-T proponent's response to, submissions received, if any, from interested parties sought	N/A
5.16.4(k)	A RIT-T proponent must prepare a report (the assessment draft report), which must include:	-
	(1) a description of each credible option assessed;	3
	(2) a summary of, and commentary on, the submissions to the project specification consultation report;	N/A
	(3) a quantification of the costs, including a breakdown of operating and capital expenditure, and classes of material market benefit for each credible option;	3 & 4
	(4) a detailed description of the methodologies used in quantifying each class of material market benefit and cost;	5 & Appendix B
	(5) reasons why the RIT-T proponent has determined that a class or classes of market benefit are not material;	4
	(6) the identification of any class of market benefit estimated to arise outside the region of the Transmission Network Service Provider affected by the RIT-T project, and quantification of the value of such market benefits (in aggregate across all regions);	4
	(7) the results of a net present value analysis of each credible option and accompanying explanatory statements regarding the results;	6
	(8) the identification of the proposed preferred option;	6
	(9) for the proposed preferred option identified under subparagraph (8), the RIT-T proponent must provide: (i) details of the technical characteristics; (ii) the estimated construction timetable and commissioning date; (iii) if the proposed preferred option is likely to have a material inter-network impact and if the Transmission Network Service Provider affected by the RIT-T project has received an augmentation technical report, that report; and (iv) a statement and the accompanying detailed analysis that the preferred option satisfies the regulatory investment test for transmission.	3 & 7
	(10) if each of the following apply to the RIT-T project: (i) if estimated capital cost of the proposed preferred option is greater than $100 million[33] (as varied in accordance with a cost threshold determination); and (ii) AEMO is not the sole RIT-T proponent, the reopening triggers applying to the RIT-T project.	N/A
5.16.4(z1)	A RIT-T proponent is exempt from preparing a PADR (paragraphs (j) to (s)) if: 1. the estimated capital cost of the proposed preferred option is less than $54 million (as varied in accordance with a cost threshold determination);	1

[33] Varied to $103m based on the AER Final Determination: Cost threshold Review published November 2024 (see: 2024 RIT and AER cost threshold review - final determination - 12 November 2024.pdf

	2. the relevant Network Service Provider has identified in its project specification consultation report: (i) its proposed preferred option; (ii) its reasons for the proposed preferred option; and (iii) that its RIT-T project has the benefit of this exemption; 3. the RIT-T proponent considers, in accordance with clause 5.15A.2(b)(6), that the proposed preferred option and any other credible option in respect of the identified need will not have a material market benefit for the classes of market benefit specified in clause 5.15A.2(b)(4) except those classes specified in clauses 5.15A.2.1(b)(4)(ii) and (iii), and has stated this in its project specification consultation report; and 4. the RIT-T proponent forms the view that no submissions were received on the project specification consultation report which identified additional credible options that could deliver a material market benefit.	

