People. Power. Possibilities.

Managing risk on Line 11 (Dapto - Sydney South)

RIT-T Project Assessment Conclusions Report

Issue date: 23 October 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 a single circuit transmission line in the Great Sydney and Southern NSW regions.

Line 11 is a single circuit steel tower 330 kV transmission line between Dapto and Sydney South substations, with a route length of 68km. There are 154 structures on this single circuit line including 129 suspension towers and 25 tension towers. The line is a key link in the Sydney South coastal region, and its route traverses urban areas near the substations, bushland in the Illawarra Escarpment, Sydney Water Catchment and National Park areas and crosses the Princes Motorway (M1) at several locations.

Line 11 is considered to have the highest level of corrosion among Transgrid's transmission lines and has a history of corrosion related defects affecting tower members, conductor/earthwire fittings, insulators and fasteners (nuts and bolts). A refurbishment project was completed in early 2018 on tension towers in line with the strategy to refurbish tension towers prior to steel loss and end of life and replace suspension structures at end of life.

This need focuses on the suspension structures, which are in varying condition along the line. Many of these are reaching end of life, while others show signs of deterioration, but where refurbishment is an option to achieve another 20 plus years of service. This need includes replacement of 127 spans of conductor which has suffered deterioration due to bushfires, as well as replacement of insulators where a new structure or new conductor is installed, and where new insulators are required due to Transgrid condition and type requirements (i.e. where the installed insulator types have demonstrated poor reliability due to poor quality or manufacturing defects).

Detailed analysis of asset condition information indicates that almost all suspension structures and/or other components on Line 11 have condition issues of some form (structure and conductor) including grillage deterioration which increase the probability of asset failure. This presents a bushfire and safety risk which Transgrid is obligated to manage.

The main drivers of the need to remediate these issues are:

- 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'; and
- Provide economic benefit to consumers through reduction in reliability, safety and bushfire risks.

Identified need: managing risks on Line 11

If action is not taken, the condition of the lines 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 these risks on Line 11.

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.

Further condition deterioration of the affected assets due to corrosion would mean an increase in safety and bushfire risks as the likelihood of failure increases. If left untreated, corrosion of some of the vital components of the steel towers could result in incidents such as conductor drop and tower collapse. Such incidents could have safety consequences for nearby residents and members of the public, as well as our field crews who may be working on or near the assets.

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).[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 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.

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 proposed in our initial Revenue Proposal.

No submissions received in response to the Project Specification Consultation Report

We published a Project Specification Consultation Report (PSCR) on 11 April 2025 and invited written submissions on the material presented within the document. No submissions were received in response to the PSCR.

No material developments since publication of the PSCR

No additional credible options were identified during the consultation period following publication of the PSCR. No material changes have occurred since the PSCR that have made an impact on the outcome of the RIT-T. However, we have applied the following updates to this PACR:

- At the time the PSCR was published, Transgrid's cost estimate for Option 1 was primarily based on a desktop assessment of the activity required. The cost for Option 1 in the PSCR was presented in 2024/25 dollars. We have updated this using CPI inflation (2025/26) and has now become $41.15m for Option 1; hence the estimated cost has not changed in the PACR.
- The estimated cost for Option 2 has been updated using a refined desktop assessment and extrapolated site scoping activity and has now been recalculated to capture the latest material costs, which aligns with current scope requirements. This has raised the estimated cost for Option 2 in the PSCR from $ 69.32m to $74.47m in the PACR.
- In the PSCR, we identified Option 1 as the preferred option; however, after the recalculation of the NPV analysis, results show that Option 2 is now ranked #1 in terms of the NPV. We consider the

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

difference between the net benefit of Option 1 and Option 2 to be marginal at less than 1%, therefore we consider either Option 1 or Option 2 could be the preferred option [2]. However, due to the significant difference in capital expenditure, specifically Option 2 being 81% more expensive than Option 1, we have taken additional factors into consideration.

The conclusion of this RIT-T is consistent with our proposed outcome in the PSCR in that we plan to progress with Option 1 because it is the most prudent and efficient credible option to address to identified need.

Credible options considered

In this PACR, we have considered two 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 43 suspension structures and refurbish 55 suspension structures. Assessment and refurbishment of grillage foundations as required and installation of new conductor[4] on 127 spans. Replacement of insulators.	41.15
Option 2	Replace 98 suspension structures and refurbish 1 suspension structures with bent members. Assessment and refurbishment of grillage foundations as required Installation of new conductor[5] on 127 spans. Replacement of Insulators.	74.47

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 corrosion-related asset deterioration. No submissions were received in response to the PSCR in relation 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.

[2] Preferred option is the credible option that maximises the present value of net economic benefit as per clause 5.15A.1 (c) and 5.17.1 (b) of the NER.
[3] As per clause 5.15.2(a) of the NER.
[4] Using the metric equivalent of the existing conductor
[5] Using the metric equivalent of the existing conductor

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 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 (i.e., where wholesale market benefits are not expected to be material).[6],[7],[8]

A summary of the key variables in each scenario is provided in the table below.

Table E-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%

How the NPV results are affected by changes to other variables (including the discount rate and capital costs) has been investigated in sensitivity analysis.

NPV results and additional considerations

Under all scenarios, the costs of mitigating the risks under Option 1 and Option 2 are found to be significantly outweighed by the expected benefit of avoiding the risks.

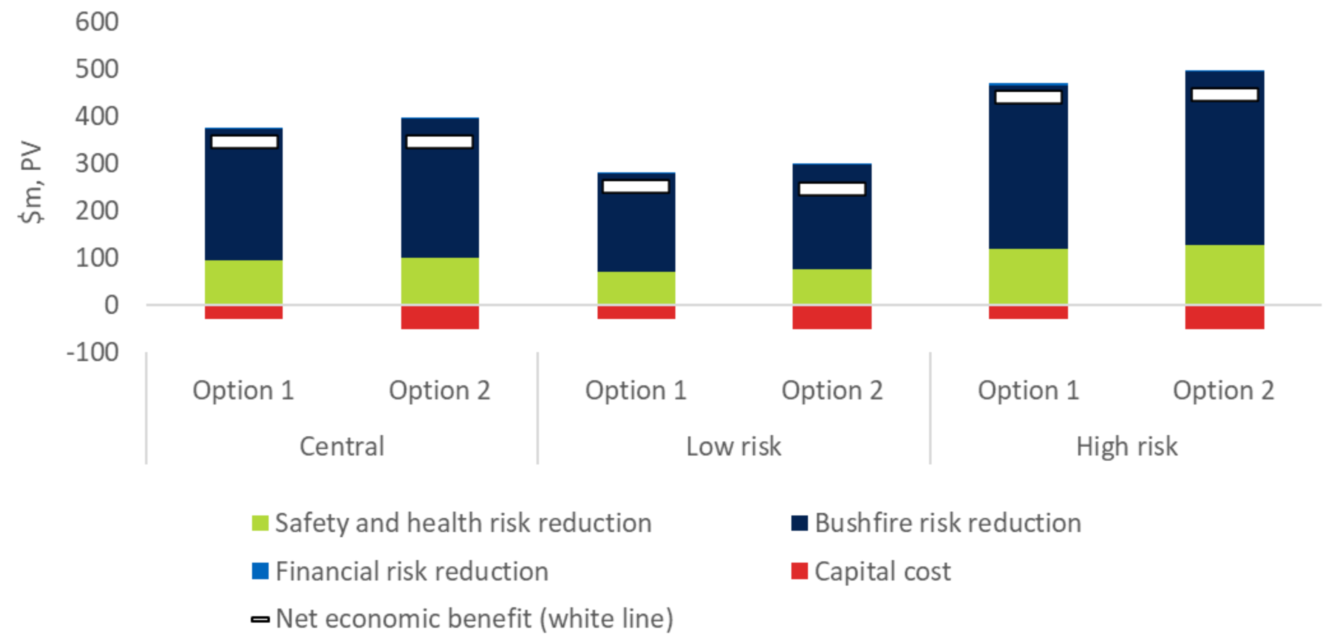
The net economic benefits delivered by Option 1 and Option 2 are estimated at $346.19 million and $347.77 million, respectively.

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

7 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.

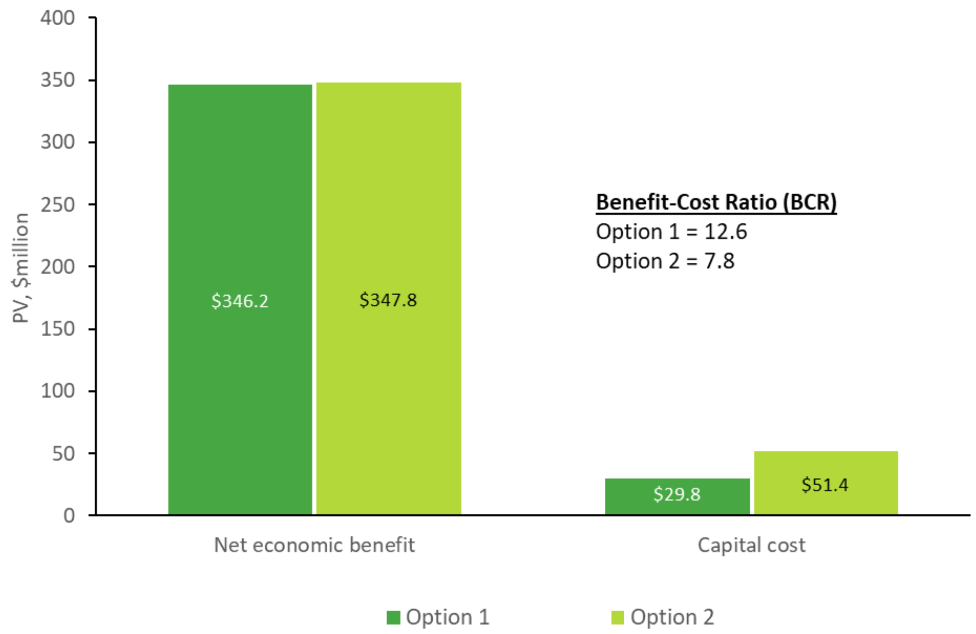
8 AEMO *2025 Inputs, Assumptions and Scenarios Report*, August 2025

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



Despite a marginal difference in NPV terms between the two options, with Option 2 being less than 1% higher than Option 1, there is a significant difference in capital expenditure. Option 2 is 81% more expensive than Option 1. Figure E-1 below demonstrates the difference between the two options in terms of capital expenditure.

Figure E-2 Net economic benefits and capital costs – Central scenario



Conclusion

We consider both Option 1 and Option 2 to be the preferred options in accordance with NER clause 5.15A.2(b)(12). As the net benefit for Option 2 is less than 1% higher than Option 1, we consider both options to equally maximise the net present value of the net economic benefit to all those who produce, consume and transport electricity in the market.

However, due to the significant difference in capital expenditure, specifically Option 2 being 81% more expensive than Option 1 and only delivering less than 1% more benefit, we have decided to progress with Option 1. The additional access requirements (for larger vehicles to access a greater number of locations in Option 2) and uncertainty associated with boring in areas where rock is present, means that Option 1 provides greater certainty regarding site work. A reduced number of structure replacements has reduced potential for weather related, other delays and additional expenditure due to encountering rock and reduced environmental impact.

Option 1 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. Taking into account the NPV results, as well as the significant difference in capital expenditure, we have decided to progress with Option 1.

Option 1 involves the following:

- Replace all suspension structures on the line that have been identified as highest risk structures (43 towers) with concrete or steel pole structures, including all relevant hardware and attachments.
- Remediate 55 suspension structures with less widespread condition issues.
- Remediate bent members on suspension structure 30.
- Like-for-like replacement of conductors on structures 27 to 154[9], including new insulators on all structures within this section.
- Replace other insulators as required by condition, where new structures are to be installed or where defective insulators are present.
- Address identified conductor spacer and anti-climb deterrent issues across all spans.

The estimated capital expenditure associated with this option is $41.15 million. Routine operating and maintenance costs relating to planned checks by our field crew are $25,149 per year. We calculate that the avoided risk cost from undertaking Option 1 ranges from approximately $28.97 million per year to $75.15 million per year in real terms over the assessment period. Option 1 is found to have positive net benefits under all scenarios investigated and, on a weighted basis and present value term, will deliver $346.19 million in net economic benefits over the assessment period.

The required works for Option 1, including preparation works, would be undertaken between 2024/25 and 2027/28. 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.

[9] Using the metric equivalent of the existing conductor

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), i.e.:

- the estimated capital cost of the preferred option is less than $54 million;
- the PSCR included statements stating:
  - 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 21 November 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 11 PACR'.

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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 transmission Line 11. Line 11 is a single circuit steel tower 330 kV transmission line between Dapto and Sydney South Substations, with a route length of 68km, and containing 154 structures. 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[10] 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. No submissions were received in response to the Project Specification Consultation Report