Appendix B Risk Assessment Methodology

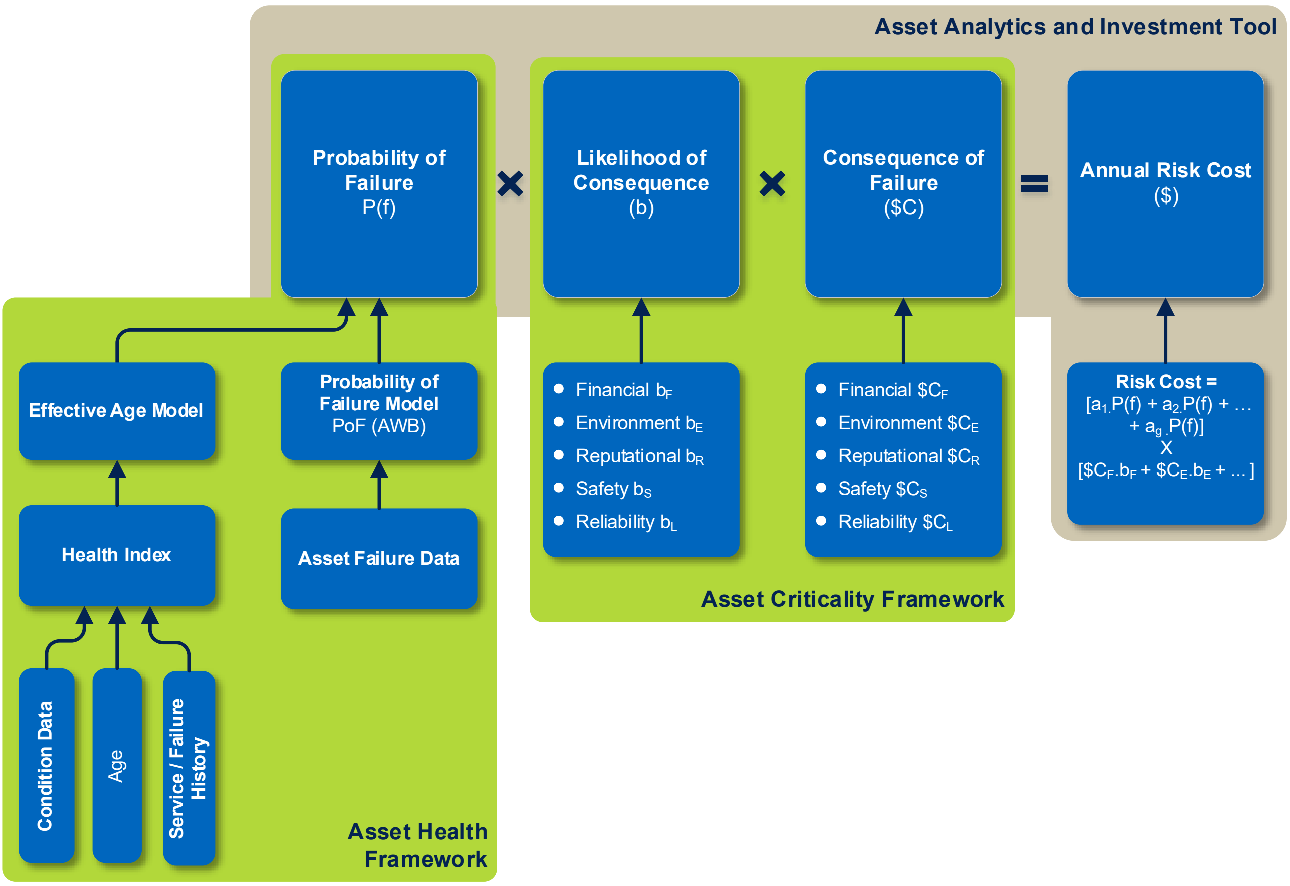
This appendix summarises our network risk assessment methodology that underpins the identified need for this RIT-T. Our risk assessment methodology is aligned with the AER's Asset Replacement Planning guideline[34] and its principles.

A fundamental part of the risk assessment methodology is calculating the annual 'risk costs' or the monetised impacts of the reliability, safety, bushfire, environmental and financial risks.

The monetary value of risk (per year) for an individual asset failure resulting in an undesired outcome, is the likelihood (probability) of failure (in that year with respect to its age), as determined through modelling the failure behaviour of an asset (Asset Health), multiplied by the consequence (cost of the impact) of the undesired outcome occurring, as determined through the consequence analysis (Asset Criticality).

Figure B-1 below summarises the framework for calculating the 'risk costs', which has been applied on our asset portfolio considered to need replacement or refurbishment.

Figure B-1 Risk cost calculation



Economic justification of repex to address an identified need is supported by risk monetised benefit streams, to allow the costs of the project or program to be assessed against the value of the avoided risks and costs. The major quantified risks we apply for repex justifications include asset failures that materialise as:

[34] Industry practice application note - Asset replacement planning, AER January 2019

- bushfire risk;
- safety risk;
- environmental risk;
- reliability risk; and
- financial risk.

The risk categories relevant to this RIT-T are explained in Section 0.

Further details are available in our Network Asset Risk Assessment Methodology.

Appendix C Asset Health and Probability of Failure

The first step in calculating the PoF of an asset is determining the asset health and associated effective age,[35] which considers that:

- an asset consists of different components, each with a particular function, criticality, underlying reliability, life expectancy and remaining life - the overall health of an asset is a compound function of all of these attributes;
- key asset condition measures and failure data provides vital information on the current health of an asset, where the 'current effective age' is derived from asset information and condition data;
- the future health of an asset (health forecasting) is a function of its current health and any factors causing accelerated (or decelerated) degradation or 'age shifting' of one or more of its components – such moderating factors can represent the cumulative effects arising from continual or discrete exposure to unusual internal, external stresses, overloads and faults; and
- 'future effective age' is derived by moderating 'current effective age' based on factors such as, external environment/influence, expected stress events and operating/loading condition.

The PoF is the likelihood that an asset will fail during a given period resulting in a particular adverse event, e.g., equipment failure, pole failure, broken overhead conductor.

The outputs of the PoF calculation are one or more probability of failure time series which provide a mapping between the effective age, discussed above, and the yearly probability of failure value for a given asset class. This analysis is performed by generating statistical failure curves, normally using Weibull analysis, to determine a PoF time series set for each asset that gives a probability of failure for each further year of asset life. This establishes how likely it is that the asset will fail over time.

The Weibull parameters which represent the probability of failure curve for key transmission line components are summarised in Table C-1 below.

Further details are available in our Network Asset Health Methodology.

Table C-1 Weibull parameters for asset components

Asset component	Weibull parameters	
	η	β
Wood pole – natural round	89.0	12

[35] Apparent age of an asset based on its condition.