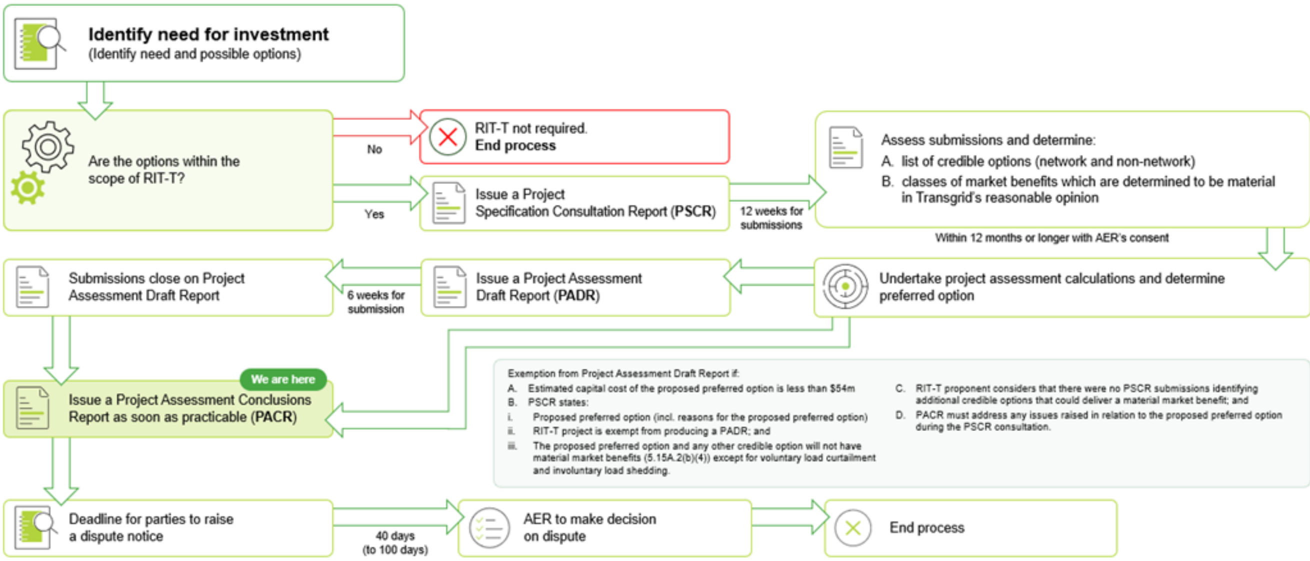
We published a PSCR on 11 April 2025 and invited written submissions on the material presented within the document. No submissions were received in response to the PSCR.

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.

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

Figure 1-1 This PACR is the final stage of the RIT-T process[11]



Parties wishing to raise a dispute notice with the AER may do so prior to 21 November 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 11 PACR'.

[11] 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 11.

2.1. Background to the identified need

Line 11, between Dapto and Sydney South substations, forms a key link in the Sydney South coastal region. Its route traverses urban areas near the substations, bushland in the Illawarra Escarpment, Sydney Water Catchment and National Park areas and also crosses the Princes Motorway (M1) at several locations. Constructed in 1962, there are 154 structures on this single circuit line: 129 suspension towers, and 25 tension towers.

Error! Reference source not found. and Figure 2-2 depicts the location of this line in our Greater Sydney and Southern NSW networks.

Figure 2-1 Location of Line 11 in our Greater Sydney Region network

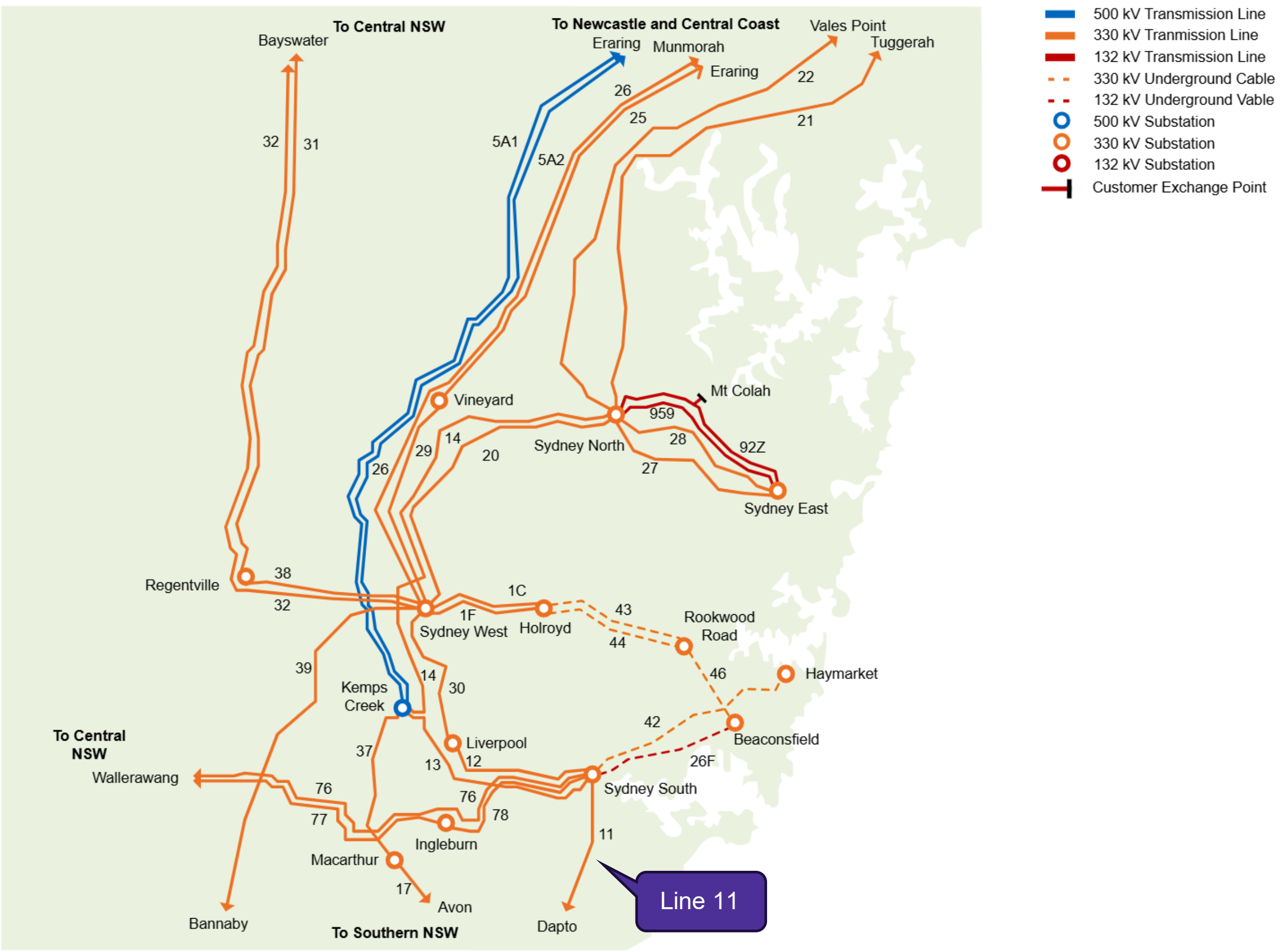


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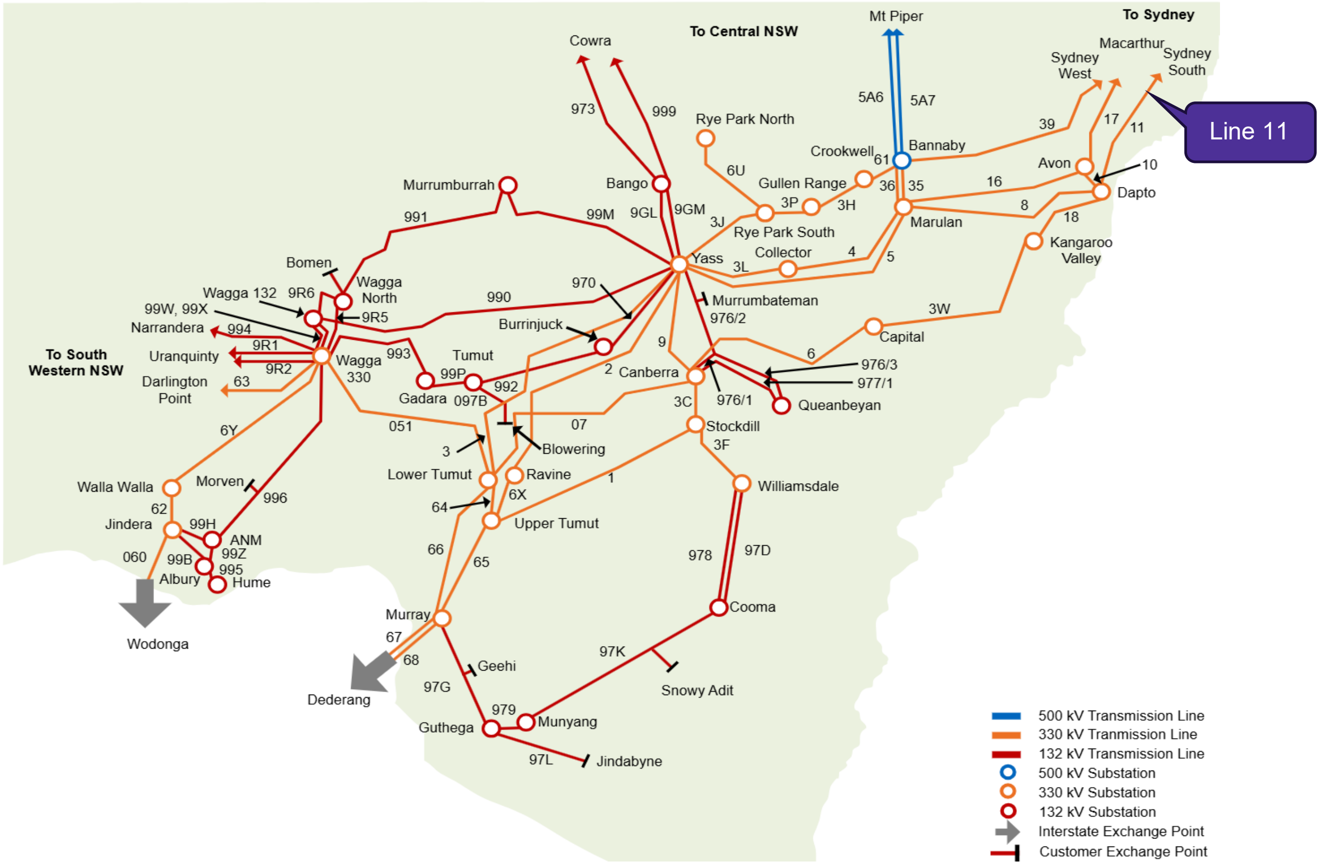
Figure 2-2 Location of Line 11 in our Southern NSW region network



The line is a key part of the network in the Greater Sydney and Southern NSW regions. Being near to the coast, 67% of structures on Line 11 are located in a C4 corrosion category (High Corrosion area) and 33% of structures on Line 11 are located in C3 category (Medium Corrosion area).

Due to its location, Line 11 is considered to have the highest level of corrosion among Transgrid's transmission lines and has a history of corrosion related defects affecting tower members, conductor/earthwire fittings, insulators and fasteners (nuts and bolts). A refurbishment project was completed on tension towers in early 2018 in line with the strategy to refurbish tension towers prior to end of life (due to steel loss) and to replace this design of single circuit suspension structures at end of life.

This need focuses on the suspension structures, which are in varying condition along the line. Many of these are reaching end of life, while others show signs of deterioration, but where refurbishment is an option to achieve another 20 plus years of service. This need includes replacement of 127 spans of conductor which has suffered deterioration due to bushfires, as well as replacement of insulators where a new structure or new conductor is installed, and where new insulators are required due to Transgrid condition and type requirements (i.e. where the installed insulator types have demonstrated poor reliability due to poor quality or manufacturing defects).

Detailed analysis of asset condition information indicates that almost all suspension structures and/or other components on Line 11 have condition issues of some form (structure and conductor) including grillage deterioration which increase the probability of asset failure. This presents a bushfire and safety risk which Transgrid is obligated to manage.

Line 11 transmission line crosses major motorways, public spaces and bushland on the urban fringe. 94% of structures on Line 11 are located in bushfire prone areas. Due to its location on bushland and urban fringe, the bushfire consequence risk on line 11 is one of the highest on Transgrid's network which Transgrid is obligated to manage.

Suspension Towers

98 suspension towers on Line 11 have been identified as having condition issues with the structure and/or other components. Of these, 43 towers have been identified as having higher priority and more widespread condition issues. An additional 55 suspension structures have less significant deterioration with an option for refurbishment, and one already refurbished structure (tower 30) has several bent members which require replacement.

Figure 2-3 below demonstrates examples of the condition of transmission line structures.

Figure 2-3 Corroded tower bolts and members

As well as corroded steelwork and fasteners, the condition of the conductor fittings, earthwire fittings and corona rings due to corrosion is of concern. These items generally had a significantly thinner layer of galvanising at the time of manufacturing compared with other steelwork on the tower. A significant number of fasteners, particularly in the structure bridge and crossarms, also have no galvanising on the bolt head or nut thread. Failure of these fitting attachments can result in fallen conductors.

The condition of the remaining 30 suspension structures (not currently proposed for refurbishment or replacement) is generally good with some exhibiting only very minor surface corrosion. One additional tower has been painted previously.

Conductor Issues

Conductor condition issues have been identified. Smart Aerial Image Processing (SAIP) inspections carried out in 2020 have identified multiple issues with conductor along the line, including broken strands and the presence of possible conductor corrosion (indicated by bulging, visible white product, and discolouration of the conductor).

Deterioration of conductor can compromise mechanical capacity and cause overheating which can lead to conductor failure.

2.2. Description of identified need

The proposed investment will enable us to manage safety and environmental risks on Line 11. 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 these lines will continue to deteriorate.

Further deterioration of the condition of the affected assets due to corrosion would mean an increase in safety and bushfire risks as the likelihood of failure increases. If left untreated, corrosion and deterioration of some of the vital components of the steel towers could result in incidents such as conductor drop and tower collapse. As the lines traverse bushland, residential, recreation and agricultural areas, the risk of public safety and bushfire incidents from conductor drop or structure failure is increased. Such incidents could have safety consequences for nearby residents and members of the public, as well as field crew members who may be working on or near the assets.

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 will also increase, with the potential for asset failures to ultimately occur where defects are undetected.

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).[12]

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.

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 initial Revenue Proposal.

2.3. Assumptions underpinning the identified need

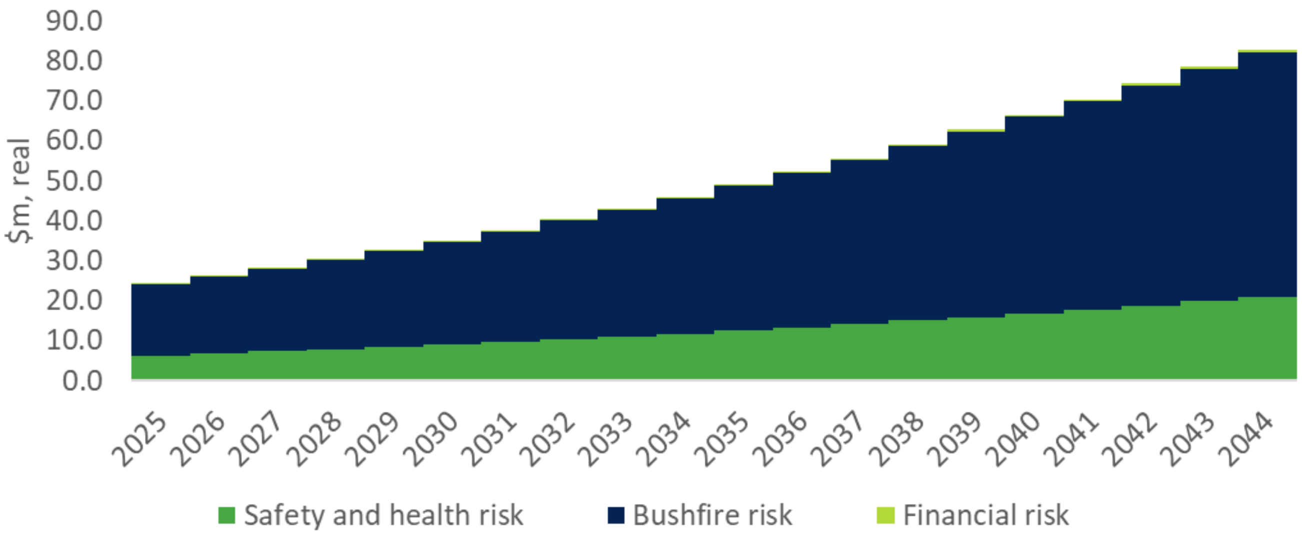
We adopt a risk cost framework to quantify and evaluate the risks and consequences of increased failure rates. Appendix B provides an overview of our risk assessment methodology.

We note that the risk cost estimating methodology aligns with that used in our 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.

[12] Our ENSMS follows the International Organization for Standardization's ISO31000 risk management framework which requires following a hierarchy of hazard mitigation approach

Figure 2-1 summarises the increasing risk costs over the assessment period under the base case.

Figure 2-1 Estimated risk costs under the central scenario ($million, real 2025/26)



This section describes the assumptions underpinning our assessment of the base case risk costs, i.e., the value of the risk avoided by undertaking the credible options below. The aggregate risk cost is estimated at around $26.19 million/year currently in 2026, and it is expected to increase going forward if action is not taken and the lines are left to deteriorate further (reaching approximately $82.78 million/year by 2044).

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.[13] 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 11 and their consequences are summarised in Table 2-1.

Table 2-1 Asset health issues along Line 11 and their consequences

Issue	Consequences if not remediated
Corrosion of tower steel bolts and members	Structural failure, leading to bushfire, safety and financial risks
Bent members	
Corrosion of grillage foundations and legs	

[13] Industry practice application note - Asset replacement planning, AER January 2024

Corrosion and deterioration of insulators, including broken discs	Conductor drop, leading to bushfire, safety and financial risks
Corrosion of conductor attachment fittings	
Conductor spacers and corona rings	
Corrosion of earthwire attachment fittings	
Conductor dampers deteriorated	
Deteriorated earthing	Increased public safety risk
Deteriorated climbing deterrents and signage	

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 lines, 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), design, 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[14] to improve our quantification of bushfire risks across our network, including the moderation of risk costs, using an electricity industry-developed approach.

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

[14] Refer to Network Asset Criticality Framework

- 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.[15].

Bushfire risk makes up approximately 74 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 1 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[16]. 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 approximately 25 per cent of the total estimated risk cost in present value terms under the base case for this RIT-T.

[15] Refer to section 6.2.5 of the Network Risk Assessment Methodology
[16] 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 two 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[17]. Under this base case, no proactive capital investment is made to remediate the deterioration of the identified assets and the lines 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 the 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 $30.37 million per year in safety, environmental and financial risk costs by 2028, rising to $82.78 million per year by 2044.[18] The environmental and safety risk costs are mainly due to the significant consequences of a bushfire event resulting from conductor drop or structure failure. Under the base case, all of these risks will continue to increase.

The annual transmission line routine operating expenditure under the base case is $25,149 per year. We do not expect this to change with any of the investment options being considered, since the options will not change the frequency of planned inspections (however, the reactive maintenance costs do differ and are captured under financial risks).

3.2. Option 1 – Replace 43 suspension structures and refurbish 55 suspension structures. Assessment and refurbishment of grillage foundations as required and installation of new conductor on 127 spans. Replacement of insulators.

Option 1 involves the following:

- Replace all suspension structures on the line that have been identified as highest risk structures (43 towers) with concrete or steel pole structures, including all relevant hardware and attachments.
- Remediate 55 suspension structures with less widespread condition issues.
- Remediate bent members on suspension structure 30.

[17] AER, *Application Guidelines Regulatory Investment Test for Transmission*, November 2024, pp. 42-44.
[18] 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.

- Like-for-like replacement of conductors on structures 27 to 154[19], including new insulators on all structures within this section.
- Replace other insulators as required by condition, where new structures are to be installed or where defective insulators are present.
- Address identified conductor spacer and anti-climb deterrent issues across all spans.

The works are expected to be undertaken between 2024/25 and 2027/28. Planning, design, development and procurement (including completion of the RIT-T) will occur between 2024/25 and 2025/26, while project delivery and construction will occur from 2026/27.

All works would be completed in accordance with the relevant standards by 2027/28 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 $41.15 million. Routine operating and maintenance costs are the same as the base case for this option (estimated at $25,149 per year).

3.3. Option 2 – Replace 98 suspension structures, refurbish 1 structure and refurbish line components on other remaining structures identified as having condition issues.

Option 2 involves the following:

- Replace 98 suspension structures on the line with concrete or steel pole structures, and remediate Structure 30, by replacement of bent members.
- Like-for-like replacement of conductors on structures 27 to 154[20], including new insulators on all structures within this section.
- Replace other insulators as required by condition, where new structures are to be installed or where defective insulators are present.
- Address identified conductor spacer and anti-climb deterrent issues across all spans.
- Assess and refurbish grillage foundation structures as required.

The works are expected to be undertaken between 2025/26 and 2028/29. Planning, design, development and procurement (including completion of the RIT-T) will occur in 2025/26, while project delivery and construction will occur from 2026/27.

All works would be completed in accordance with the relevant standards by 2028/29 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 $74.47million. Routine operating and maintenance costs are the same as the base case for this option (estimated at $25,149 per year).

[19] Using the metric equivalent of the existing conductor
[20] Using the metric equivalent of the existing conductor

3.4. Options considered but not progressed

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 as transfer capacity of Line 11 is needed in this part of the network.
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 risks posed as a result of corrosion-related asset deterioration. No submissions were received in response to the PSCR in relation to non-network solutions.

3.5. No material inter-network impact is expected

We have considered whether the credible options described above is expected to have material inter-regional impact.[21] 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."*

AEMO's suggested screening test to indicate that a transmission augmentation has no material inter-regional impact is that it satisfies the following[22]:

- 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.

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

[22] 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. Accessed 14 May 2020. https://www.aemo.com.au/-/media/Files/PDF/170-0035-pdf

3.6. Community engagement

Transgrid recognises that the preferred option being considered in this RIT-T may impact the surrounding communities and key stakeholders. As such, Transgrid will create a Community and Stakeholder Engagement Plan to engage, inform and consult as required with stakeholders, including local landowners, local council, local community members, local environmental groups and traditional owners.

Transgrid will commit to informing, and consulting, with landowners in the months leading up to planned works and working with landowners and key stakeholders to mitigate impacts during construction.

For works on private land and easements, contractors and staff will be informed of landowner access and biosecurity requirements. Our people follow a Land Access Code of Conduct when visiting properties. The landowner would be provided with contacts for key staff members, and our Community Information Line and Transgrid community email should issues arise, so they can be addressed in a timely manner. Community enquiries and concerns are responded to and resolved in accordance with the applicable internal policies and procedures.

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.[23]

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.[24]

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. No other classes of market benefits are material

In addition to the classes of market benefits listed above, NER clause 5.15A.2(b)(4) requires that we consider the following classes of market benefits, listed in **Error! Not a valid bookmark self-reference.**, 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 in **Error! Not a valid bookmark self-reference.**.

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

Market benefits	Reason
Changes in involuntary curtailment	Since Line 11 forms part of a meshed network (N-1 redundant) required to supply the Sydney/South Coast region, a failure of the 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.

23 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(b)(4). See Appendix A for requirements applicable to this document.

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

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.[25] 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	Neither option is expected to induce a material change in Australia's greenhouse gas emissions.

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

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 2024/25 to 2043/44 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

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[26] We note that the AER RIT-T Guidelines state that the base case is where the RIT–T proponent does not implement a credible option to meet the identified need, but rather continues its 'BAU activities'. The AER define 'BAU activities' as ongoing, economically prudent activities that occur in the absence of a credible option being implemented. Australian Energy Regulator. "*Application guidelines Regulatory Investment for Transmission*, November 2024"

[27] AEMO '*2025 Inputs, Assumptions and Scenarios Report*', August 2025, pp.159..

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).[28]

We estimate the majority of structures will be refurbished in normal soil with some presence of rock along the line, which introduces uncertainty particularly where large diameter boring is required for replacement pole structures. As the work is to refurbish and replace structures on an existing line, minor access track upgrade work, water crossing upgrades, groundwork in the form of grade and filling, and vegetation clearing have been allowed for. This will be more significant where access for larger drill rigs and cranes is required (i.e. for replacement of structures rather than refurbishment). This has been considered for both options; however, the scope for Option 1 presents less risk than Option 2 due to the smaller volume of structures to be replaced.

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, 2025/26 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 with an existing substation and therefore low impact on community, we do not anticipate the need to provide additional costs to address social license considerations as outlines in section 3.6.

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

[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.

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).

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).[29],[30],[31]

Table 5-1 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%

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

[29] AER, *Application Guidelines Regulatory Investment Test for Transmission*, November 2024, pp.42-44.

[30] 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.

[31] AEMO '*2025 Inputs, Assumptions and Scenarios Report'*, August 2025, pp.159.

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:

- 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	376.02	282.01	470.02	376.02
Option 2	399.19	299.39	498.99	399.19

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	29.82
Option 2	51.43

6.3. Estimated net economic benefits

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

Table 6-2 summarise the present value of the net economic benefits for both Options are found to have positive net benefits for all scenarios investigated. On a weighted basis, Option 1 is found to deliver approximately $346.19 million and Option 2 approximately $347.77 million.

Given the marginal difference in net economic benefits between Option 1 and Option 2, an additional financial metric, the benefit-cost ratio (BCR) has been estimated to support the assessment. As presented in Table 6-4, the BCR for Option 1 is approximately 12.6, compared to 7.8 for Option 2. This indicates that

Option 1 offers significantly greater economic efficiency in managing and mitigating safety, environmental, and financial risks.

Table 6-2 NPV of net economic benefits relative to the base case ($million)

Option	Central scenario	Low risk costs scenario	High risk costs scenario	Weighted scenario	Benefit-Cost Ratio
Scenario weighting	1/3	1/3	1/3		
Option 1	346.19	252.19	440.20	346.19	12.6
Option 2	347.77	247.97	447.57	347.77	7.8

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

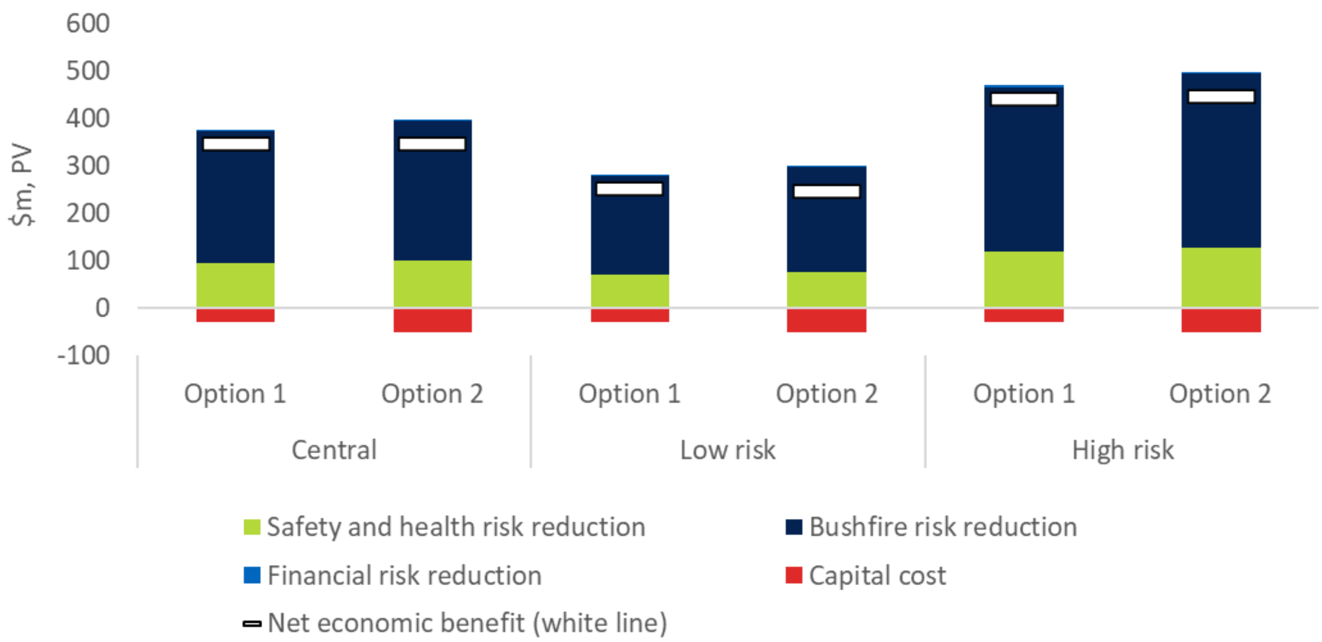
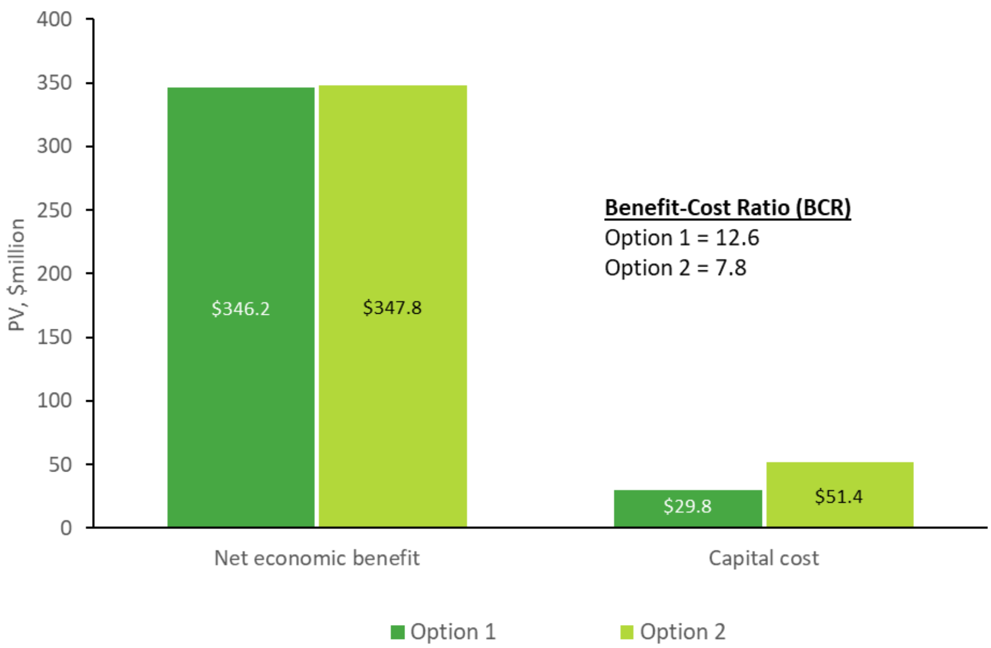


Figure 6-2 Net economic benefits and capital expenditure ($million, PV)



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 invariant to the assumptions of:

- a 25 per cent increase/decrease in the assumed network capital costs;
- lower discount rate of 3.00 per cent as well as a higher rate of 10.00 per cent; and
- lower (or higher) assumed safety, environmental and financial risks.

Each timing sensitivity has been undertaken on the central scenario.

Error! Reference source not found. below 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 2028/29 for all of the sensitivities investigated.

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

The same sensitivity testing of the optimal commissioning year was also undertaken for Option 2. The results were consistent with the observed for Option 1, confirming the optimal timing for implementation remains robust across all tested assumptions. This also supports the rationale for considering either Option 1 or Option 2 as a preferred option.

Figure 6-32 Optimal timing of Option 1

Figure 6-43 Optimal timing of Option 2

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 2027/28. 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 discount rate of 3.00 per cent as well as a higher rate of 10.00 per cent; and
- lower (or higher) assumed safety, environmental and financial risks.

All these sensitivities investigate the consequences of ‘getting it wrong’ having committed to a certain investment decision.

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 6-54 Capital cost sensitivity

Figure 6-65 Risk costs sensitivity

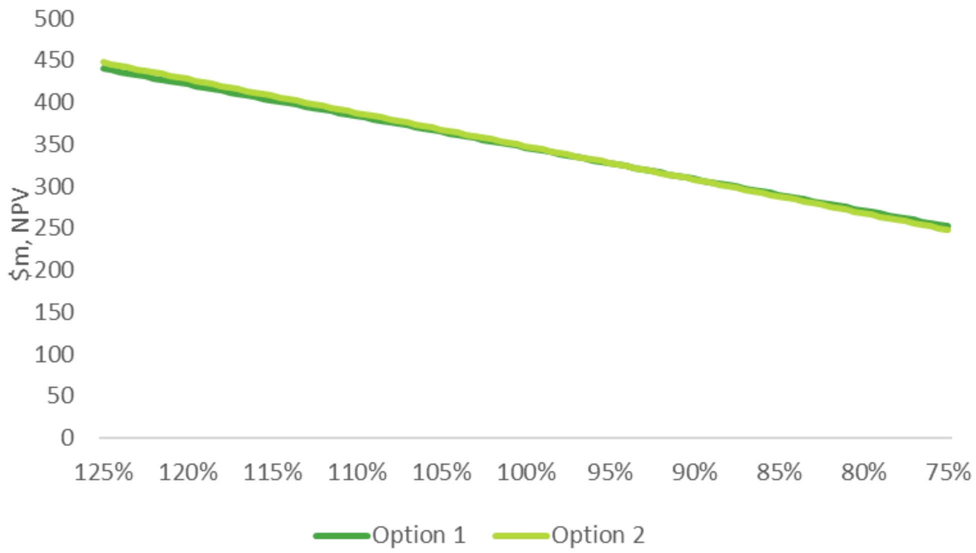
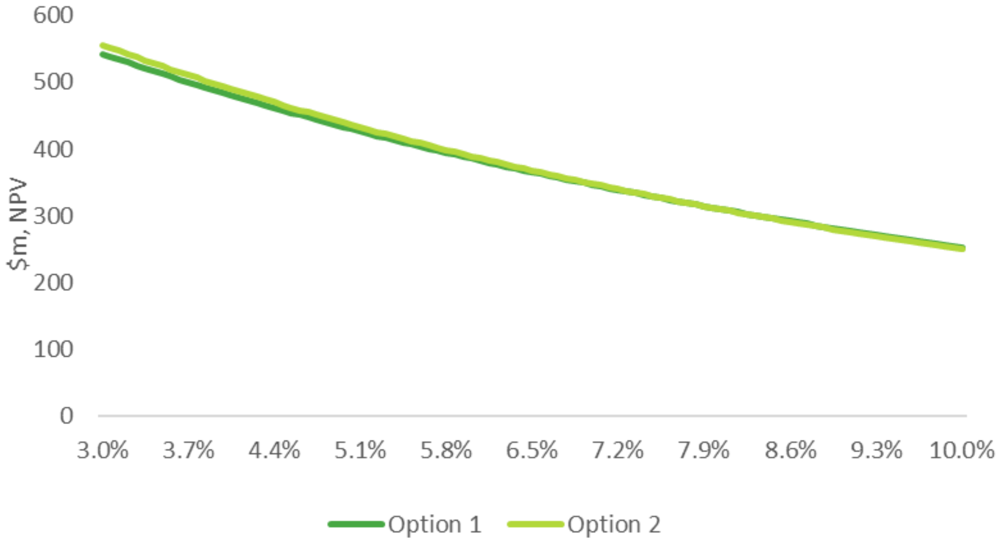


Figure 6-76 Commercial discount rate sensitivity



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 and Option 2 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 increase by 7 per cent;
- the estimated risk costs (in aggregate) would need to decrease by over 7 per cent; and
- a discount rate would need to be greater than 7.9 per cent.

On an NPV weighted basis, the preferred option is either Option 1 or Option 2, with a marginal difference of less than 1% between them. While Option 2 is marginally higher than Option 1 on an NPV basis, it is significantly more expensive in terms of capital cost.

7. Conclusion

We consider both Option 1 and Option 2 to be the preferred options in accordance with NER clause 5.15A.2(b)(12). As the net benefit for Option 2 is less than 1% higher than Option 1, we consider both options to equally maximise the net present value of the net economic benefit to all those who produce, consume and transport electricity in the market.

However, due to the significant difference in capital expenditure, specifically Option 2 being 81% more expensive than Option 1 and only delivering less than 1% more benefit, we have decided to progress with Option 1. The additional access requirements (for larger vehicles to access a greater number of locations in Option 2) and uncertainty associated with boring in areas where rock is present, means that Option 1 provides greater certainty in regard to site work. A reduced number of structure replacements has reduced potential for weather related, other delays and additional expenditure due to encountering rock and reduced environmental impact.

The analysis undertaken and the decision to progress with Option 1 satisfies the RIT-T.

Option 1 involves the following:

- Replace all suspension structures on the line that have been identified as highest risk structures (43 towers) with concrete or steel pole structures, including all relevant hardware and attachments.
- Remediate 55 suspension structures with less widespread condition issues.
- Remediate bent members on suspension structure 30.
- Like-for-like replacement of conductors on structures 27 to 154[32], including new insulators on all structures within this section.
- Replace other insulators as required by condition, where new structures are to be installed or where defective insulators are present.
- Address identified conductor spacer and anti-climb deterrent issues across all spans.

The estimated capital expenditure associated with this option is $41.15 million. Routine operating and maintenance costs relating to planned checks by our field crew are $24,393 per year (base case). We calculate that the avoided risk cost from undertaking Option 1 ranges from approximately $28.10 million per year to $72.89 million per year in real terms over the assessment period.

The required works for Option 1, including preparation works, would be undertaken between 2024/25 and 2027/28. 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.

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.

[32] Using the metric equivalent of the existing conductor

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 version 236.

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 $35 million[34] (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
[34] Varied to $54m based on the *AER Final Determination: Cost threshold Review* published November 2024

	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

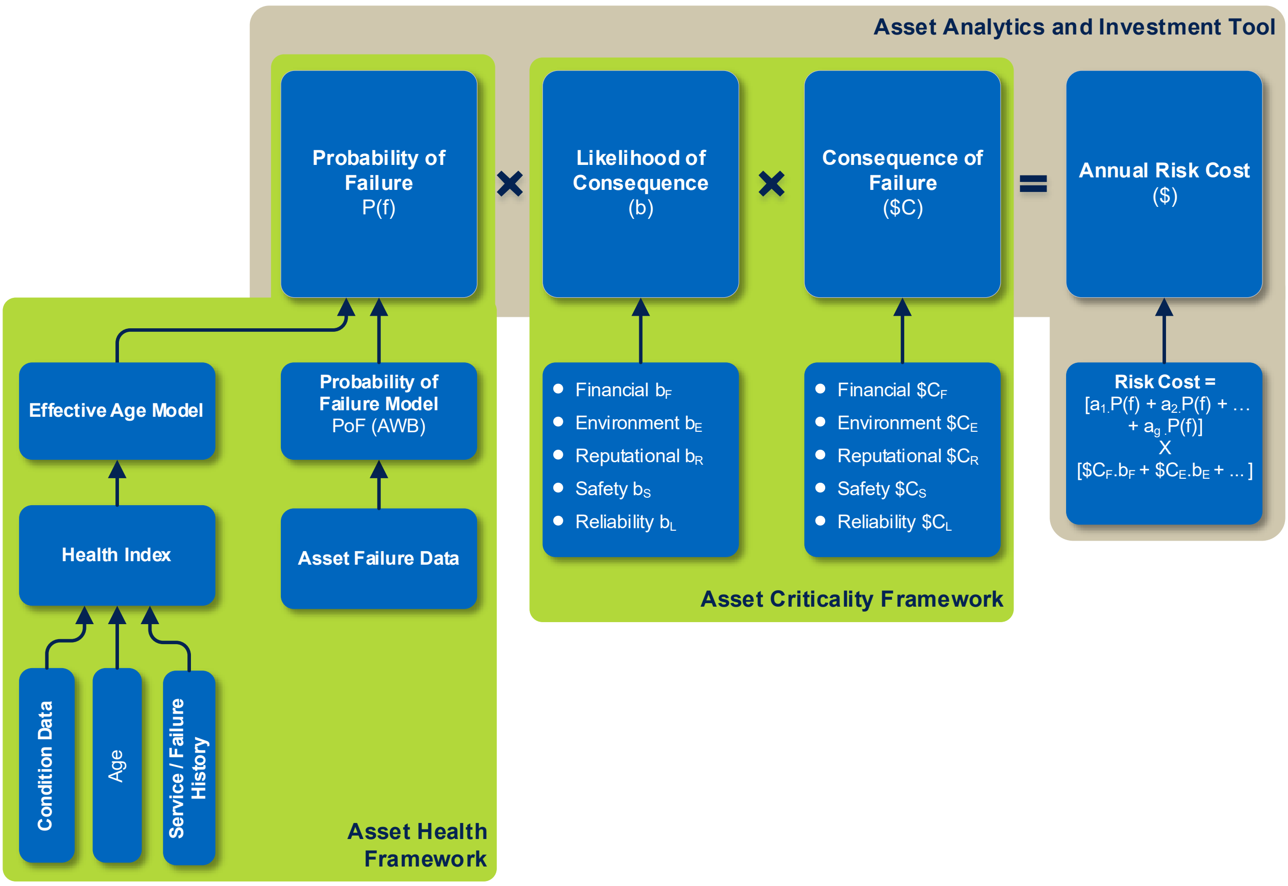
This appendix summarises our network risk assessment methodology that underpins the identified need for this RIT-T. Our risk assessment methodology is aligned with the AER's Asset Replacement Planning guideline[35] and its principles.

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:

[35] 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,[36] 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
Lattice steel Tower Corrosion Zone C3	270.9	2.17
Lattice steel Tower Corrosion Zone C4	141.2	2.71

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